Clinical Foundations in Maternal and Child Health:
A Proposed Graduate Level Course for the Gillings School of Global Public Health Department of Maternal and Child Health

by

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April 5, 2013

Approved by:

First Reader

Second Reader
Course Rationale

Courses and lectures in maternal and child health are vital parts of the educational process for students obtaining public health degrees. It is widely recognized that maternal health is a critical part of global health and that improving the health of women improves the health of everyone including men, children, and infants.\(^1\) Despite a wide variety of opportunities for students to learn about important topics in maternal and child health from a public health perspective, programs often assume that students understand the clinical context of the health conditions affecting women and children. Upon review of the curricula of the top ten Maternal and Child Health Public Health degree programs, none currently offer courses that distinctly address the clinical aspects of these conditions. As future public health practitioners, these students will learn about the societal, cultural, community, family, and individual risk factors that predispose women and children to higher rates of morbidity and mortality. Rarely, however, will they have the chance to gain a real appreciation for the clinical aspects of these conditions or learn how to effectively apply them within a public health framework.

Of all public health students, only 8% have a medical degree prior to beginning their program.\(^2\) The remaining students come from a wide variety of academic backgrounds, including international relations, communications, women’s studies, English, and more. A course of this nature could provide a valuable foundation in maternal and neonatal medicine for public health professionals. This was well articulated in this statement by a current student:

“\textit{I didn't get a strong foundation in ‘medical’ MCH. I can discuss pregnancy interventions but couldn't explain, medically, about the life cycle from conception to birth.}
*Having a strong medical foundation in ‘maternal & child health’ can help support better program/intervention design.”*

Thus, my proposed course is designed to fill this gap by providing an introduction to many of the key conditions that maternal and child health practitioners should be aware of. In turn, individuals in their careers will use this knowledge as they develop programs, interventions, policies, and evaluations. A deeper and more thorough understanding can help public health professionals ensure that the work they is do is accounting for and sensitive to all of the factors (biological, sociological, economical, and environmental) that affect the short-term and long-term health of women and children.

Course Demand

Much like medical students complement their medical education with a public health degree, there is demand for public health students to complement their education with additional coursework from a medical or clinical perspective. A convenience sample of current graduate students in the Gillings School of Global Public Health completed a Qualtrics (Qualtrics, Provo, UT) survey showing that there is support for this course with greater than 50% of respondents stating that they would be interested in enrolling in a course of this nature (N=26). When asked why, respondents stated:

“I feel the clinical aspect of our work is often left out, and I see this as important background knowledge as we move forward as public health practitioners”

and

“I do not have a medical background and I think it would be incredibly important and helpful to have courses that explain the medical/physical nature of a lot of the things we are talking about--I think it would strengthen my understanding”.
For the full Qualtrics report, please see Appendix A.

Project Contents

This project includes a course description, objectives, and rationale. In addition, the topics covered for each week are listed with corresponding objectives and readings for each section. For each of the required readings a rationale or objective has been included to justify why they are valuable for this topic. The target audience, assignments, and grading policies are included as well. This syllabus will be accompanied by two PowerPoint presentations that were developed for the course. The first presentation is entitled, “Two Sides of the Same Coin: Cesarean Deliveries in Developed and Developing Countries” (see Appendix B). This presentation focuses on describing the medical indications for cesarean deliveries and highlights issues with too many and too few cesareans. The second presentation is entitled “Preterm Birth, Prematurity, Pneumonia, and Congenital Anomalies” and focuses on fetal and neonatal health related to fetal development and preterm delivery (see Appendix C).

Conclusion

Centering on pregnancy, postpartum, and the neonatal period, this course is designed to provide public health students with medical information that will bolster their public health education and ensure that they graduate with an understanding of the clinical aspects of maternal and child health as a complement to their knowledge of public health problems from the population-level perspective.
Course Name: Clinical Foundations in Maternal and Child Health
Department: Maternal and Child Health
Credit Hours: 3

Course Description
This course is designed to introduce students to common medical issues that face women and children in developing and developed countries. This course will enable students to have a deeper understanding and critical perspective as public health practitioners.

Target Audience
Master’s and doctoral level students with an interest in developing a stronger foundation in the medical issues that affect the health of women and children around the world. Because maternal and early childhood health is a fundamental component of global health, this course is open to students from any department in the Gillings School of Global Public Health. Undergraduate students are not permitted to take this course. Graduate students from other schools may contact the course instructor for permission to enroll.

Course Format
This course will meet once a week for 2 ½ hours. The course sessions will involve a variety of lectures, class discussions, small group activities, and videos that are designed to critically engage the student in the medical issue(s) for that week. The course will be broken up into three thematic areas: chronic illness affecting pregnancy and birth; pregnancy, delivery, and postpartum; and newborn health and development.

Objectives
The objectives of this course are to supplement the education students receive on the theoretical and applied aspects of the public health needs pertaining to women and children in domestic and global settings. Specifically, students will develop an understanding of the:

- Medical conditions that contribute to maternal morbidity and mortality around the world
- Normal labor and birth, and the potential complications that may arise
- Medical conditions that contribute to neonatal morbidity and mortality throughout the world
- Normal newborn transition and development
- Public health interventions that are addressing these key conditions in the world

Competencies
Through participation in this course, students will have the opportunity to further develop the competencies expected of graduate level students in the Gillings School of Global Public Health. The ASPH Cross-Cutting Competencies have six main areas, all of which can be found in some element of the course. However, there are three main competencies that will be addressed by this course in the following ways:

1) Professionalism & Ethics
The ability to demonstrate ethical choices, values, and professional practices implicit in public health decisions; to consider the effect of choices on community stewardship, equity,
social justice, and accountability; and to commit to personal and institutional development.

A) Review, integrate, and apply ethical and/or legal principles in both personal and professional interactions, as well as public health practice and/or research.
   a. The students and instructors will use sound ethical principles in their interactions with other students and staff. These ethical principles will also be expected from the students with the submission of assignments, projects, and presentations.

B) Apply evidence-based concepts in public health decision-making.
   a. The students will utilize current research and literature to develop their projects, presentations, and papers.

C) Appreciate the need for lifelong learning in the field of public health.
   a. This course will provide the students with a necessary background understanding of medical conditions affecting women and their children. This knowledge can be applied and deepened through additional study throughout the student’s professional career.

D) Consider the effect of public health decisions on social justice and equity.
   a. This course exposes students to a variety of disparities experienced by women and their children throughout the world. Discussions and activities that focus on identifying relevant interventions and treatments will highlight some of the inequities experienced by these populations.

2) Program Planning
The ability to plan the design, development, implementation, and evaluation of strategies to improve individual and community health.

A) Discuss social, behavioral, environmental, and biological factors that contribute to specific individual and community health outcomes.
   a. Within the context of medical conditions, this course will include discussions on how the social, behavioral, environmental, and biological factors will contribute to the individual expression of negative pregnancy and birth outcomes.

B) Identify needed resources for public health programs or research.
   a. Through group projects, individual papers, and classroom activities, students will have the chance to identify and discuss the types of resources most needed to treat specific medical conditions.

3) Systems Thinking
The ability to recognize system level properties that result from dynamic interactions among human and social systems and how they affect the relationships among individuals, groups, organizations, communities, and environments.

A) Identify characteristics of a system.
   a. This course will show how the morbidity and mortality of different medical conditions can vary based on the availability, quality, and accessibility of health care for women and their children.

