Maternal Hemorrhage Plan

A BAPTIST HOSPITAL OF MIAMI
MULTIDISCIPLINARY APPROACH TO
RECOGNITION AND TREATMENT OF
MATERNAL HEMORRHAGE

CASE PRESENTATION

- 27 y.o. G4 P1, prior LTCS x 1 for breech
- PMH- CHTN
- U/S 17 wks- complete anterior previa, thin segment
- U/S 26 wks- invasion of LUS, vessels crossing serosa
- Later U/S- suspicious for bladder invasion
- Consultations with MFM, GYO, Anesthesia, BCVI, URO
- Multidisciplinary team meeting including OB, MFM, Anesthesia, BCVI, Nursing- plan of care

CASE PRESENTATION

- Patient admitted at 34 wks until delivery
- Active Type & Cross
- At 35 3/7 wks pt began having regular CTX
- Transferred to BCVI for delivery
Maternal Hemorrhage Plan
Evidence in the Literature

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MATERNAL HEMORRHAGE

“No woman should die giving life.”

MATERNAL HEMORRHAGE TASK FORCE
• Anesthesiology
• Obstetrics
• Nursing
• Transfusion Services
• Pharmacy
• Lab
• Respiratory
Do: Develop and implement a protocol for maternal hemorrhage.

Plan: Decrease morbidity and mortality related to maternal hemorrhage.

Act: Track for coagulopathies (INR), timeliness of arrival of blood and PPH LOS.

Check: Monitor outcomes of MHP patients. Debrief and assess communication post hemorrhage.

MATERNAL HEMORRHAGE

• Every minute of every day a woman dies from complications in pregnancy or childbirth
• The global maternal mortality ratio of 402 deaths per 100,000 live births obscures the fact that 99% of these deaths occur in the developing world
• PPH affects 1-3% of all deliveries

DAMAGE CONTROL RESUSCITATION

The term ‘damage control’ connotes the application of early and aggressive life-saving techniques, and describes the surgical practice of quickly controlling hemorrhage and containing contamination, with delayed definitive repair of injuries.

Damage control resuscitation describes the rapid correction of hypothermia and acidosis and the direct treatment of coagulopathy.

The early transfusion of trauma pts, the use of permissive hypotension, and minimization of crystalloid use.
Massive transfusion is defined as the transfusion of 10 or more PRBC units in a 24 hour period.

There is very limited data in the obstetric literature. Numerous efforts have been made to refine our understanding of blood transfusion for trauma. The recent trauma experience has largely been drawn from the war theatres in Iraq and Afghanistan.

Military physicians have noticed a decrease in coagulopathy in bleeding cases when replacing blood loss with a 1:1 ratio of FFP to RBC’s.


Methods:
- Retrospective chart review of 246 patients at a US Army combat support hospital, each of who received a massive transfusion (>=10 units of RBC’s in 24 hours).
- Three group of pts were constructed according to the plasma to RBC ratio transfused during massive transfusion.
- Mortality rates and the cause of death were compared among groups.
DESCRIPTIVE STATISTICS FOR EACH
PLASMA TO RBC RATIO GROUP

<table>
<thead>
<tr>
<th>Variable/Condition</th>
<th>Low Ratio Group, n = 21</th>
<th>Medium Ratio Group, n = 13</th>
<th>High Ratio Group, n = 12</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bilirubin (mg/dL)</td>
<td>12.9±6.3</td>
<td>17.3±13.9</td>
<td>12.4±5.9</td>
</tr>
<tr>
<td>Hgb (g/dL)</td>
<td>9.1 (7.0-11.0)</td>
<td>12.0 (9.5-14.0)</td>
<td>9.2 (7.0-12.0)</td>
</tr>
<tr>
<td>Hct (%)</td>
<td>31 (25-38)</td>
<td>36 (32-41)</td>
<td>32 (28-36)</td>
</tr>
<tr>
<td>Vasoconstriction</td>
<td>12 (10-14)</td>
<td>15 (13-18)</td>
<td>12 (10-14)</td>
</tr>
<tr>
<td>Fever (%)</td>
<td>7 (5-9)</td>
<td>9 (7-11)</td>
<td>7 (5-9)</td>
</tr>
<tr>
<td>SBP (mm Hg)</td>
<td>105 (90-120)</td>
<td>110 (95-125)</td>
<td>108 (95-120)</td>
</tr>
<tr>
<td>Lactic acid levels</td>
<td>16 (12-20)</td>
<td>18 (15-22)</td>
<td>16 (12-20)</td>
</tr>
<tr>
<td>Hemorrhagic deaths</td>
<td>6 (4-8)</td>
<td>8 (6-10)</td>
<td>6 (4-8)</td>
</tr>
</tbody>
</table>

