Safe Motherhood: Investing in the Health of Women

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- In the USA, in the 21st Century, Illness and Death should be a RARE occurrence.
- Each day more than 2,000 Women have major complications before labor and 2-3 die as a result of Pregnancy.
- 10,000 Women a day give birth (2,200 by C/S)
Safe Motherhood:
Investing in the Health of Women

• Safe Motherhood Begins:
  - Before conception with proper nutrition
  - Continues with planned pregnancy
  - Has appropriate Prenatal Care
  - Complications are “prevented”
  - Any complications that do occur should be recognized early and effectively treated….

Investing in the Health of Women

• ....It ends with labor at term, without unnecessary interventions
• ....It ends with the delivery of a healthy infants,
• ....It has a healthy PP period,
• ....It occurs in a positive environment that supports the physical and emotional needs of the women, infants and family.
Investing in the Health of Women

• “Safe Motherhood is a Vital, Cost-Effective Economic and Social Investment”

• “Even One Woman Dying is Too Many Women Dying”

Hani Atrash, MD, MPH
Chief, Pregnancy and Infants Health, National Center Chronic Disease Prevention and Health Promotion

Investing in the Health of Women

• Pregnancy-Related Deaths
  - Risk of Dying of Causes Related to Pregnancy has declined dramatically from 1950-1980
  - Has remained **UNCHANGED** since ’82
  - Every Year, at least **700** Young American Women die of Pregnancy-Related Complications
Ratio is used instead of Rate because the numerator includes some Maternal Deaths that were NOT related to live births and thus were not included in the denominator.

FIGURE 6. Time interval between delivery and death for women who died after delivering a live-born or stillborn infant — United States, 1987-1990

*Number of days between delivery and death.
Maternal Mortality: Why Are We Still Interested?

- A measure of the overall effectiveness of the obstetric and general health care system.
- A sentinel indicator of problems or "gaps" in the system.
- There was a dramatic decline in maternal deaths in the 20th century; however, there has been no improvement in the national maternal mortality ratio since 1982.

**Child Deaths When a Parent Dies (per 1,000)**

- No Parent Dies: 30, 40
- Father Dies: 35, 55
- Mother Dies: 190, 85
Enhanced Surveillance of Pregnancy-Related Mortality in North Carolina

The Problem

• Pregnancy-related deaths are seriously underreported through death certificates alone.
• Poor data limits our understanding of the problem and our ability to develop appropriate interventions.
North Carolina’s Strategy

• In 1988, SCHS and WFU SOM began cooperative program to enhance surveillance of maternal deaths in NC.
• The goal is to improve the completeness and quality of data on pregnancy-related deaths, and to better characterize their causes as a basis for enhancing prevention.

NC’s Strategy (cont.)

• SCHS links multiple data bases to improve ascertainment of pregnancy-related deaths.
• WFU SOM carries out a detailed medical review of each identified death to confirm that it is pregnancy-related and assign an accurate cause of death.
• Estimated completeness for ascertaining pregnancy-related deaths is 98%.
Confidentiality

- There is strict adherence to professional codes of conduct and legal requirements.
  - Release of medical data from birth certificate approved by State Registrar.
  - Certificates and other records are kept in a locked file cabinet.
  - Access to the data is limited.
  - IRB approval from WFUSM is maintained.

First Step:

Data Linkage
Data Linkage

- Surveillance of pregnancy-related deaths is done on an annual basis.
- We identify death certificates containing ICD-9 COD codes 630-676 (ICD-10 O00-O99).
- A nosologist in SCHS also flags death certificates where there is some written mention of pregnancy on the death certificate, but the death is not assigned a pregnancy-related cause of death code.

Data Linkage (cont.)

- All deaths for women ages 10-50 are matched to the live birth and fetal death files for the same and previous calendar years to identify deaths that occurred within one year after a delivery.
- Match on woman’s last & maiden names, first name, DOB, and SSN.
Data Linkage (cont.)

• Records that match are reviewed manually, using full name and other information, to confirm that the match is valid.
• Hard copies of the matched certificates are obtained and collated in pairs since information on the delivery record helps in establishing an accurate cause of death.

Data Linkage (cont.)

• Hospital discharge data are used to further improve data quality and completeness.
  - Records with a pregnancy-related diagnosis where the woman died in the hospital are identified and matched with death certificates.
  - These records identify a few deaths missed from other sources and also provide supplementary data on diagnoses (ICD-9-CM codes) and procedures.
Second Step:

Medical review

Medical Review

• All of the data compiled by SCHS is given one MD (Dr. Harper) at WFU SOM for detailed medical review and classification of the deaths, using established guidelines.
• Deaths are classified according to CDC definitions.
The Medical Review (cont.)

