Prevention through the Reproductive Life Cycle: When Is Too Early? When Is Too Late?

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Images courtesy of: https://unsplash.com/search/photos/diverse-women
Objectives

• Describe a life course approach to the health of today’s women and tomorrow’s children.

• Identify opportunities to impact prematurity before pregnancy occurs, during pregnancy and between/after pregnancy.

• Discuss how the work you do could impact at least 4 common women’s preventive health care needs.
The Current Dominant Prevention Paradigm: What’s Wrong with this Picture?
Current Dominant Perinatal Prevention Paradigm
Advancing Women’s Health for Her Own Needs Now and in the Future

• Formulate and assess individual reproductive life plan (short and long term)
• Link to/provide access to contraception matched to desires
• Nutritional status (achieving healthiest weight possible)
• Encourage daily use multivitamin with folic acid
• Immunizations up-to-date

• Assess and address STI risks and diseases
• Assess and address tobacco and other substance use
• Assess and address chronic diseases in light of woman’s health and health of any future pregnancies
• Assess and address medication and herbal use and safety to woman and to fetus if she conceives
• Identify and offer interventions for substance abuse and intimate partner violence
Which of those foci for care would benefit a woman’s life course?

Which would benefit a pregnancy and pregnancy outcome?
Advancing Women’s Health to Improve Future Pregnancy Outcomes

- Formulate and assess individual reproductive life plan (short and long term)
- Link to/provide access to contraception matched to desires
- Nutritional status (achieving healthiest weight possible)
- Encourage daily use multivitamin with folic acid
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- Identify and offer interventions for substance abuse and intimate partner violence
Preventing the Preventable

• When is it too early?
• When is it just a missed opportunity to do what can be done?
• When is it too late?
A Life Course Approach to Improved Women's Health

Pregnancy/Well Woman/Family Planning

Well-Woman/Family planning/Pre/Interconception Care

Own gestation, childhood and adolescence

Postpartum/Inter conception/Well-Woman

Childbirth/Family Planning/Well-Woman

Continuity to Post Menopausal Well Woman Care
We Need to Move Our Efforts Toward Prevention Rather than Rescue

• Healthier women from conception through senescence are an important outcome whether they EVER become pregnant or pregnant again
• Healthier women have healthier pregnancies and healthier pregnancy outcomes

Isn’t that the focus of our work?
Examining the Evidence of Links Between Women’s Health Status and Reproductive Outcomes
NUTRITIONAL STATUS: Obesity
An Epidemic

• Obesity and Women’s Health:
  – Diabetes
  – Hypertension
  – Cardiovascular disease
  – Disabilities

• Maternal Obesity and pregnancy complications:
  – Glucose intolerance of pregnancy
  – Pregnancy induced hypertension
  – Thrombophlebitis
  – Infertility
  – Neural tube defects
  – Prematurity
Usual Approach to Weight Status in Women of Reproductive Age
What about the Other Epidemic: Underweight
Other examples of the link. . .

• Tobacco use
• Alcohol use
• Chronic Disease Control
• Folic acid
The Benefits of Higher Levels of Women’s Wellness

• Higher levels of women’s wellness will result in healthier women across the lifespan.
• Higher levels of women’s wellness will result in healthier pregnancy outcomes (because of the primary prevention benefits of reducing periconceptional risks)
• Because most pregnancies aren’t planned in the US new approaches for promoting preconceptional/interconceptional health are needed for all women (and men, too)
• It is very likely that we could achieve better periconceptional health by addressing women’s wellness as an important good unto itself, irrespective of reproductive plans
An Example of NOT Too Early

- Jenny is 21 years old and has never been pregnant.
  - She weighs 98 pounds
  - She smokes 1 ½ packs of cigarettes a day
  - She takes accutane for cystic acne but no other medications including vitamins
  - She does not wish to become pregnant, is in a sexually intimate relationship and is not using a highly effective contraceptive method.
In obstetrics. . .
most of our outcomes or their
determinants are
already present before we ever
meet our patients—
In the NICU. . . 
many of the admissions 
could have been predicted 
preceding the conception
Important Examples

- Intendedness of conception
- Interpregnancy interval
- Maternal age
- Maternal weight
- Chronic disease control
- Exposure ART/ovulation stimulation
- Spontaneous abortion
- Abnormal placentation
- Congenital anomalies
- Timing of entry into prenatal care
What Is The Leading Cause of Infant Mortality/Morbidity in US?

