Massive Hemorrhage Protocol: From Rural to Urban

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SK Transfusion Symposium

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Outline

- Discuss Massive Hemorrhage protocols in relation to urban and rural settings
- Discuss the unique challenges for bleeding patients in rural areas
- Discuss how to clinically manage these challenging patients in both settings

Case #1

- 43 yo male brought in by EMS after being attacked with a knife
- Large, deep laceration across anterior neck
- Vitals with EMS:
  - HR 120
  - BP 100/60
  - RR 20
- EMS says bleeding “controlled” with pressure to wound

Case cont…

- Arrives in trauma bay
- ATLS initiated
  - A- awake, talking, GCS 14
  - B- Sats 95% 4L NP, no obvious chest trauma
  - C- ~20cm laceration across anterior neck
    - Trachea exposed
    - Clear breach of all strap muscles
    - ?breach of carotid sheath on right side
  - D- normal
  - E- normal

Case cont…

- As you are doing your assessment, patient gets agitated/confused and starts coughing
- Sudden arterial spray from right side of neck
- Immediate pressure to area
  - Blood still pouring out around gauze

- What are you going to do now?
- What would be the difference in course of action between rural and tertiary sites?

Scope of the Problem

- Trauma is the leading cause of death for Canadians under the age of 44 and 3rd leading cause of death for all ages
- Although trauma care has improved sig since the implementation of trauma systems, the mortality rate is sig higher in rural compared to urban settings for the same injury
- This can be attributed to many reasons
- Prehospital and emergency department deaths account for a large proportion of rural trauma death

Rural Trauma

- 17.8% of Canadians lived in “rural” areas in 2021
  - Rural defined as <400 people per square kilometer
- Almost half of Canada’s rural ED’s are located greater than 300km from a trauma center
  - Thus already are out of the “golden hour” of trauma care

- Rural Trauma is defined as:
  - Injury where the victim is isolated in terms of geography, population density, weather, distance, availability of professional or institutional resources and/or a combination of these factors

Challenges Faced in Rural Trauma

- Isolation
  - Injury occurring in a very rural/austere environment with prolonged extrication
  - Distance to rural ED
  - Distance to definitive care

- Lack of Resources/Experience
  - MDs/AHP not accustomed to taking care of severely injured patients
  - No surgical care available
  - Limited supply of personnel, equipment, diagnostics, blood products

Isolation is a Reality…. With no simple solution

You Cannot Change Geography BUT…

- Technological advancements can help find an injured party
- Prehospital accessibility has improved
- Non invasive hemostatic agents have evolved
- Educational courses/opportunities have increased

Massive Hemorrhage Protocols

- Rapid delivery of blood products is central to the care of trauma-related hemorrhage
  - Amount of RBCs transfused within the first 24 hours correlates with mortality

- They act in tandem to the clinical problem which is what is pivotal to the survival of trauma patients:
  - Where are they bleeding?
  - How can we stop the bleeding?