- **Pregnancy-related:**
  Deaths that result from complications of the pregnancy itself, interventions elected or required because of the pregnancy, or from the chain of events initiated by the complications or interventions, or from a disease which was obviously aggravated by the physiologic effects of pregnancy.

The Medical Review (cont.)

- **Unrelated to Pregnancy:**
  Deaths temporally associated to the pregnancy (within 1 year), but not causally related.
If the information is inadequate to classify the death:

- A letter is mailed to the medical examiner or physician signing the death certificate requesting specific information or an autopsy report.
- For deaths within one of the tertiary centers, a perinatologist is asked to review the record and give an opinion.

All pregnancy-associated deaths are assigned an underlying cause and classified as being related or unrelated to pregnancy.

This information, along with demographic and other medical history, is entered into a database from which reports can be generated.
Perspectives in Disease Prevention and Health Promotion Maternal Mortality: Pilot surveillance in 7 States:
(39 deaths in participating states vs 28 reported through Vital Stats. in 1983)

- **Pilot Surveillance**: 9.6/100,000 live births (6.9/100,000 when vital records data alone were used).
- **Pilot Surveillance**: MM rate for A-A/Hispanics = 16.6/100,000 [7.6/100,000 for whites (RR = 2.2)]
  [95% confidence limits = 1.2-4.1]

*MMWR Nov 29,1985*

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**Results**

5-Year pregnancy-related death ratios, 1993-1997 (deaths per 100,000 live births):

From enhanced surveillance: 23.1
From death certificates alone: 12.6

Ratio: 1.8

*NC Statistics*

![Graph showing trend of pregnancy-related maternal mortality ratio from 1992 to 1998.](image)

Results (cont.)

Total Number of maternal deaths ascertained through enhanced surveillance between 1993-1997:

- Total = 297
- Preg/Related = 119 (40.1%)
- Unrelated = 178 (59.9%)
Investing in the Health of Women

- Most Important Causes of Pregnancy-Related Deaths:
  - Massive Bleeding
  - Pregnancy-Induced High Blood Pressure
  - Pulmonary Emboli
  - Infection
  - Cardiomyopathy

MMWR, 1985

N.C. - Results (cont.)

Causes of 1993-1997 pregnancy-related deaths (total = 119):
- Peripartum cardiomyopathy: 26 (21.8%)
- Hypertensive disorders of preg.: 20 (16.8%)
- Pulmonary emboli (incl. AF and thrombotic emboli): 19 (16.0%)
- Infection: 16 (13.4%)
- Hemorrhage: 14 (11.8%)
NC - Results (cont.)

*Causes of 1993-1997 pregnancy-related deaths (continued):*

<table>
<thead>
<tr>
<th>Cause</th>
<th>Count (Percentage)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stroke (hemorrhagic or thrombotic)</td>
<td>7 (5.9%)</td>
</tr>
<tr>
<td>Anesthesia</td>
<td>2 (1.7%)</td>
</tr>
<tr>
<td>Suicide while pregnant</td>
<td>2 (1.7%)</td>
</tr>
<tr>
<td>Undetermined</td>
<td>2 (1.7%)</td>
</tr>
<tr>
<td>All other</td>
<td>11 (9.2%)</td>
</tr>
</tbody>
</table>

NC - Results (cont.)

*Causes of 1993-1997 death unrelated to pregnancy (total = 178):*

<table>
<thead>
<tr>
<th>Cause</th>
<th>Count (Percentage)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Medical unrelated</td>
<td>66 (37.1%)</td>
</tr>
<tr>
<td>Motor vehicle injury</td>
<td>47 (26.4%)</td>
</tr>
<tr>
<td>Homicide</td>
<td>35 (19.7%)</td>
</tr>
<tr>
<td>Suicide (after pregnancy)</td>
<td>10 (5.6%)</td>
</tr>
<tr>
<td>Other injury</td>
<td>10 (5.6%)</td>
</tr>
<tr>
<td>Drug related</td>
<td>10 (5.6%)</td>
</tr>
</tbody>
</table>
NC - Results (cont.)

Risk factors for pregnancy-related death:

**Mother’s education**
- More than high school: 15.2 (RR=1.0)
- High school: 28.7 (RR=1.9)
- Less than high school: 28.2 (RR=1.9)

MMWR, 1985
NC - Results (cont.)

Risk factors for pregnancy-related death:

Initiation of prenatal care
   First trimester   16.0   (RR=1.0)
   After first trimester   30.4   (RR=1.9)

Note: For 24 of the 119 pregnancy-related deaths the time of initiation of prenatal care was unknown; these deaths are not included in the numerators of these ratios.