1. Congenital Malformations/Birth Defects
2. Premature Birth/Low Birthweight
3. Sudden Infant Death Syndrome (SIDS)
4. Maternal Complications of Pregnancy
5. Injury
GENERALLY UNDER-RECOGNIZED:
IMPORTANCE OF
Periconception Period ON
PREGNANCY OUTCOMES
Some Definitions

- **Preconception**—before pregnancy
- **Periconception**—immediately before conception through organogenesis
- **Interconception**—period between end of one pregnancy and conception of next
CRITICAL PERIODS OF DEVELOPMENT
(RED DENOTES HIGHLY SENSITIVE PERIODS)

<table>
<thead>
<tr>
<th>embryonic period (in weeks)</th>
<th>fetal period (in weeks)</th>
<th>full term</th>
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<tbody>
<tr>
<td>1</td>
<td>period of dividing zygote, implantation &amp; bilaminar embryo</td>
<td>C.N.S. heart</td>
</tr>
<tr>
<td>2</td>
<td>usually not susceptible to teratogens</td>
<td>eye</td>
</tr>
<tr>
<td>3</td>
<td></td>
<td>heart</td>
</tr>
<tr>
<td>4</td>
<td></td>
<td>eye</td>
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<tr>
<td>5</td>
<td></td>
<td>heart</td>
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<tr>
<td>6</td>
<td></td>
<td>arm</td>
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<td>7</td>
<td></td>
<td>leg</td>
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<td>8</td>
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<td>ear</td>
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<td>palate</td>
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<td>10</td>
<td></td>
<td>external genitalia</td>
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<td>tooth</td>
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<td>12</td>
<td></td>
<td>palate</td>
</tr>
<tr>
<td>13</td>
<td></td>
<td>external genitalia</td>
</tr>
<tr>
<td>14</td>
<td></td>
<td>ear</td>
</tr>
</tbody>
</table>

- Indicates common site of action of teratogen.

Major morphological abnormalities
- Heart
- Arms
- Legs
- Eyes
- Teeth
- Palate
- External genitalia
- Ear

Physiological defects & minor morphological abnormalities
An Example of NOT Too Early

- Jenny is 21 years old and has never been pregnant.
  - She weighs 98 pounds
  - She smokes 1 ½ packs of cigarettes a day
  - She takes accutane for cystic acne but no other medications including vitamins
  - She does not wish to become pregnant, is in a sexually intimate relationship and is not using a highly effective contraceptive method.

WHAT ARE HER PERSONAL RISKS?

WHAT ARE PREGNANCY OUTCOME RISKS?
Interventions During Pregnancy to Prevent Poor Outcomes (and missed opportunities to prevent the preventable)
Antepartum Care

- Early, continuous prenatal care
  - Evidence based medical care
  - Designed around previous pregnancy outcomes
  - Nutrition education, support
  - Health care for the life course not just the pregnancy (e.g. tobacco cessation, etc.)
  - Holistic, patient-centered, mindful of multiple determinants of health
“As attractive and relatively inexpensive as prenatal care is, a medical model directed at a 6-8 month interval in a woman’s life cannot erase the influence of years of social, economic, [physical] and emotional distress and hardship.”

Important Under-Utilized Prenatal Prevention Strategies to Prevent Preterm Birth

• Appropriate use of
  – Smoking cessation
  – Weight gain guidance/management
  – 17a-hydroxyprogesterone caproate (17P)
  – Appropriate use of low dose aspirin
Smoking in Pregnancy

• According to the 2011 Pregnancy Risk Assessment and Monitoring System (PRAMS) data from 24 states
  – Approximately 10% of women reported smoking during the last 3 months of pregnancy.
  – Of women who smoked 3 months before pregnancy, 55% quit during pregnancy.
  – Among women who quit smoking during pregnancy, 40% started smoking again within 6 months after delivery.
Pregnancy Weight Gain Guidance

- New article underscores missed opportunity
  - Provider advice about weight matters
  - Only 25% of pregnant women received guidance consistent with the IOM recommendations
  - Another 25% received no advice at all
    - Deputy, N., Sharma, A., Kim, S., Olson C. JWH, Jan, 2018

Yet gestational weight gain is a strong predictor of infant birth weight, complications of pregnancy and a gateway to lifelong health risks related to postpartum weight retention
Use of 17-P