B) Respond to identified public health needs within their appropriate contextual setting.
   a. This course will focus on the application of specific tests, treatments, and possible public health interventions within the appropriate contextual setting.
**Student Participation (10% of grade)**
Students are expected to participate in the course through completion of the readings before class, full attention to the activity or speaker, and participation in class discussions. Attendance at all classes is expected, and students missing three or more classes will be subject to a 10% decrease in their final grade for the course. When possible, absences should be discussed in advance with the course instructor.

Assignments received after midnight on the date in which they are due, will receive a 5% reduction for each day late. Students are expected to have their assignments completed by the due date, and only extreme circumstances warranting extensions for not completing the assignments will be considered.

**Assignments**

**Papers (15% each; 45% of total grade)**
Students will be given the opportunity to write three 750-1000 word papers, one for each thematic area. Students will pick a topic from each of the three thematic areas that were not covered during the lectures. Each paper will focus on a region or country of interest to the student. These papers will include the following information: Description of the problem for that region/country, key medical signs/symptoms/treatments for the condition, and the public health implications of the condition.

**Group Project (25% of grade)**
Students will be grouped together with 3 or 4 students to work on a project together based on a common interest. The groups will develop a 20-30 minute interactive presentation on a topic from the list below. The students will have the opportunity to pick a country or state of their choice and pick one of the topics to present on. The students will be responsible for providing the class with a description of the condition, the incidence/prevalence, how it is diagnosed and treated (with particular emphasis placed on location-appropriate resources), maternal and fetal implications, and key public health interventions that are seeking to address the problem.

The purpose of this project will be for the students to have a chance to teach each other about conditions that are not covered in the class using a variety of teaching strategies such as demonstrations, games, videos, etc.

**Topics:**
- Toxoplasmosis
- Rubella
- Cytomegalovirus
- Hepatitis A
- Varicella/Chicken Pox
- Listeria

Additional topics may be considered pending discussion with the instructor.

**Final Exam (20% of grade)**
The course will culminate in a final exam, which will broadly cover the key issues and conditions covered in the course. The exam format will be fill-in-the-blank, short answer, and multiple-choice questions.

Grading will be as follows: $\geq 90\% = H, 70\%-89.9\% = P, 60\%-69.9\% = L, <60\% = F$. Grading rubrics will be designed for each of the papers and the group project to ensure student understanding of the grading procedures for this class.

### Course Schedule

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<th>Week</th>
<th>Topics/Objectives/Readings</th>
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<tr>
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<td><strong>Topics</strong></td>
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<td>• Course Introduction/Syllabus Review</td>
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<td></td>
<td>• Video: Introduction to Maternal and Child Health</td>
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<td></td>
<td>• Doctors, Midwives, TBAs, SBAs, oh my!</td>
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<td></td>
<td><strong>Objectives</strong></td>
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<td>1. Understand the scope of the course, including what it will and will not cover</td>
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<td>2. Understand student expectations for this course</td>
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<td>3. Understand the myriad of health care providers who provide care to women and infants during pregnancy and labor</td>
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<td><strong>Required Readings</strong></td>
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<td>Objectives: These readings were selected to help the students develop a deeper understanding of the different types of birth providers in developed and developing countries. These readings will show the students how differential outcomes are associated with different levels and types of delivery providers. These readings will also provide the students with a thorough understand of the different types of training, responsibilities, and legal and medical limitations of some types of providers.</td>
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<tr>
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<td>• This reading was included to supplement lecture content that would discuss the benefits and risks of home birth vs. hospital birth. The lecture would highlight the debates between midwives and obstetricians regarding the safety of home births.</td>
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<td>• This reading was included to help explain and identify some of the reasons behind the decisions women make when choosing a childbirth provider.</td>
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<td>• This reading will further supplement content describing the different types of caregivers that can be present at and attend births throughout the world.</td>
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|      |   • This reading will supplement lecture content that highlights some of the
challenges women face in accessing and utilizing skilled providers at birth.

**Recommended Readings:**


**2 Changes and adaptations in pregnancy**

- Physical Changes
- Anatomical Changes
- Hormonal Changes

**Fetal Development**
First trimester: Organ and System Development (genetic, physical, cardiac, etc.)
Second trimester: Growth
Third trimester: Maturation of Systems (neurological, hematological, respiratory, etc.)

**Objectives**
1. Describe the key physical changes that occur in pregnancy
2. Describe the key anatomical changes that occur in pregnancy
3. Describe the key hormonal changes that occur in pregnancy
Understand the key developmental periods of the fetus in pregnancy

**Required Readings**
Objectives: The purpose of this collective group of readings is to provide students with an in-depth understanding of the physical, physiological, hematological, and hormonal changes that women undergo in pregnancy. Rather than selecting journal articles to read, I chose the following UpToDate articles because they provide a medically focused description of the specific changes experienced by women in pregnancy and are able to break down complicated medical information into fairly simple, easy to read descriptions. These materials will supplement lecture material that ensures students understand the different medical concepts and their importance within the public health perspective.


2. Petraglia F and D’Antona, D. Maternal endocrine and metabolic adaptation to


3 Labor Dynamics

• Stages of labor
• Power, presentation, passenger, passage
• Induction and Augmentation of Labor

Birth
• Delivery of infant
• Delivery of placenta

Cesarean Deliveries
• Types of cesarean deliveries
• Indications for cesarean deliveries
• Risks of cesarean deliveries

Future pregnancy implications

Objectives
1. Understand what a cesarean delivery is
2. Understand the clinical indications for a cesarean delivery
3. Learn the ideal rates of C/S deliveries vs. actual rates
4. Understand the reasons behind too many and too few C/S

Discuss potential strategies to address these issues

Required Readings
Objectives: The purpose of the readings was to introduce the students to some of the key debate in obstetrics at this time. From too many or too few cesarean deliveries, to the benefits or drawbacks of labor anesthesia on birth outcomes, these articles will show the students that there are always two sides to any issue. As medical or public health professionals, it is important to be aware of these issues in order to make the best choices given the context and need.

   • This article was included to help the students understand that too much of a good
thing can have consequences for maternal and infant health outcomes and that is important to use this delivery method only when appropriate and medically indicated.

   - This article urges delivery practitioners to incorporate respect for the cultural beliefs of women during the intrapartum period. As childbirth is a period defined by unique cultural and personal beliefs, understanding these customs can help improve the patient-provider relationship and positively impact delivery outcomes.

   - Within obstetrics there is a significant debate on whether labor analgesia negatively affects labor outcomes by lengthening labor, contributing to fetal distress, and making it difficult for women to push effectively. This article was included because the majority of women in the US choose to use labor analgesia and this can significantly impact birth outcomes.

   - This study was included to supplement lecture material that shows the link between mortality risk and delivery method highlighting that being on the extremes (too many or too few cesarean deliveries) contributes to maternal mortality.

**Recommended Readings:**


| 4 | **Hypertensive Disorders** |
### Objectives

1. Understand the prevalence of hypertensive disorders among women of reproductive age
2. Understand the effects of hypertensive disorders on pregnancy
3. Understand the main treatments for hypertensive disorders in pregnancy

### Required Readings

Objectives: These readings were selected to help the students gain an understanding of what these conditions are, and what impact they have on pregnancy and neonatal outcomes. As rates of chronic disease including hypertensive disorders rise, more women around the world are likely to experience these conditions and have their pregnancies affected by them. These readings will supplement lecture material that will help the students understand the significance and implications hypertensive disorders in pregnancy.