Results:

- For the low ratio group the plasma to RBC median ratio was 1:8 (interquartile range, 0:12-1:5), for the medium ratio group, 1:2.5 (interquartile range, 1:3-0:1:2), and for the high ratio group, 1:1.4 (interquartile range 1:1.7-1:1:2) (p<0.001).
- Median Injury Severity Score (ISS) was 18 for all groups (interquartile range, 14-25).
- For low, medium and high plasma to RBC ratios, overall mortality rates were 65%, 34% and 19% (p<0.001); and hemorrhage mortality rates were 92.5%, 78% and 37% respectively, (p<0.001) upon logistic regression,
- Plasma to RBC ratio was independently associated with survival (odds ratio 8.6, 95% confidence interval 2.1-35.2)

Conclusions:

- In patients with combat related trauma requiring massive transfusion, a high 1:1.4 plasma to PRBC ratio is independently associated with improved survival to hospital discharge, primarily by decreasing death from hemorrhage.

- For practical purposes, massive transfusions protocols should utilize a 1:1 ratio of plasma to PRBC’s for all pts who are hypocoagulable with traumatic injuries.

LETHAL TRIAD / BLOODY Vicious CYCLE

- Hypothermia
- Metabolic Acidosis
- Coagulopathy
LIQUID PLASMA & THAWED PLASMA

1. Liquid Plasma: Plasma prepared from whole blood. It is stored unfrozen at between 1-6°C, and can be transfused up to 5 days after the expiration date of the whole blood.
2. Thawed Plasma: FFP prepared in a closed system, but not transfused within 24 hours after thawing. It can be stored between 1-6°C, or be used up to five days after thawing.
3. Reduced levels of Factors V and VIII
4. Can be transfused up to 5 days after expiration of original whole blood.
5. Indications same as for FFP:
   - Congenital and acquired deficiencies of the stable clotting factors (including II, VII, IX, X, XI, and XIII), if specific factor concentrates are unavailable or inappropriate.


Recombinant Factor VIIa

Tissue factor (TF)/FVIIa, or TF/FVIIa interaction, is necessary to initiate haemostasis

At pharmacological concentrations, FVIIa directly activates FX on the surface of locally activated platelets. This activation will initiate the "thrombin burst" independently of FVIII and FIX. This step is independent of TF.

The thrombin burst leads to the formation of a stable clot.
Conclusion:

- In high doses rFVIIa binds to the surface of the locally activated platelets where it leads to the formation of a "thrombin burst"

Recombinant Factor VIIa

- Activates extrinsic pathway of coagulation cascade
- "off label" use for obstetric hemorrhage
- Used after conventional blood products have failed
  - > 10-12 PRBC, 6-9 FFP, 2-3 platelets, cryo AND still DIC
- Requirements for effectiveness
  - Platelets >50K, adequate Fib, normal pH and body temperature
- Dose 30-90 mcg/kg, repeated in 20-30 minutes
- Significant risk, but potentially life-saving

ROLE OF THE ANESTHESIA PROVIDER

TEAM LEADER

- Leadership in communication with the OB attending. Activates MHP if not already active
- Directs care and assigns roles, will call for additional help if necessary.
- Differential Dx (Pulmonary embolus, Amniotic fluid embolus, Uterine atony, Abruptio, etc.)
- Determines if sufficient IV access is present.
- Will not distract himself obtaining lines but rather assign line person with that task.
- Order removal of any person not actively involved in the case.
“Obstetrics is a bloody business”

BACKGROUND

Joint Commission Sentinel Event Alert #44 Preventing Maternal Death

- Maternal mortality is increasing in the US
- Leading causes of death: Hemorrhage, Hypertensive Disorders, PE, AFE
- Recommendations: Guidelines/protocols and use of drills

1999-2008 FLORIDA MATERNAL MORTALITY

Mortality Rate
17 PER 100,000 LIVE BIRTHS

*Florida Pregnancy-Related Maternal Mortality Report: Why are Florida Mothers Continuing to Die? Florida Department of Health
MATERNAL HEMORRHAGE TASK FORCE