MMWR, 1985
Objectives from the Office on Women's Health, Dept. of Health and Human Services

- Healthy People 2010 has these Goals:
  - To increase Quality and Years of Life
  - To eliminate Racial Disparities
  - To significantly decrease Maternal Death to 3.3 per 100,000
  - To increase the proportion of Women who Receive Early PNC (Care starting in 1st trimester)

- AIMS:
  - 88% non-Hispanic White
  - 73% Non-Hispanic African American
  - 74% Hispanics

AIMS: 

90% for ALL Women

Investing in the Health of Women

- The Risk of Dying is NOT the same for all Women
- Ex. The risk of a Pregnancy-Related Death is FOUR times higher among African-Americans and TWICE among Hispanics
- Women OLDER than age 35, are THREE times more likely to die than Younger Women.

NCCDPHP, Vol 13; Spring/Summer 2000
Results (cont.)

Risk factors for pregnancy-related death:

Race

- White, age < 20: 9.5 (RR=1.0)
- White, age 20-34: 13.5 (RR=1.4)
- White, age 35+: 27.3 (RR=2.9)
- Black, age < 20: 21.1 (RR=2.2)
- Black, age 20-34: 42.6 (RR=4.5)
- Black, age 35+: 149.7 (RR=15.8)

FIGURE 3. Age-adjusted pregnancy-related mortality ratio,* by marital status and race† — United States, 1987–1990

* Pregnancy-related deaths per 100,000 live births.
† Hispanic women were classified by their reported racial group.
Findings from N.C. Data

- Violence is a significant contributor to maternal mortality. For 1993-97, the maternal mortality ratio for deaths from homicides exceeds the maternal mortality ratios for any of the major causes of pregnancy-related deaths.
Findings from N.C. Data (cont.)

• In recent years, cardiomyopathy has emerged as the leading cause of pregnancy-related death in North Carolina. This is probably due to enhanced surveillance and a decline in deaths from other causes.

Perspectives in Disease Prevention and Health Promotion Maternal Mortality: Pilot Surveillance in 7 States

(39 deaths in participating states vs 28 reported through Vital Stats. in 1983)

• Embolism, peripartum cardiomyopathy, and cerebrovascular accident together accounted for 49% of the maternal deaths.
• In four (10%) of 39 cases, data were insufficient to arrive at a cause of death more specific than "cardiopulmonary arrest."

MMWR Nov 29, 1985
Findings from N.C. Data (cont.)

• The risk of pregnancy-related mortality among African American women is strikingly higher than the risk among Caucasian women.

Conclusions

• Pregnancy-related mortality ratios are greatly underestimated from death certificates alone.
• The use of enhanced surveillance significantly improves ascertainment of maternal deaths from all causes.
Conclusions (cont.)

- Using our method of enhanced maternal mortality surveillance, over 95% of pregnancy-related deaths can be identified.
- A simple, inexpensive approach that could easily be replicated in nearly all states.

Conclusions (cont.)

- We are far from the goals set for maternal mortality for Healthy People 2010.
- Further efforts to reduce maternal mortality must be identified.
- Maternal Mortality Studies are still relevant.
- Maternal mortality is just the tip of the iceberg as compared to morbidity.
Maternal Mortality

- Problem with reporting
- Problem with proper surveillance
- Problem with data not available from death certificates

Peripartum Cardiomyopathy

A condition that puts young women with apparently normal hearts at risk for sudden death.
**Peripartum Cardiomyopathy**

Congestive heart failure which occurs during the last month of pregnancy or during the first 5 months after delivery.

*Figure 1*
Peripartum Cardiomyopathy

Table 1. Definition of Peripartum Cardiomyopathy

<table>
<thead>
<tr>
<th>Classic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Development of cardiac failure in the last month of pregnancy or within 5 months of delivery</td>
</tr>
<tr>
<td>Absence of an identifiable cause for the cardiac failure</td>
</tr>
<tr>
<td>Absence of recognizable heart disease prior to the last month of pregnancy</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Additional</th>
</tr>
</thead>
<tbody>
<tr>
<td>Left ventricular systolic dysfunction demonstrated by classic echocardiographic criteria, such as depressed shortening fraction or ejection fraction</td>
</tr>
</tbody>
</table>

JAMA, March 1, 2000—Vol 283, No. 9

Incidence......