1. **Ananth CV, Basso O.** Impact of pregnancy-induced hypertension on stillbirth and neonatal mortality in first and higher order births: A population-based study. Epidemiology [Internet]. 2010;21(1):118-123.
   - This reading will supplement lecture material on the medical aspects of these conditions to show the public health impact of these conditions. By linking the medical information and public health perspective, students will be given the chance to develop an understanding of how to incorporate this information into their public health careers.

   - This is included to show the students the general significance and magnitude of these conditions within the United States.

   - As one of the leading causes of maternal morbidity and mortality, this article will describe the global burden of these conditions and help students to understand some of the basic causes and treatments of them.

   - This article will introduce students to some of the common forms of medical management for these conditions. This will be further discussed in the classroom lecture.

### Recommended Readings:


### Objectives

1. Understand the public health implications of rising diabetes rates among women of reproductive age
2. Learn about the effects of diabetes on women and their infants
3. Understand the implications of rising obesity rates and its effect on pregnancy and childbirth outcomes

### Required Readings

Objectives: The purpose of these readings is to help the students understand the effects of obesity and diabetes on pregnancy and neonatal outcomes. These readings will allow the student to gain a deeper understanding of the effects of obesity on pregnancy outcomes and risks for the development of complications. These articles will further supplement student’s knowledge of the long-term effects of obesity and diabetes on health outcomes.

   - This article will introduce students to some of the types of adverse events experienced by obese women.


- This article will show students the links between maternal health and the development of complications in pregnancy, with particular emphasis placed on the role of weight.


- This article will complement the previous article by further looking at the relationship between obesity and the development of blood pressure problems in pregnancy.

### Mental Health

- Emotional changes in pregnancy
- The effects of pregnancy on preexisting mental health conditions
- Postpartum Depression and the “Baby Blues”

### Violence in Pregnancy

- Domestic Violence
- Sexual Assault

### Objectives

1. Understand the unique emotional needs of women in pregnancy
2. Understand the effects on mental health conditions on pregnancy outcomes
3. Understand the different types of mood disorders unique to pregnancy and common treatment regimens
4. Learn about the trends, predictors, and outcomes of violence in pregnancy
5. Understand the incidence and implications of sexual assault in pregnancy

### Required Readings

Objectives: The purpose of these readings is to provide students with a general introduction of the interactions between mental health and pregnancy. These readings will cover mental health illnesses that exist prior to pregnancy and those that develop related to the pregnancy. Further readings will explore the risk of violence that women face during pregnancy. Collectively they will explore the associated pregnancy and neonatal risks to help the students appreciate the significant impact that mental illness and violence can have.


   - This article will provide students with an overview on the global magnitude of intimate partner violence to show students the severity and significance of the problem.


   - This article will supplement lecture materials that shows the link between
maternal mental health and pregnancy outcomes, particularly the effects on neonatal health.


   - This article was included to help the students understand the unique vulnerabilities women experience during pregnancy and how past experiences and mental health problems can exhibit during childbirth.

**Recommended Readings:**


3. Nerum H, Halvorsen L, Straume B, Sørlie T, Øian P. Different labour outcomes in primiparous women that have been subjected to childhood sexual abuse or rape in adulthood: a case–control study in a clinical cohort. BJOG. 2012;120(4):487-495.


**Hemorrhage**

- Anemia in pregnancy
- Normal blood loss with birth
- Causes of hemorrhage
• Common treatments of hemorrhage
• Morbidity and mortality of hemorrhage

**Film: No Woman, No Cry**
Description: This film shares the consequences of maternal mortality through the stories of four women around the world: the United States, Tanzania, Bangladesh, and Guatemala. From prolonged labor to unsafe abortion, this film covers some of the common causes of maternal mortality and describes some basic strategies that can help prevent it. Length: 60 minutes.

**Objectives**
1. Understand the risk factors for hemorrhage.
2. Learn common diagnostic and prevention techniques that are helpful in recognizing and reducing the rates of hemorrhage.
3. Understand common treatments for hemorrhage in developed countries and low resource settings.

**Required Readings**
Objectives: The objectives of these readings will help provide a public health perspective to the medical information that will be covered in the lecture. These readings will help the students understand the medical factors associated with hemorrhage can be addressed through individual, community, societal level interventions.

   - This article provides a specific breakdown on how hemorrhage contributes to and can be a direct cause of maternal mortality.

   - EmONC is an important aspect of addressing maternal mortality and morbidity due to hemorrhage. This article describes it roles in the prevention of death and disability through key interventions, referral systems and medical treatments to save the life of mothers and infants experiencing birth-related emergencies.

   - This article provides a description on the incidence of maternal mortality and how frequent of an occurrence it is throughout the world. Wide disparities exist in the frequency of these deaths between the developed and developing world. Discussion on potential ways to address these issues are included.

   - Although much is known about how to prevent, diagnose, and treat conditions that contribute to maternal mortality, major challenges exist to the widespread
Sanchez, 2013

Implementation and success of the interventions, particularly in low resource settings. This article focuses on describing potential solutions to these challenges so that progress can be made in this area.

**Recommended Readings:**


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**Fistulas**

- What are they?
- How they happen
- Prevention and treatment of fistula
- Where do they occur?
- Social, physical, and emotional ramifications

**Adolescent Pregnancy**

- Unique physical and emotional needs
- Birth outcomes

**Undernutrition in Pregnancy**

- Maternal and fetal nutritional needs
- Pregnancy and birth outcomes for underweight women

**Film: A Walk to Beautiful**

Description: This film tells of the story of 5 Ethiopian women suffering from obstetric fistula. They have been shunned by their communities, left by their husbands, and live with the physical and emotional consequences of their condition. This film documents their journey to the Addis Ababa Fistula Hospital with the hope of receiving the simple surgery that can restore their lives. Length: 53 minutes

**Objectives**

1. Understand the significance of fistulas on women’s health
2. Understand why and where fistulas happen
3. Learn how to prevent and treat fistulas
4. Understand the unique needs of adolescents in pregnancy
5. Understand the importance of sufficient nutrition in pregnancy

**Required Readings**

Objectives: This group of articles focuses on illustrating how nutrition, maternal age, and birth outcomes are intrinsically linked. Women throughout the world experience undernutrition, early pregnancy and conditions like fistulas and obstructed labor. These articles provide a basic introduction to the nutritional requirements of women in pregnancy and the consequences that these conditions have on maternal and neonatal outcomes.

   - This article describes the incidence, prevalence, and outcomes of women who experience fistula, focusing on the areas of the world where fistula is more common.

   - This article describes how micronutrients are important for normal fetal development, growth, and birth outcomes. Information in the articles shows how nutrient deficiencies affect pregnancy and how different interventions can be implemented to prevent them or correct existing deficiencies.

   - This article provides an overview on the state of adolescent health around the world. Through reading this article, the students will gain a deeper understanding on the unique medical needs of adolescents, particularly during pregnancy and childbirth.

   - This article supplements the Hindin article above, showing the specific health needs of adolescent women and the impact of early marriage on birth outcomes.