• Which of these women are candidates for 17-P?
  – MB is G3P1102 (preterm infant was born after induction for FGR)
  – KL is G1P000 (currently pregnant with twins)
  – MM is G2P1001 who has just now established ongoing prenatal care due to moving from across country at 25 weeks GA
  – MB is G2P0100 who is starting prenatal care at 9 weeks GA
Use of 17-P

Level A Recommendation (ACOG):

• Woman with a singleton gestation and prior spontaneous preterm singleton birth should be offered progesterone supplementation starting at 16-24 weeks GA, regardless of transvaginal u/s length, to reduce risk of SVPB

• Recommendation came from research indicating this strategy would reduce risk of recurrent preterm delivery by 34% (note: full implementation would NOT prevent the majority of SVPBs)
Penetration of this Promising Strategy

• Actual implementation falling short—\textsc{FAR short}
  
  – Case report of “ideal” implementation case indicates only 59% of eligible women initiated 17P and 20% of those women electively stopped before receiving the full course.

What are some explanations?
Barriers to Promising Strategy

- Necessary steps:
  - Early prenatal care
  - Identification as candidate for 17-P use
  - Offered 17-P
  - Accepting 17-P
  - Affording 17-P
  - Accessing 17-P
  - Adherence to [inconvenient] weekly dose schedule

“Until a commitment is made to actually measure 17-P coverage, understand the reasons for failed coverage and act upon our findings, we will likely continue to fall short. . .[of preventing the preventable]”

Low-dose ASA to Reduce Maternal Mortality, Morbidity and PTB

• Preeclampsia accounts for 12% - 16% of maternal deaths in the United States, and 15% of preterm births.

• According to the US Preventive Services Task Force, an effective, inexpensive, and simple intervention exists to reduce rates of preeclampsia:  low dose ASA (2014).
• The USPSTF recommends the use of low-dose aspirin (81 mg/d) as preventive medication after 12 weeks of gestation in women who are at high risk for preeclampsia. (Level B)

• The related SER concluded that low-dose aspirin (range, 60 to 150 mg/d) reduced the risk for preeclampsia by 24% in clinical trials and reduced the risk for preterm birth by 14% and IUGR by 20%.
# USPSTF Recommendations

<table>
<thead>
<tr>
<th>Risk Level</th>
<th>Risk Factors</th>
<th>Recommendation</th>
</tr>
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<tbody>
<tr>
<td>High†</td>
<td>History of preeclampsia, especially when accompanied by an adverse outcome</td>
<td>Recommend low-dose aspirin if the patient has ≥1 of these high-risk factors</td>
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<tr>
<td></td>
<td>Multifetal gestation</td>
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<td></td>
<td>Chronic hypertension</td>
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<td></td>
<td>Type 1 or 2 diabetes</td>
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<tr>
<td></td>
<td>Renal disease</td>
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<tr>
<td></td>
<td>Autoimmune disease (systemic lupus erythematosus, antiphospholipid syndrome)</td>
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<tr>
<td>Moderate‡</td>
<td>Nulliparity</td>
<td>Consider low-dose aspirin if the patient has several of these moderate-risk factors§</td>
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<tr>
<td></td>
<td>Obesity (body mass index &gt;30 kg/m²)</td>
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<tr>
<td></td>
<td>Family history of preeclampsia (mother or sister)</td>
<td></td>
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<tr>
<td></td>
<td>Sociodemographic characteristics (African American race, low socioeconomic status)</td>
<td></td>
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<tr>
<td></td>
<td>Age ≥35 years</td>
<td></td>
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<tr>
<td></td>
<td>Personal history factors (e.g., low birthweight or small for gestational age, previous adverse pregnancy outcome, &gt;10-year pregnancy interval)</td>
<td></td>
</tr>
<tr>
<td>Low</td>
<td>Previous uncomplicated full-term delivery</td>
<td>Do not recommend low-dose aspirin</td>
</tr>
</tbody>
</table>
Penetration of this Promising Strategy

• What percent of eligible women are offered education and counseling about low dose ASA?
Important Over-Utilized Prenatal Prevention Strategies to Prevent Preterm Birth

- Fetal fibronectin screening
- Bacterial vaginosis testing
- Home uterine activity monitoring (HUAM)
When Is Too Late?
• Jessica is a 19 yo who had an infant in your NICU. Five months ago she gave birth to her first child, a 3 ½ pound infant. Her pregnancy was complicated because she:
  • Was obese when she started prenatal care (BMI 30) and gained weight rapidly
  • Smoked 1 ppd which she was able to cut down on but she was not able to quit
  • Experienced an unintended pregnancy with the father of the pregnancy in and out of the picture.
  • Developed severe preeclampsia; subsequently induced
  • Gave birth by cesarean to an SGA infant at 35 weeks GA
None of these issues were revisited after her last delivery—despite contact with:

- the neonatal care unit for 6 weeks
- home visiting care for infant follow-up
- routine and high risk pediatric care.