- Difficult to assess because of the lack of definition 1/3000 to 1/15,000
- Higher incidence in Africa, Southern regions of USA, warmer area of the World
- Higher in Multiparous, multiple gestation, Older women
Peripartum Cardiomyopathy

**Symptoms:** Chest Pain, Orthopnea, Cough, Dyspnea, Pedal Edema, Fatigue (many of these are associated with normal pregnancy)

**Signs:** Tachycardia, Gallop, murmur, jugular vein distention, peripheral edema. *Many of these occur during NI pregnancy.*

PPCM: Myocarditis accounts for up to 44% of fatal events

**Hx:** Recent flu-like illness
- Cardiac involvement is unpredictable
- May affect the muscle or the conducting system

**Viruses:**
- Enterovirus, Cytomegalovirus, Herpes simplex, parvovirus, Influenza, Hepatitis B/C
**Improvement in Risk Factor Identification**

- Predictors: Molecular/Genetic/Biophysical/Biochemical

**Improving the Diagnosis Health Care Awareness**

**Education/Public Awareness News Media**

**Targetting and Evaluating New Treatments Randomized Trials**

**Primary: Immediate Rx**
- Immediate Rx: B-adrenergic antagonists
- ACE-inhibitors

**Secondary: Prevention of sudden Death**
- OPCM - Susceptibility
- Who is at Risk?

**Opportunities for Progress**
- Role of Myocarditis?
- More initial and aggressive Rx on "Predisposed Subjects"....

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**Peripartum Cardiomyopathy**

**Table 2. Serum Levels of Antibodies to Cardiac Muscle Proteins in Patients With Peripartum Cardiomyopathy (CM) and Idiopathic Dilated Cardiomyopathy**

<table>
<thead>
<tr>
<th>Antibody Titer Levels‡</th>
<th>Patient Group</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>ANT</td>
</tr>
<tr>
<td>&lt;1:20</td>
<td>16/56 (26)</td>
</tr>
<tr>
<td>1:20-1:160</td>
<td>29/56 (53)</td>
</tr>
<tr>
<td>&gt;1:160</td>
<td>11/56 (20)</td>
</tr>
</tbody>
</table>

**Patient Group**
- Idiopathic CM
- Peripartum CM

**Antibody Titer Levels‡**
- AN: Antithrombin
- BCKD: Brachioradialis chain
- Myosin

**Antibody Titer Levels‡**
- 1/10, 1/10, 1/10, 1/10, 1/10

**Antibody Titer Levels‡**
- Data presented as No./Total (%) of patients in each group.

*From: Antman, M.D., unpublished data, 1997.*

**Reciprocal of the highest dilution of serum samples showing reactivity arbitrarily divided into those with low (<1:20), medium (1:20-1:160), and high (>1:160) titers.**

**Table 2. Serum Levels of Antibodies to Cardiac Muscle Proteins in Patients With Peripartum Cardiomyopathy (CM) and Idiopathic Dilated Cardiomyopathy**

**JAMA, March 1, 2000—Vol 283, No. 9**
**Peripartum Cardiomyopathy**

**Course of the Disease**
*Survivors have a Higher EF and Smaller EDD*

- **Outcomes: Group I vs. Group II**
  - I = Heart size/function returned to normal
  - II = Heart size/function does not return to normal

Those who continue to deteriorate may need a heart transplant. Morbidity and mortality for this group has been estimated to be as high as 60 percent.

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**PPCM – What Have We Learned?**

- Raise awareness to this RARE condition among Care Providers,
- Empower Women about this disorder
- Education for all - Students, Residents, Attendings, Patients, Family Members..
- Increase research
- Investigate the role of viral infection, genetic predisposition, and immunological responses...
Peripartum Cardiomyopathy

What do we need to do?

- Stimulate interest… Initiate Research…
- Collect pertinent data
  (registry: www.phs.wfubmc/ppcm)
- Collect blood samples/tissue…
  (Dr., AA Ansari at Emory University)
- Monitor “cluster/outbreaks…”
  (Dr. J Frett in Haiti)
- Detect early… Treat Aggressively
- Stress Echoes on women who want to try to get pregnant again… and monitor subsequent pregnancies

Cardiovascular Disease in Women

Each year, more women die from Heart Disease than from all other malignancies, including breasts, cervical, ovarian, uterine or lung cancer.
Safe Motherhood is a sound “An Economic Investment”

- Poor Maternal health/nutrition contributes to LBW in 20 Million babies/yr,
- Motherless children are likely to get less health care and education,
- Maternal Health interventions are among the most cost-effective investment in Health,
- Good maternal health services can strengthen the entire health system,
- Building women’s trust promotes preventive care.

Great Opportunities to...

- Increase Safe Delivery of Care
- Increase Efficiency of Care
- Increase Accessibility to Care
- Increase Basic and Clinical Research in Gender Specific Research,
- Decrease Disparity of Care ....