   - This article provides an overview of US trends in pregnancies and will supplement lecture content focusing on the unique medical needs of adolescents, particularly related to the utilization of medical care during pregnancy.
**Recommended Readings:**


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<td>• Prevalence of HIV infection among women of reproductive age</td>
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<td>• Effects of HIV on pregnancy and pregnancy outcomes</td>
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<td>• HIV treatment in pregnancy (PMTCT) in developing countries vs. developed countries</td>
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**Sexually Transmitted Infections**

- Herpes
- Bacterial Vaginosis
- Syphilis
- Chlamydia/Gonorrhea

Guest Speakers: Dr. Jeffrey Stringer and Dr. Bill Miller

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<td>1. Understand the implications of HIV infection pregnancy</td>
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<td>2. Learn common PMTCT strategies for use in developed and developing countries</td>
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<td>3. Understand the maternal, fetal, and neonatal implications of sexually transmitted infections in pregnancies</td>
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**Required Readings**

Objectives: The readings describe the effects of sexually transmitted diseases on pregnancy, maternal, and neonatal outcomes. Particularly emphasized within these articles are the prevention, diagnosis, prevalence, treatment, and management of these conditions during pregnancy and after birth. Additional information is provided on maternal to fetal or neonatal transmission.

   - This provides an overview on the medical management of herpes infection in pregnancy.

   - This article was included to show common chlamydial and gonorrheal infections are in pregnancy, particularly among adolescents. This article also highlights the risk of reinfection and the potential consequences of these infections for pregnancy and neonatal outcomes.
   • This article highlights the maternal, fetal, and neonatal significance of syphilis infection on pregnancy outcomes.

   • This article describes the symptoms, diagnosis, treatment and prevention of herpes infection of the neonate.

Recommended Readings:


10 Infection
   Sepsis
      • What is sepsis and how does it occur?
      • Preventative measures and treatments of sepsis
      • Prevalence of sepsis around the world
      • Maternal and fetal outcomes

Flu
      • Prevalence
      • Prevention and treatment
      • Maternal and fetal outcomes

Malaria
      • Prevalence
      • Prevention and treatment
      • Maternal and fetal outcomes

Hepatitis B
      • Prevalence
      • Treatment
### Objectives
1. Understand common infectious diseases experienced in pregnancy
2. Understand how to prevent and treat these conditions
3. Understand the maternal and fetal ramifications of contracting these conditions

### Required Readings

**Objectives:** Through these readings, students will come to understand the clinical issues associated with infectious diseases in pregnancy, in addition to their prevalence and the challenges associated with treatment and prevention of neonatal infection. These readings will be supplemented with lecture material that goes deeper into what the conditions are, how they are spread, treated and prevented, and how the field of public health is addressing them.

   - This reading will provide information on common infectious diseases in sub-Saharan Africa. It was included to provide an overview on the types of infections and their prevalence in part of the world where the rates of some of these diseases are high, particularly in women of childbearing age.

   - This reading provides an overview on the prevalence of Hepatitis B infection in pregnancy and the maternal, fetal, and neonatal effects of this virus. Discussion in this article also includes common means for the prevention of maternal to child transmission.

   - This article was included to show how the burden of HIV/tuberculosis coinfection can have significant impacts on maternal mortality. Discussion within the article describes the significance of the two conditions on maternal health in Africa. Lecture content will also include the significance of tuberculosis infection on pregnancy without coexisting HIV infection.

   - This article was included to show how the presence of infectious diseases can negatively impact fetal health. This article describes ways to recognize and diagnose diseases, monitor the disease progression during pregnancy,

- This article addresses one of top causes of maternal and neonatal death in the world and provides the reader with information on the magnitude of the problem and offers suggestions on potentially effective ways to address this problem.

**Recommended Readings:**

2. Lapinsky SE. Critical illness as a result of influenza A/H1N1 infection in pregnancy. BMJ. 2010;340:c1235.


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<th>Cigarette Smoking</th>
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<td>Maternal and fetal outcomes of smoking in pregnancy</td>
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<td>Alcohol use</td>
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<td>Methamphetamines</td>
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<td>Cocaine/Heroin</td>
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<td>Marijuana</td>
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<td>Treatment with Methadone</td>
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**Objectives**
1. Learn the short- and long-term effects of smoking in pregnancy
2. Understand the implications of drug use on fetal development and pregnancy outcomes
3. Discuss neonatal withdrawal in drug-exposed infants
4. Describe the use of methadone in drug addicted women

**Required Readings**
Objectives: The purposes of these are to show the students the short- and long-term effects of substance use during pregnancy for both the mother and the infants. These articles provide a comprehensive overview of the specific effects that substance use can have on pregnancy, postpartum recovery, and the long term neurological, cognitive, and
physical development of the child. These articles will supplement medical content that illustrates the physical and cognitive influences of substance use during pregnancy.

   • Though the dangers of smoking are well known, particularly during pregnancy, there remains a substantial number of women who continue to smoke. This article describes the fetal and neonatal outcomes associated with maternal cigarette smoking in pregnancy, relating some of the consequences to similar effects noted with maternal illicit drug use.

   • Commonly used as a substitute for women addicted to illicit drugs, methadone has significant withdrawal effects for the infant after birth. This article describes what these effects are and the type of health care resources needed to take care of these infants.

   • This article describes how maternal cigarette smoking affects the fetus and infant at a genetic level, ultimately impacting many aspects of the future health including their cognitive development.

   • This article provides a broad overview on the scope of the problem of alcohol, drug, and tobacco use among the general population. Information from this article will be used to show how prevalent these conditions are in women of childbearing age and how these factors must be considered in the care and treatment of women during pregnancy.

Recommended Readings:


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<tr>
<th>Newborn Transition</th>
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<tbody>
<tr>
<td>Cardiac and respiratory changes</td>
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<tr>
<td>Temperature regulation</td>
</tr>
<tr>
<td>Glucose Regulation</td>
</tr>
<tr>
<td>APGARs</td>
</tr>
</tbody>
</table>

**Neonatal Resuscitation**

- Warm/Dry/Stimulate
- Oxygen, positive pressure ventilation, intubation

**Early Infant Bonding**

- Skin to skin contact
- Breastfeeding

### Objectives

- Develop a basic understanding of resuscitation methods in developing and developed countries
- Understand basic strategies to ensure successful newborn transition
- Understand the importance of early infant bonding and describe ways to facilitate bonding

### Required Readings

**Objectives:** The purpose of these readings was to highlight the critical period for the neonate just after delivery. Within the first hour, the infant’s body undergoes major transitions making it one of the most critical times where skilled care is necessary to anticipate, diagnose and treat problems. All of the articles included highlight some aspect of newborn transition that is important in the first hour and beyond. In addition, some of these articles put newborn transition within the global context to show key areas where public health and medical practitioners can be helpful.

   - Bonding begins long before birth and continues long after. However, the bonding that happens between a mother and her infant in the first hour is a particularly important time period. Successful bonding in the first hour can help promote healthy and successful transition from fetal to neonatal life. This article was included to help the students form an understanding of the physical, physiological, mental, hormonal, and emotional factors that facilitate this important bond.

• This article provides the clinical context for how newborn transition should occur after birth. Many birth practices have been established that do not always support these recommendations. This article encourages practitioners to consider some practice changes to help improve the management of this time period.

   • This article discusses the importance of neonatal resuscitation and the difficulties in ensuring that women have access to it after they give birth. This article focuses on the difficulties in managing resuscitations in low resource settings when there are significant shortages in the healthcare workforce and in access to appropriate equipment.

   • This article describes the best practices that should be used to ensure optimal transition of the infant. This article was included to help the students learn the different components of effective and safe transition.

   • This article was included to allow the students to learn about the global challenges in implementing best practices in neonatal resuscitation. Focusing on low resource settings, this article will give students an idea of some ways in which public health professionals can work to improve health care delivery at this critical time.

