Maternal Mortality II: THE THREE SAFETY BUNDLES AND ECLECTIC NEWS FROM RESEARCH

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National Partnership for Maternal Safety

- National Partnership for Maternal Safety—three areas of focus
  - Hemorrhage
  - Hypertensive disorders
  - Venous Thromboembolism

- Thought that up to half of maternal deaths in U.S. are preventable and most caused by hemorrhage

- Strategy also involves better case review

- Severe Maternal Morbidity also of interest
  - 50 times more common than mortality
  - May be better source of data for improvement
Safety Bundle #1—Hemorrhage

- Sources of problematic care:
  - Underrecognition of blood loss
  - Lack of attention to clinical signs of hemorrhage
  - Failure to intervene decisively
  - Failure to restore blood volume in a timely fashion
Safety Bundle, Hemorrhage, Continued

• Recommendations:
  – Standard obstetric hemorrhage protocol and event checklist
  – Hemorrhage kit
  – Partnership with blood bank
  – Active management of third stage of labor
Classification of Hemorrhage

Class I: up to 15%. Minimal HR elevation. No other VS changes.

Class II: 15-30% HR 100-120. RR 20-24. decreased pulse pressure (systolic minimal change). Skin cool and clammy. Capillary refill may be delayed.

Class III: 30-40% blood loss.
  - Drop in BP
    • BP 20-30% < than at presentation = concern
  - Mental status changes.
  - HR > 120, output diminished. RR elevated Cold and pale. Refill delayed

Class IV: 40% blood loss. Marked change in mental status. Output minimal or absent.
Safety Bundle #2—Severe Hypertension in Pregnancy

• Systolic hypertension may be the best predictor of hemorrhagic stroke and infarction
• 60% of deaths resulting from HTN preventable?
• Standardized guidelines have reduced morbidity and deaths
• Order sets for IV Labetalol and Hydralazine available from ACOG

Errors in Hypertension Treatment

• Failure to adequately control blood pressure

• Failure to recognize (HELLP)
  – Hemolysis
  – Elevated liver enzymes
  – Low platelets

• Failure to dx and rx pulmonary edema

Safety Bundle #3—VTE

• Most amenable to reduction by change in practice?
• UK: reduction in VTE deaths following protocol introductions
  – VTE prophylaxis cesareans—RCOG—1995
  – VTE prophylaxis vaginal birth—RCOG—2004
• Joint Commission:
  – Compression devices for Cesarean birth for those who are at increased risk for PE
  – Evaluate pp patients and treat with anti-coagulation for those at high risk
• Risk factors: Cesarean, thrombophilias, smoking, BMI—persists post-partum
Eclectic Insight From My Research: DIC

- Full time private practice; in “free time” do research related to AFE, immunology of late pregnancy; have foundation funding for lab testing, statistical analysis
- Investigated obstetrical DIC: pathology study on 59 peripartum hysterectomy specimens
- Hypothesis: Those with DIC would have fetal material in uterine vasculature; those without would not
- Results: 1/3 of women in all diagnostic categories had intravascular fetal material
  - Those with DIC
  - Those without DIC
• Intravascular fetal material does not necessarily cause disease (no one knows why not)
• Most women have more than one diagnosis for their mortal bleeding
• Virtually all current explanations of obstetrical DIC have little or zero empirical support
• Can (and may need to) do hysterectomy during DIC

Amniotic Fluid Embolism

• Not diagnosis of exclusion—fairly consistent world-wide clinical definition

• One or more:
  – CV collapse
  – Respiratory Distress
  – Coagulopathy
  – Neurologic—seizures, coma

• Other diseases may co-exist

• Maternal intravascular fetal material diagnostic in death—not in life
Amniotic Fluid Embolism (Continued)

- NOT anaphylaxis and certainly not “anaphylactoid” (specifically means non-antigen/antibody mediated degranulation of mast cells)
- Might be complement mediated but data not sufficient yet
- NOT 90% fatal. Case series overstate morbidity/mortality due to ascertainment bias. Population studies with millions of women: 10-35% mortality rate


Benson, MD. Amniotic fluid embolism: the known and not known. Obstet Med. 7(1); 17-21. 2014.
Has Time Run Out For the 4 Minute Rule?

- Four minute rule (1986, Katz et al. Obstetrics and Gynecology):
  - Begin cesarean at four minutes for cardiac arrest in third trimester if pulse not restored
  - Deliver baby in next minute

- Questions about both assumptions
  - Brain damage in pregnant women in 4 minutes?
  - Possible to deliver in one minute?

- Study—Search of perimortem Cesarean reports with six key words
  - 53 cases
  - Abstracted into Excel spreadsheet


Maternal Injury Free Survival As Function of Arrest to Birth Interval

Product-Limit Survival Estimate

Survival Probability

N=16

* Censored

Arrest_Birth_min_

Newborn Injury Free Survival As Function of Arrest to Birth Interval

Has Time Run Out For The Four-minute Rule? (2)

• Both fetal and maternal INJURY FREE survival diminish in a more or less linear fashion—AND IT IS LONGER THAN YOU MIGHT THINK

• 50% injury free threshold for mothers—arrest to birth time = 15 minutes

• 50% injury free threshold for newborns—arrest to birth time 30 minutes

Third Trimester Resuscitation

• Do not wait four minutes!
• You will NOT deliver the baby within one minute of starting incision and you WON’T even start the incision in four minutes, HOWEVER... 
• For Maternal cardiac arrest in the third trimester—cesarean as quickly as possible 
• Very few hospitals are prepared for this type of emergency
  – Generally benefits from obstetrician, anesthesiologist, and pediatrician presence
  – Maternal cardiac arrest in third trimester rare—on order of 1 in 50,000
  – However, severe maternal morbidity (50 times more common) might also benefit from “no notice” cesarean protocol
Summary

• Three safety bundles
  – Hemorrhage
    • Be extremely conscious of EBL and vital signs
    • For acute on-going blood loss think transfusion early
  – Hypertension
    • Treat systolic blood pressure promptly per ACOG protocol
    • Check for severe disease
  – Venous Thromboembolism—RCOG has well established protocol. ACOG not as far along
Summary (Continued)

• Cause of obstetric DIC remains unknown

• AFE—Most survive
  – Clinical Diagnosis
  – Mortality rate roughly 10 to 35%
  – MAY be immunologic but certainly not “anaphylactoid”
  – Fetal material in maternal circulation not diagnostic during life
    (at the present it is diagnostic during death—??)

• Cardiac arrest in third trimester—initiate cesarean promptly
  – Do not wait 4 minutes but you will NOT deliver the baby in 1 minute
  – Both maternal and fetal injury free survival diminish as time for
    arrest to birth interval increases
QUESTIONS?