She missed her postpartum visit because it coincided with the week she took her baby home.

No one from that practice contacted her and she was subsequently so overwhelmed she failed to reschedule.
Who dropped the ball?
Who Dropped the Ball?

• The postpartum unit?
• The NICU?
• The home visitors?
• The obstetrician’s office?
• The pediatric services?
• The woman?
• Her partner?
Who dropped the ball--everyone?
(yes!)
Today, you learn. . .
She is pregnant again!!

WHAT ARE HER RISKS FOR ANOTHER INFANT ADMITTED TO THE NICU (OR NEVER MAKING IT TO ADMISSION) THIS TIME?
Jessica’s Risks THIS time

- Short interpregnancy interval (ideal is 18-60 months from one birth to next pregnancy)
- Obesity
- Smoker
- History of severe PIH
- Likely unintended conception
- Probably stress
- Possibly poor social support
- Others???
In fact, Jessica’s baby was in YOUR NICU!!

What could you and your unit have done to avoid “dropping the ball”? 
Why Interpregnancy Intervals (IPIs) Matter

• IPIs are measured from the end of one pregnancy and to the conception of the next one.

• Women with IPIs of less than 18 months are 14-47 percent more likely to have premature infants.

• The most recent data suggests that approximately 14% of women, aged 15-44, gave birth within 24 months of their last birth (note: to achieve the 18 month ideal interpregnancy interval a full term pregnancy would need a 27 month interval).

• Rates are higher among African-American, Latina, and poor women.

• Some reports indicate the rates are higher amongst older women and those with a previous poor pregnancy outcome.

Why IPI Matters

• For each month that IPI was below 18 months,
  – Preterm births increased 1.9%
  – Low birthweight increased 3.3%
  – Poor intrauterine growth increased 1.5%

• This means that helping a woman/couple decide to wait 12 months before attempting pregnancy rather than 6 months is important for risk reduction; and waiting 18 months rather than 15 is even less likely to create risks.

Conde-Aquedelo JAMA 2006 296(15) 1809-23.
Giving the Numbers Meaning

• A woman becomes pregnant again 6 months after giving birth. Compared to waiting at least 18 months, her risks are:
  – Increased 23% for preterm birth
  – Increased 40% for low birth weight
  – Increase 18% for small for gestational age

• If woman had a previous preterm birth and a 6 month IPI she would have a 38% risk for having a second premature birth
Obvious Point for Follow-Up

• The Post Partum Exam—unfortunately, far from universal:
  – Commercially insured women: 81% have a pp visit 3-8 weeks after giving birth.
  – Medicaid insured women: 64% have a pp visit 3-8 weeks after giving birth.
  – Self pay: ???? (likely even lower).

USDHHS, Women’s Health, USA, 2013
Some of the “BIG” Misses at the Post Partum Visit

• Multivitamins with folic acid to prevent neural tube defects and nutrient deficiencies
• Cigarette smoking
• Education about interpregnancy intervals
• Contraception matched to patient desires
• Counseling and strategies for weight control
• Follow-up on pregnancy complications (e.g. PIH, GDM, PTB, congenital anomalies)
Omission of Key Health Promotion and Disease Prevention Opportunities at PP Visit

- Study of the content of pp visit for 400 women
  - Family planning counseling—72%
  - Weight recorded—50%
  - Weight discussed—4%
  - Return to sexual intimacy—36%
  - Breast exam—28%
  - Vitamin recommendation—16%
  - Inquired about substance use—14%
  - Inquired about maternal-infant bonding--4%
  - Inquired about family violence—2%

  » Unpublished data from dissertation by S. Verbiest (SPH-UNC-CH, 2008)
A Reminder: Family Planning is, indeed, the most foundational step in the life course trajectory

• ...and we can reinforce the importance of this concept by **NOT** using family planning and contraception as synonyms.

• Family planning is planning if and when to have any (or any more) children
  • if pregnancy is the choice, family planning involves undertaking actions to increase the likelihood of a healthy pregnancy and infant—in other words “planning for your future family”.