**Recommended Readings:**


<table>
<thead>
<tr>
<th>13</th>
<th><strong>Prematurity/Preterm Labor</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>• Terminology: Premature, late preterm, term, and postterm</td>
</tr>
<tr>
<td></td>
<td>• Diagnosis and treatment of preterm labor</td>
</tr>
</tbody>
</table>
### Neonatal needs after premature birth
- Fetal development

### Pneumonia
- Causes
- Symptoms
- Diagnosis and Treatment

### Congenital Anomalies
- Common types (gastroschisis, cardiac, congenital diaphragmatic hernia)
- Diagnosis and prognosis
- Post-birth management

### Objectives
- Understand the causes and treatments for preterm labor
- Learn the unique medical needs of preterm infants
- Understand the risk factors and treatments for pneumonia
- Learn the prevalence of and understand the medical and social implications of congenital anomalies

### Required Readings

Objectives: These readings will provide important context and statistical data to support lecture material that will delve into the causes, predictors, and treatments of preterm labor and preterm infants. These readings will provide a domestic and global context for students that will form a foundation which the lecture will build on.

   - This article provides the global context of preterm birth describing the different causes and outcomes and describing key areas where interventions can make a difference. This article will be referenced in the lecture and also shows the students the different geographical differences in the incidence of preterm birth.

   - This article highlights the glaring disparities in fetal and infant mortality for mothers and children of different ethnic groups and shows how factors greater than access to medical care affect their outcomes. This information will complement lecture material to help the student have a broad understanding of the many factors that should be considered when addressing preterm birth and mortality.

   - This article provides a clinical perspective on some common birth defects that infants may have. This is meant to teach the students some of the clinical features
and treatment options for patients with these conditions. This will supplement lecture material that will further describe the anatomical and physiological differences of these conditions.

   • This article describes the unique challenges of infants born with gastroschisis, and includes information on the prevalence of this birth defect, the ways in which it is treated and managed, and the long term outcomes for these infants.

   • Though not subject to the same risks and outcomes as very premature infants, late preterm infants can still be affected by delivery before term. This article was include to help the students understand that regardless of how early an infant is born, all premature infants (less than 37 weeks) have medical and developmental needs that need to be monitored.

**Recommended Readings:**


**From Birth to Age 1:**

- Developmental and nutritional needs
- Diarrhea, respiratory infections
- Vaccinations

**Breastfeeding, Formula Feeding, and Complementary Feeding**

- Recommendations
- WIC
- HIV infection
- Mastitis, low milk supply, and donor milk

## Objectives
- Understand the basic developmental and nutritional needs of infants
- Understand common infectious diseases experienced by infants
- Learn the vaccination schedule for infants
- Understanding basic feeding principles for infants and common challenges to breastfeeding
- Learn the recommendations for infant feeding with HIV infection

## Required Readings

Objectives: The purpose of these readings is to provide a broad overview of some of the topics covered in this lecture and to give the students a basic foundation of infant needs in the first year of life.

   - This article was included to provide an example of how some disparities, such as SES, can play a role in affecting the development of infants. This article will support data included in the lecture, which shows how development varies between cultures, races, and countries and how certain disparities can be risk factors for delays.

   - This article provides an up to date description of the recommended practices for infant feeding in Africa. This is important for the students to learn so that they can fully understand the difficulties in meeting an infant’s nutritional needs in low resources settings and in areas with high HIV prevalence.

   - This article was included to provide the evidence base that refutes earlier publications reporting causal linkages between vaccinations and autism. The initial article reporting these linkages has had significant impacts on the rates of parents who are declining to vaccinate their children. As one of the most important public health innovations, it is important for public health professionals to understand what affects vaccination rates around the world.

## Recommended Readings:


<table>
<thead>
<tr>
<th>15</th>
<th>Group Presentations</th>
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</thead>
<tbody>
<tr>
<td>16</td>
<td>Group Presentations</td>
</tr>
<tr>
<td>17</td>
<td>Final Exam</td>
</tr>
</tbody>
</table>
References


Appendix A. Qualtrics Survey

Melissa Sanchez Qualtrics Survey

Last Modified: 03/06/2013

1. What department are you in?

<table>
<thead>
<tr>
<th>#</th>
<th>Answer</th>
<th>Response</th>
<th>%</th>
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<tr>
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<td>2</td>
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<td>HCAP/PHLP</td>
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<tr>
<td>6</td>
<td>Biostatistics</td>
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<tr>
<td>7</td>
<td>Health Policy and Management</td>
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Statistic | Value  
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<tr>
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</tbody>
</table>

2. Are you a medical professional or are you in school to become one (Medical, Nursing, Dental)?

<table>
<thead>
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<th>Answer</th>
<th>Response</th>
<th>%</th>
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<td>17%</td>
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<td>2</td>
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<td></td>
<td>Total</td>
<td>24</td>
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</table>
### 3. Please tell me if you would be interested in taking a course that focuses on learning about the medical aspects of maternal and child health. For example, this could include topics on preeclampsia, sepsis, preterm labor, and more. This course would incorporate both domestic and global content.

<table>
<thead>
<tr>
<th>#</th>
<th>Answer</th>
<th>Response</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>I am interested</td>
<td></td>
<td>15</td>
</tr>
<tr>
<td>2</td>
<td>I am not interested</td>
<td></td>
<td>11</td>
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<tr>
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### Summary Statistics

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<tr>
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<td>26</td>
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</table>

Sanchez, 2013
### 4. Please indicate how likely you would be to take a course of this nature.

<table>
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<th>Answer</th>
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</thead>
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</tr>
<tr>
<td>2</td>
<td>Somewhat Unlikely</td>
<td>0</td>
<td>0%</td>
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<tr>
<td>3</td>
<td>Undecided</td>
<td>1</td>
<td>7%</td>
</tr>
<tr>
<td>4</td>
<td>Somewhat Likely</td>
<td>2</td>
<td>13%</td>
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<tr>
<td>5</td>
<td>Likely</td>
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<tr>
<td>6</td>
<td>Very Likely</td>
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<tr>
<td></td>
<td><strong>Total</strong></td>
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<table>
<thead>
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<tr>
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</tbody>
</table>

### 5. Please describe why you would be interested in this course.

<table>
<thead>
<tr>
<th>#</th>
<th>Answer</th>
<th>Response</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>I am interested because...</td>
<td>13</td>
<td>100%</td>
</tr>
<tr>
<td></td>
<td><strong>Total</strong></td>
<td>13</td>
<td>100%</td>
</tr>
</tbody>
</table>
I am interested because...

- it is a method of learning ways to improve maternal health
- I didn't get a strong foundation in "medical" MCH. I can discuss pregnancy interventions but couldn't explain, medically, about the life cycle from conception to birth. Having a strong medical foundation in "maternal & child health" can help support better program/intervention design.
- PH folks need better medical background
- I have a clinical focused background and like science
- I have been considering clinical work and this type of course may help with that.
- I feel medical concepts and terms are often discussed in MCH, but an understanding of their definition and clinical significance is lacking.
- I'm a doula interested in lowering the c-sec rates
- I feel the clinical aspect of our work is often left out, and I see this as important background knowledge as we move forward as public health practitioners
- it's a subject that I am unfamiliar with and I would love to learn more about information this this.
- Understanding the biology and epidemiology is important to really understand broad determinants.
- I do not have a medical background and I think it would be incredibly important and helpful to have courses that explain the medical/physical nature of a lot of the things we are talking about--I think it would strengthen my understanding to gain technical expertise
- I am an international medical doctor

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<td>Min Value</td>
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<tr>
<td>Total Responses</td>
<td>13</td>
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</table>
6. Please describe why you would not be interested in a course of this nature.