- Anesthesiology
- Obstetrics
- Nursing
- Blood Bank
- Pharmacy
- Lab
- Respiratory

MATERNAL HEMORRHAGE PLAN

- **Readiness**: Multidisciplinary plan
- **Recognition**: EBL calculation, VS “triggers”
- **Response**: Mobilize resources, Role clarity

MATERNAL HEMORRHAGE PLAN

- Admission Risk Assessment
- **Prevention**: Active management of the 3rd stage
  - **Level 1**: Early recognition, response
  - **Level 2**: Escalation of interventions
  - **Level 3**: Advanced interventions, resources, roles
ACTIVE MANAGEMENT OF THIRD STAGE

- Pitocin before delivery of placenta
- Controlled cord traction
- Cord clamping within 2 minutes
- Fundal massage after placental delivery
- Significant reduction in PPH
LEVEL 1 MHP

- If cumulative EBL > 500 mL vaginal delivery or greater than 1000 mL C/S  OR
- Vital signs > 15% change or HR >110, BP <85/45, O2 sat < 95%  OR
- Increased bleeding during recovery period

ESTIMATION OF BLOOD LOSS

- Consistent methodology
- Visual aids
- Cumulative EBL
HEMORRHAGE MEDPACK

Oxytocin (10 units) x 4 vials
Methylergonovine 0.2 mg x 1 dose
Carboprost tromethamine 250 mcg x 2 doses
Misoprostol 200 mcg x 5 tablets

Do Not Delay Interventions While Waiting Response To Medications

LEVEL 2 MHP

- Continued bleeding  OR
- Continued vital sign instability  AND
- EBL < 1500 mL
LEVEL 3 MHP

- If cumulative EBL > 1500 mL  **AND**
- Greater than 2 units PRBCs given  **AND/OR**
- VS unstable or suspicion of DIC  **AND**
- Actively bleeding
MASSIVE HEMORRHAGE PACK

6:4:1 PRBC:FFP:Platelets

MASSIVE HEMORRHAGE PANEL

Life Saver Panel + Clotting Studies
### CASE PRESENTATION

- Invasive monitoring
- Placement of balloons in bilat hypogastric arteries with balloons on ends which can be inflated into arteries supplying the uterus
- General anesthesia
- SURGERY
- EBL 8000mL
- Transfused 11 PRBC, 11 FFP, 4 PLT, 4 CRYO
Measuring good outcomes...

DATA GATHERING
- Debriefing Tool (California Collaborative)
  - Measuring process and communication
- Delivery and availability of blood products.
  - Decrease in average delivery times.
- Prevention of coagulopathy
  - Comparing INR historic controls with current values
- Decrease of PPH LOS
- Total blood products usage

MHP IMPLEMENTATION
- Education
- Manuals
- Mandatory education for RN
- Skills lab
- Simulation
- Reference tools at each nursing station and OR
- Medpack at every location
- Accountability
- Debriefing tool
Maternal Hemorrhage Plan
Postpartum Hemorrhage

Usage and Control of INR

INR performed
INR within range (<1.4)

70% 87% 91%

Nov 2010-April 2011
May 2011 - Feb 2012

Nov 2010-April 2011 - n = 23
May 2011 – Feb 2012 – n = 38

Maternal Hemorrhage Plan
Postpartum Hemorrhage

ALOS

5.3 3.1

Nov 2010-April 2011
May 2011 - Feb 2012

Nov 2010-April 2011 - n = 23
May 2011 – Feb 2012 – n = 38

This preliminary calculation is based on a manual log and recordkeeping in the labor room from Nov 2010 - Feb 2012.

Since the implementation of the Maternal Hemorrhage Plan:

Are you more confident when caring for a patient with an obstetrical hemorrhage?

n = 46 responses
Since the implementation of the Maternal Hemorrhage Plan:

Do you feel more empowered to make intervention suggestions to the team?

![Bar Chart]

n=46 responses

Since the implementation of the Maternal Hemorrhage Plan:

Do you think that communication during a crisis has improved?

![Bar Chart]

n=46 responses

Since the implementation of the Maternal Hemorrhage Plan:

Has the timely availability of resources (ie blood, lab results, medications, personnel, equipment, etc) improved?

![Bar Chart]

n=47 responses
Since the implementation of the Maternal Hemorrhage Plan:

Has it made the unit safer?

- strongly agree
- agree
- neutral
- disagree
- strongly disagree

n=47 responses