• Contraception (whether abstinence, short acting, long acting or permanent) is a strategy to achieve one’s goals about having children.
When Is It Too LATE??

• Serena was 38 yo G2P2 who died of an MI
• People could not believe it. . .She seemed so healthy.
• However, a careful look at her complete history revealed that both of her pregnancies were complicated by severe PIH and PTB.
• No notes in her EMR indicate that any provider considered her total history and risks when providing care.
• Like so many women, her care was organized around reproductive silos rather than a holistic prevention agenda.
Pregnancy serves as a “stress test” for life. . .

. . .but too often the test results are not used to design care that matters.
Pregnancy is **NOT** a disease but...

It *is* accompanied by complications which can be risk factors for a woman developing new chronic diseases in the future.
How Medical Complications of Pregnancy Become New Chronic Diseases

• The demands of pregnancy on a woman’s body uncover some “temporary” chronic disease.

• These “temporary” conditions threaten the health of the woman, the pregnancy and the offspring.

• Often (but not always) the condition is “cured” when the pregnancy ends.

BUT . . .
• The “cure” does not last because the “temporary” condition represented a risk factor for developing one or more specific chronic diseases.

• Many women in these situations do not get needed follow-up and monitoring after giving birth which places them at high risk for complications from new chronic diseases.
Examples of Pregnancy Complications Becoming Chronic Diseases

• Gestational Diabetes
  as high as 50% risk of developing Type II diabetes within next 5 years

• Preeclampsia/eclampsia
  Up to 400% (4 X) times as likely to develop chronic hypertension in their futures than women who did not have preeclampsia
Playing It Forward: Impact of PIH on Woman’s Health

- Increased risk for subsequent cardiovascular and cerebral vascular diseases. (Bellamy, et al., BMJ, 2007)
- Increased risk for T2DM. (Lykke, et al., Htn, 2009; Carr, et al., Hypertens Preg, 2009)
- May be first manifestation of metabolic syndrome.
- If recurrence of hypertensive disorders in pregnancy, the risks for vascular disease increases substantially.
- Risk greatest where preeclampsia and preterm delivery occur in combination.
Playing It Forward: Impact of GDM on Women’s Health

Subsequent development of metabolic diseases including:

- **T2DM**
  - Twenty to 50 percent chance of developing diabetes in the five to ten years after index pregnancy (ADA)
  - Relative risk is 6.0 compared to women who did not have GDM (Cheung, 2003)
  - 10-31% of parous women with T2DM had GDM (Cheung)

- **Metabolic Syndrome**
  - Hypertension
  - Dyslipidmia
  - Microalbuminuria

Why Follow-up of Pregnancy Complications after Pregnancy is Important

• Women who develop new chronic diseases in the interconception period have new risks for their own health and new risks should they become pregnant again.

• Women are often unaware of the link between pregnancy complications and future medical problems.
Follow-Up after GDM

- ACOG, WHO and others recommend postpartum testing at 6-12 weeks for women diagnosed with GDM in pregnancy:
- Only about *50%* of women who **attend their postpartum visit** actually are tested.
- Women who have abnormal results (pre-diabetic or T2DM) need follow-up
- Women who have normal results need continued surveillance

What can you and your colleagues do to increase the likelihood of appropriate care and follow-up?
Current Dominant Perinatal Prevention Paradigm
A Life Course Approach to Improved Women’s Health

Well-Woman/Family Planning

Pregnancy/Well Woman/Family Planning

Well-Woman/Pre/Interconception Care

Childbirth/Family Planning/Well Woman

Postpartum/Interconception/Well Woman

Own gestation, childhood and adolescence

Continuity to Post Menopausal Well Woman Care
**Summary**

- Strategies to prevent the preventable start too late or are poorly implemented.
- It is possible to reframe the prevention paradigm to make a difference for today’s women and tomorrow’s children.
- To change prevention paradigms requires new ways of approaching old problems:
  - Moving out of our silos to impact upstream opportunities
  - Reaching people with timely information—”who”
  - Providing people with simple actions—”what”
  - Recognizing that we all have opportunities to create strategies to have bigger impacts by working smarter not harder—“how”
The Opportunities Are Yours to Move Our Strategies Further Upstream:

Think Small or Think Big, But Think New
Promotion of Lifelong Wellness

Promotion of Desired and Healthy Future Pregnancies

Promotion of Healthy Future Offspring

Impacting the Life Course for Today’s Women and Tomorrow’s Children