<table>
<thead>
<tr>
<th>#</th>
<th>Answer</th>
<th>Response</th>
<th>%</th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>I am not interested because...</td>
<td>9</td>
<td>100%</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>9</td>
<td>100%</td>
</tr>
</tbody>
</table>

I am not interested because...

- I am more interested in research
- Seems outside the scope of future work I hope to do.
- I am more interested in social determinants of health rather than biological processes.
- We can't compete with doctors. Someone recommended me against MCH b/c they thought it was medical and content training in which people won't assume we have that knowledge, and/or will trust it more coming from someone with an actual medical degree. I think its much more important that we learn skills.
- I am not interested in direct clinical practice and feel the content of these specific topics could be found through readings and interacting with medical professionals working on collaborative projects. As a public health professional, I would prefer to focus my time on gaining M&E skills, program planning, etc... that would cross over to a variety of specific health concerns.
- I am in a dual-degree program that is very rigorous and time-limited. HOWEVER, I think this is a great idea for MCH students who don't have a medical background. If I were a "normal" MCH student I would consider a class like this.
- Other courses would better suit my career trajectory.
- I have no need for this information.
- It makes me squeamish/I will not be focusing on the medical aspects of pregnancy in my research.

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<tr>
<td>Total Responses</td>
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</table>
Two Sides of the Same Coin: Too Many and Too Few Cesarean Deliveries

Melissa Sanchez

MHCH 702

January 23, 2012
Learning Objectives

- Understand what a cesarean delivery is
- Understand the clinical indications for a cesarean delivery
- Learn the ideal rates of C/S deliveries vs. actual rates
- Understand why there are too many and too few C/S
- Discuss potential strategies to address these issues
Why Should It Matter to Me?

- Public Health Practitioners may work with organizations like the March of Dimes, local health departments, NGOs, etc. that focus on prenatal education, modifying behavior, and improving prepregnancy health.

- Having an understanding of what factors contribute to too many cesarean deliveries and too few cesarean deliveries will help inform your practice as you develop programs and interventions to address these problems.
Terminology

- **C/S**: cesarean section or cesarean delivery
- **TOL or TOLAC**: Trial of labor after cesarean
- **VBAC**: Vaginal birth after cesarean
- **PCS**: Primary cesarean section
- **RCS**: Repeat cesarean section
- **ERCD**: Elective repeat cesarean delivery
History

Plate XLII from Schulteus’ Amrmentaerium chirugicum bipartitum, 1666
What is a Cesarean Section (C/S)?

http://www.yalemedicalgroup.org/stw/Page.asp?PageID=STW029025
Vaginal Birth After cesarean (VBAC)

- ACOG Committee Opinion No. 2:
  - 24 hour obstetric and anesthesiology services in house
  - Continuous Fetal Monitoring

- Perinatal death rate with TOL: 1.3/1000 vs. 0.5 for ERCD

- Intrapartum death rates: 0.1-0.4/1000 for TOL vs. 0-0.04/1000 for ERCD

- Vertical uterine incision or unknown scar precludes VBAC attempt
What are the recommended rates of C/S?

- WHO recommendations
  - 1985: 10-15% ideal rates of cesarean deliveries

- 2010 WHO study found that only about 10% of countries had rates at this level
  - 40% had rates less than 10%
    - Mostly Africa and Asia
  - 50% had rates greater than 15%
The Developed World
Current status in U.S.

- Most common surgical procedure conducted in the U.S.
- Associated with a hospital stay of 2-3 days after delivery of infant
  - Less if planned cesarean delivery, more if labors first
  - Compared with a hospital stay of 1-2 days after vaginal delivery
- Procedure lasts 20-30 minutes for experienced surgeons
- Staples, tape or glue are placed on external incision, sutures are used internally
- Most patients are awake, with spinal/epidural anesthesia used for pain management
- Most patients have one support person in the room with them

Figure 1. Cesarean delivery rates: United States, 1991–2007

Vaginal Birth After cesarean (VBAC)

Figure 1. Rates of vaginal birth after cesarean (VBAC rate), total cesarean deliveries (CD rate), primary cesarean deliveries (Primary CD), and repeat cesarean delivery (RCD).^6,9

*ACOG guidelines from 1995 states “In the absence of contraindications, a woman with one previous cesarean delivery with a lower transverse uterine incision is a candidate for VBAC and should be counseled and encouraged to undergo a trial of labor.”

1Landmark paper published by McMahon10
2Landmark paper published by Lydon-Rochelle, 200111
Why do they happen?

- Pregnancy indications:
  - Preeclampsia
  - Preterm labor
  - Placenta issues
  - Previous C/S
  - Comorbid conditions
  - Multifetal pregnancies
Why do they happen?

- Labor indications:
  - Breech or transverse
  - Cephalopelvic Disproportion
  - Obstructed or prolonged labor
  - Infection
  - Maternal exhaustion
  - Failed vacuum or forceps delivery
  - Cord prolapse
Factors influencing labor progression

- Size of infant
- Previous history of birth
- Strength and frequency of contractions
- Movement
- Comfort/fear
- Pain
- Support
- Medications
## Pelvic Anatomy

<table>
<thead>
<tr>
<th>Pelvic inlet Transverse diameter</th>
<th>Gyneoid</th>
<th>Anthropoid</th>
<th>Android</th>
<th>Platypelloid</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pelvic midcavity Side walls</td>
<td>Narrow</td>
<td>Normal</td>
<td>Narrow</td>
<td>Straight</td>
</tr>
<tr>
<td>Inclination of sacrum</td>
<td>Normal</td>
<td>Convergent</td>
<td>Normal</td>
<td>Narrow</td>
</tr>
<tr>
<td>Pelvic outlet Subpubic arch</td>
<td>Wide</td>
<td>Narrow</td>
<td>Normal</td>
<td>Wide</td>
</tr>
</tbody>
</table>

- **Gyneoid**: Narrow pelvis, straight side walls, normal inclination of sacrum, wide outlet.
- **Anthropoid**: Normal pelvis, divergent side walls, normal inclination of sacrum, narrow outlet.
- **Android**: Narrow pelvis, narrow outlet, convergent side walls, normal inclination of sacrum.
- **Platypelloid**: Normal pelvis, straight side walls, narrow outlet, normal inclination of sacrum.
Reasons For Increasing C/S

- Rising maternal age
- Multifetal pregnancies
- Maternal prepregnancy health
- Provider skills-less use of forceps/vacuum
- Maternal/cultural preferences
- Litigation
- Earlier admission/anesthesia
- Increased use of fetal monitoring
Fetal Monitoring

- Developed in 1960s and 1970s, commonly used by 1980s
- Used to predict fetal distress and fetal hypoxia
- Informs medical decisions regarding speed and type of delivery
- Intermittent vs. Continuous
- Monitoring on admission was shown to increase the risk of cesarean delivery by 20% (Cochrane Review), but was not significantly associated with decreased rates of neonatal hypoxia/asphyxia, NICU admissions, and lower APGAR scores.
Why are too many a problem?

- Higher rates of infection, pain, blood clots
- Higher blood loss
- Hysterectomy
- Anesthetic complications
- Delayed bonding and breastfeeding
- Future pregnancy concerns
- Costs and longer hospital stays
- Neonatal complications (RDS, transition, lower APGARs)
- Fertility implications
Future Pregnancy Concerns

- Uterine Rupture
- Adhesions
- Placental Implantation
  - Accreta (OR 8.6-29.8 with two or more prior
  - Increta
  - Percreta
  - Previa (OR=2.7 in meta-analysis)

http://www.fetalsono.com/teachfiles/PlacAcc.lasso
Placenta Previa
Uterine Rupture

- The risk for all women with a prior cesarean delivery regardless of current route of delivery is 0.3% (95% CI: 0.2-0.4%).

- The risk of uterine rupture for women undergoing a TOLAC is significantly elevated at 0.47% (95% CI: 0.28-0.77%); compared with women undergoing an ERCD (0.026%; 95% CI: 0.009-0.082%).

- **Maternal morbidity:** Risk of hysterectomy is 14-33%.

- **Neonatal morbidity:** Perinatal death due to uterine rupture was 6.2% (at any point in pregnancy). Term deliveries with perinatal death ranged from 0-2.8% (based on two studies included in the review).
Neonatal Concerns

- Lower APGARs with general anesthesia
- Increased need for neonatal resuscitation
- Increased incidence of respiratory distress syndrome
- Temperature instability
- Breastfeeding difficulties
- Longer hospital stays
- Increased incidence of NICU admissions
- Bonding
- Fetal injury (rare)
Costs

- Longer hospital stays, greater health care costs
- C/S deliveries account for one-third of all births, yet account for almost half of childbirth related expenditures. In the US, this was $7.8 billion (Guise)
- C-sections are more costly than vaginal deliveries, $4,500 versus $2,600 in deliveries without complications, and $6,100 versus $3,500 in deliveries with complications. (AHRQ)
- Medicaid patients average longer hospital stays and costlier deliveries
- $1,000 increase in the reimbursement for performing a cesarean increases cesarean delivery rates by 1 percent
Question...

- What are key recommendations, policies, or programs that could be implemented to reduce the number of unnecessary cesarean deliveries?
Interventions To Address Too Many

- Standards for reproductive technology
- Discourage elective inductions (especially for first time mothers)
- Don’t attempt IOLs until after 39 weeks
- Different types and doses of epidural/spinal anesthetics
- Antenatal education on coping in early labor and how to distinguish true labor
- Financial incentives for hospitals or providers to perform VBACs or to reduce the CS rate (without compromising safety)
- Avoid putting patients on “schedules”

What about home births, birth centers, or midwifery deliveries?
The Developing World
Cesarean Rates Around the World

- Worldwide average: 15%
- Developed Countries: 21.1%
- Less Developed: 14.3%
- Least Developed: 2.0%
Percentage of Births by Cesarean
Why are too few a problem?

- Fetal/Neonatal
  - Intrapartum or neonatal Infection
  - Birth asphyxia/cerebral palsy
  - Injury: Brachial plexus, broken arms or clavicles
  - Fetal hemorrhage
  - Death

- Maternal
  - Preexisting or pregnancy related conditions: diabetes, hypertension, cardiac
  - Hemorrhage
  - Infection: HIV, STDs, or intrapartum
  - Fistula
  - Urinary or fecal incontinence
  - 3rd and 4th degree tears
  - Death
Why don’t they happen?

• Lack of:
  • Diagnostic capabilities to determine fetal distress or compromise
  • Equipment/electricity/supplies/facilities
  • Blood availability
  • Trained and available staff
  • Money to pay for services
  • Determination that “nothing can be done”

• Fear of stigma, discrimination, forced procedures

• Cultural and religious preferences to avoid C/S deliveries
  • Permission from husband, male relatives, or mother-in-laws
  • Avoidance of male practitioners

• Deliveries outside of health care facilities (distance, transportation, weather)
Question...

What are key recommendations, policies, or programs that could be implemented that would increase the number of necessary cesarean deliveries?
Interventions to address too few

- Mozambique: Birth of a Surgeon documentary on training midwives to perform cesarean deliveries, with particular emphasis in rural areas
- Conditional cash transfers to encourage deliveries in facilities: Nepal
- Nutritional interventions to minimize malnutrition
- Family planning programs and educational campaigns to discourage adolescent pregnancies
- Training programs for traditional birth attendants to increase recognition and diagnosis of problems or warning signs
Costs

- Fewer cesarean deliveries leads to economic repercussions; particularly if maternal morbidity or mortality is experienced
  - Example: Obstetric Fistula
References


• Devane. Cardiotocography versus intermittent auscultation of fetal heart on admission to labour ward for assessment of fetal wellbeing

• http://www.hcup-us.ahrq.gov/reports/statbriefs/sb71.jsp
Preterm Birth, Prematurity, Pneumonia, and Congenital Anomalies

Melissa Sanchez
Spring 2013
Outline

- Determination of gestational age
- Fetal development
- Preterm Labor
- Prematurity
- Neonatal Pneumonia
- Congenital Anomalies
Objectives

- Understand the different stages of fetal development
- Learn the terminology pertaining to gestational age and fetal weight
- Understand the causes of and treatments for preterm labor
- Learn the unique medical needs of preterm infants
- Understand the risk factors and treatments for pneumonia
- Learn the prevalence of and understand the medical and social implications of congenital anomalies
Gestational Age

- Ultrasound
  - Can be done at any point in pregnancy
  - Crown-rump length is most accurate in 1st trimester
  - Less accurate in 2nd and 3rd trimesters

- Last menstrual period (LMP)
  - Calculator

- Post-birth evaluations
  - Ballard and Dubowitz
Term Delivery

- Delivery between 37 and 42 weeks
Post-term delivery

- After 42 weeks
- Placenta gets “old” and doesn’t transfer nutrients and oxygen as well
- Greater risk of stillbirth, meconium, macrosomia, oligohydramnios
Preterm Delivery

- Between 20 weeks and 37 weeks
  - (Before 20 weeks is a miscarriage)
- Very Preterm
  - <28 weeks
- Late Preterm
  - >34 weeks <37 weeks
Fetal Weight Classifications

- Very Low Birth Weight (VLBW)
- Low Birth Weight (LBW)
- Appropriate for Gestational Age (AGA)
  - Usually for term infants
- Small for Gestational Age (SGA)
  - <2500 grams
- Large for Gestational Age (LGA)
  - >4200 grams
- Intrauterine Growth Restriction (Retardation)
  - Less than 10th percentile
Fetal weights

- Difficult to measure in most of developing world, especially if delivery does not occur in facility
- 65% of neonates are not weighed at birth in developing countries
  - Can be as high as 77% in the least developed countries
Fetal Development
First trimester 0-12 weeks

- Heart starts beating by 8 weeks
- 2 ½ inches long and ½ ounce in weight by 12 weeks
- Organogenesis occurs
- Alcohol use during this period leads to physical features associated with fetal alcohol effects/syndrome
  - Use at any point can cause FAS/FAE, just won’t see facial features
Second Trimester 13-26 weeks

- Different types of testing between 16-20 weeks can tell if there are any genetic abnormalities
- A full ultrasound is completed to look for congenital anomalies or birth defects
- Sex can be determined
Third Trimester 27-40 weeks

- Refining and fattening
  - Brown fat and white fat

- Final touches on respiratory, GI, skeletal, and neurological systems
  - Lungs have increased surfactant
  - The bones harden
  - The brain grows

- Maternal transfer of antibodies
Viability

- In developed countries, typically 24 weeks
  - Generally considered when the risk of dying is the same as the chance of surviving
  - Can be a little earlier, depending on delivery facility and skills of providers
  - Resuscitation may occur after 22 weeks

- In developing countries, may be 26 weeks or greater
  - Lack of appropriate resuscitation equipment
  - Lack of skilled providers
  - Electricity and oxygen shortages
  - Cultural preferences/expectations/adaptations
Survival by gestational age without major complications

<table>
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<tr>
<th>GA (weeks)</th>
<th>p-value 96-00</th>
<th>p-value 00-04</th>
<th>p-value 04-08</th>
<th>p-value 96-08</th>
<th>regression coeff. β</th>
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<tr>
<td>&lt;26</td>
<td>&lt;0.001</td>
<td></td>
<td></td>
<td>&lt;0.01</td>
<td>1.6%</td>
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<tr>
<td>26-27</td>
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<td>0.07</td>
<td>0.20</td>
<td>&lt;0.001</td>
<td>3.3%</td>
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<td>28-29</td>
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<td>0.12</td>
<td>0.13</td>
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<td>30-31</td>
<td>0.59</td>
<td>0.16</td>
<td>0.04</td>
<td>&lt;0.01</td>
<td>1.2%</td>
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Preterm Labor
Preterm Labor

- Definition: Progressive cervical dilation before the 37th week of pregnancy
- Considered an “acute” event, through management may occur for long periods of time
- Can be via contractions with cause dilation, or cervical incompetence where the cervix dilates without contractions
Preterm Birth

- 45-50% of preterm births are idiopathic
- 30% are related to preterm rupture of membranes (PROM)
- 15-20% are attributed to medically indicated or elective preterm deliveries.
- 9.6% of all births in the world are premature
  - 7.5% in developed countries
  - 8.8% in less developed
  - 12.5% in least developed
Causes of preterm labor and birth

- Premature Rupture of Membranes
- Abruption
- Drug use
- Maternal infection (Flu, HIV, STIs)
- Intrauterine infection
- ??? Many episodes have no known cause
Predictors of Preterm Labor

- Greatest predictor is a history of a prior preterm labor and birth
- Multiple Gestation
- Occupation
- Cervical shortening
- History of cervical biopsies that contribute to cervical incompetence
Treatment

- Hospitalization
- Bedrest/Trendelenburg
- Hydration
- IV medications (acute)-magnesium
- Oral medications-ibuprofen, nifedipine, terbutaline
- Cerclage
- Delivery
Premature Infants

- Timely and adequate resuscitation is key
- Respiratory systems are underdeveloped
  - Prone to apnea, hypoxia
- Unable to maintain temperature and blood sugar
- Neurologically, immunologically, and hematologically immature
  - Greater risk of bleeding in the brain, infections, and anemia
- Requires IV nutrition or tube feedings
Premature Infants cont’d.

- Overstimulation
  - Lack of day/night regulation, quiet in 24 hour NICU environment

- Jaundice due to liver immaturity
  - Will often require phototherapy

- Eyesight
  - Retinopathy of prematurity
  - Greater risk with higher oxygen %
20-24 weeks: Survival

[Bar chart showing survival rates by gestational age, sex, and birth weight categories.]

Gestational Age (Completed Weeks), Sex, and Birth Weight Categories

Survival to Discharge
20-24 weeks

- 1-1 ½ pounds and 8 inches long by 24 weeks
- Major resuscitation needed with specialized equipment
  - Anticipate long NICU stays, massive intervention
- Female infants do better than males
- Long-term morbidities (>90% likelihood)
24-28 weeks

- Weight is between 1 ½-2 ½ pounds
- 92% survive by 28 weeks
- Morbidities: Similar to those born less than 24 weeks, but less severe
- After birth: typically need intubation, IV nutrition, temperature regulation, phototherapy, in NICU for 2-3 months
27 weeks
28-32 weeks

- 2 ¼ to 3 ¾ pounds
- 11 inches long by 32 weeks
- Survival rates >95% by 32 weeks
- Morbidities/Complications
  - Needs: Possibly intubation, temperature regulation, tube feedings, blood sugar regulation
31 weeks
32-36 weeks

- 6 ½ pounds and 14 inches by 36 weeks
- Physical appearance: Skinny, big heads, very little fat
- >90% survival, mortality is often related to sepsis or anomalies
- Morbidities/Complications: Dehydration, hypothermia, jaundice; feeding difficulties, greater risk of respiratory infections, lower immune status
- Needs: oxygen, temperature regulation, tube feedings, blood sugar monitoring
36 weeks-Birth

- **Size**
  - Gain $\frac{1}{2}$ pound per week, average fetal weight is 8 pounds and is increasing developed countries

- >95% survival, mortality related to sepsis, asphyxia, and anomalies

- **Brown fat storage**
  - Assists with glucose maintenance and temperature regulation after birth

- **Neurological system is refining suck/swallow/breath for breastfeeding**
Fetal weights, cont’d.

- Weight loss
  - Prior to term birth, infants store fluid to protect against dehydration in early neonatal life and produce meconium
  - As they use up the fluid and pass the meconium, their weight will drop (even formula fed infants)
  - Up to 10% drop is “normal”, more than that requires intervention: supplementation, pumping, lactation consult
  - Weight loss >10% increases risk of hospitalization for dehydration, jaundice, and fever
Neonatal Pneumonia
Pneumonia Basics

- **Signs and symptoms:**
  - Fluid collection in the lungs, tachypnea, hypoxia, retractions, lethargy, poor feeding

- **Causes:** Bacterial or viral
  - Mainly streptococcus pneumoniae and staphylococcus aureus

- **Predictors:** Maternal infection, preterm delivery, prolonged rupture of membranes
Pneumonia cont.

- Mortality: Contributes to 4%-32% of neonatal deaths worldwide
  - Wide variation
  - Difficult to diagnose in resource limited settings

- Treatment
  - Management of hypoxia
  - Maintain hydration
  - Antibiotics if bacterial
Prevention

- Vaccinations
  - Pneumococcal Conjugate Vaccine
    - Available in 46 countries, more to be added pending GAVI approval
- Breastfeeding
- Prophylaxis against opportunistic infections for HIV infected infants
- Hand hygiene
Congenital Anomalies
Congenital Diaphragmatic Hernia

- Hole in the diaphragm
  - Depending on size different abdominal organs may be in pulmonary cavity
  - Can have severely restricted lung development

- Causes

- Treatment
  - Depends on severity of restricted lung function
  - Minor/small hernias can be surgically repaired

- Prognosis/outcomes
Gastroschisis/Omphalocele

- Incomplete closure of the abdominal wall during fetal development leading to external location of the intestines
- Can be “loose” with no covering or with a sac over it
- What causes it?
  - Exposure to certain teratogens (chemicals)
  - Many causes unknown
Gastroschisis/Omphalocele

- **Treatment**
  - Requires highly skilled providers at birth to avoid tearing the intestines
  - Must cover the intestines to keep them from drying out
  - Intestines may be slowly rolled or pushed back into abdomen then the hole is surgically closed

- **Prognosis/Outcomes**
Cardiac Anomalies

Tetralogy of Fallot
- Incidence
- Causes
- Treatments
- Outcomes

Transposition of the Great Vessels
- Incidence
- Causes
- Treatments
- Outcomes
Other Anomalies

- Down Syndrome
- Spina Bifida
- Cleft lip/Cleft Palate
Thank you!