Massive Hemorrhage Event

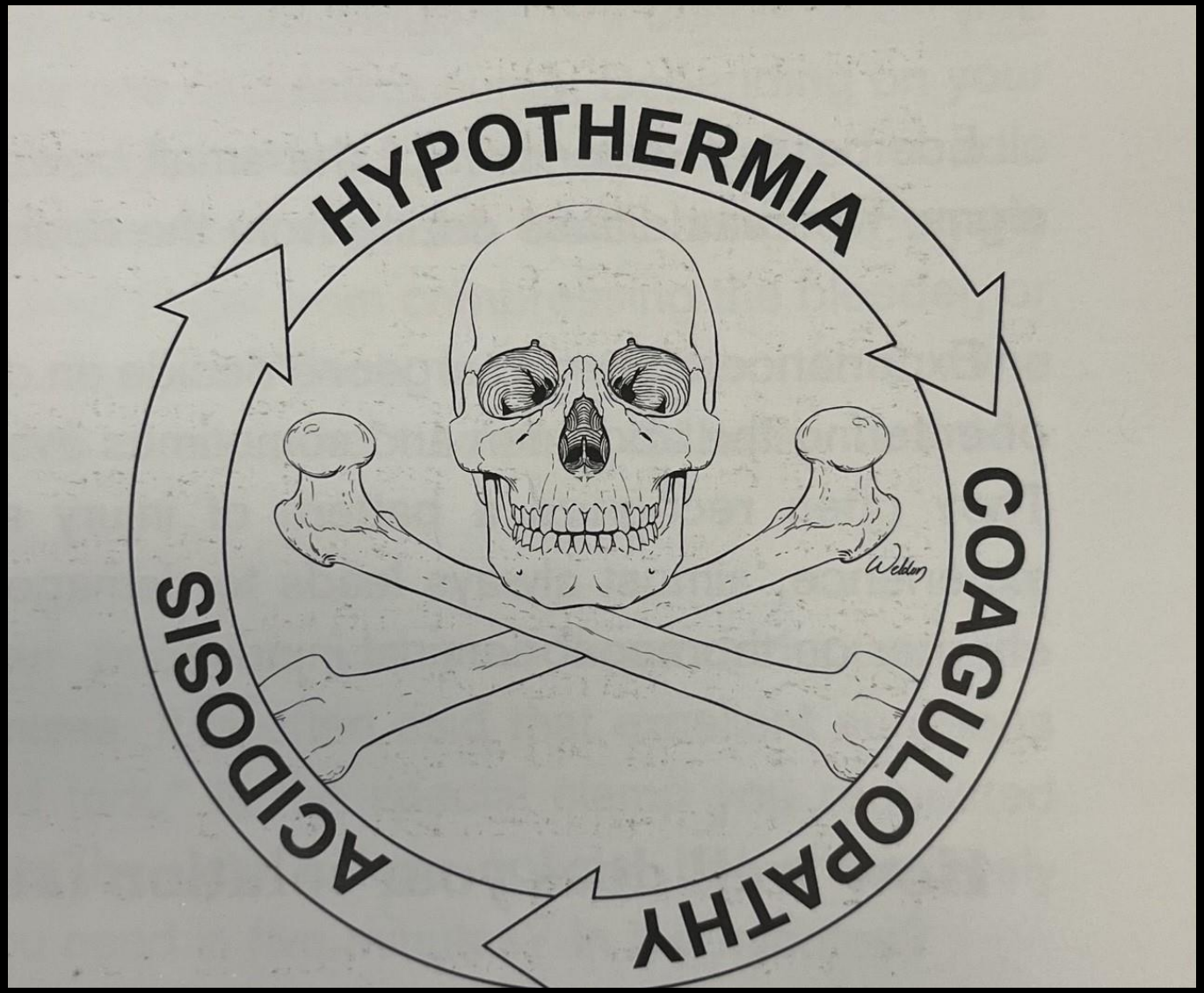
- Transfusion of a volume of blood components equivalent to a patient's estimated total blood volume within a 24 hour period
  - ~10 units or more packed red blood cells (RBCs) in adults
    - Other definitions include 50% loss of total blood volume within 3 hours (one blood volume is approximately 5000mL or 70mL/kg in a 70 kg adult); blood loss at a rate greater than 150 mL/minute; or blood loss requiring four units of RBCs in a four hour time period
- Majority of Massive Hemorrhage Events are traumatic, surgical or obstetrical

Massive Hemorrhage Protocols

- Priorities:
  - Restore blood volume to maintain tissue perfusion and oxygenation
  - Achieve hemostasis by treating surgical sources of bleeding and correcting coagulopathy

- Bucket analogy
- Engine analogy

Deadly Triad of Trauma



Acute Traumatic Coagulopathy

- Recognized now to be an entity and not (as previously believed) from dilution
- 25% of trauma patients had coagulopathy on arrival to hospital (INR>1.5)
  - Risk of death was 4x higher if present
- TEG/ROTEM have also allowed us to realize that some patients clearly have coagulopathy derangements despite “normal” coag studies
- Also observed hyperfibrinolysis in trauma patients

- Poor clot formation, increased clot breakdown… the triad continues…

Static vs Dynamic Labs in MHPs

- Utility of conventional labs in the setting of acute bleeding is fraught with difficulties
  - Tests are designed for static measurements in the stable, clinical setting
  - May not be reflective of true risk of bleeding in the acute setting
  - Time delays problematic- speed is critical
  - “Normal” does not necessarily mean “normal”
- TEG/ROTEM
  - Can help explain if bleeding is surgical or coagulopathic
  - Can help improve an algorithm-driven transfusion approach

Ratio Based Resuscitation in MHPs

- Damage Control Rescusitation (DCR) 1:1:1 with limited crystalloid
  - Really only applies to the truly massively bleeding patients
- Most protocols aim for 1:1 or 1:2 ratio (high ratio)
- Plasma needed to reverse consumptive coagulopathy, prevents dilutional coagulopathy and repairs endothelial dysfunction
- Systemic review of 11 non-randomized studies totaling 3107 patients concluded “there is insufficient evidence to support the use of a fixed 1:1 ratio of plasma to RBC units in massively transfused trauma patients”
- Overall the existing literature is comprised of small observational retrospective studies with survival biases, unmeasured variable, but which seem to favor higher ratio survival benefits

Regina Qu'Appelle HEALTH REGION

JOB AID LABTranOP7142A

MASSIVE TRANSFUSION PROTOCOL ALGORITHM

Updated June 2018

Criteria for Activation

≥ 4 packed red cells transfused in **≤ 1 hour** with uncontrolled bleeding and/or request by **Code Blue Captain, Trauma Team Leader or Anaesthesiologist** when clinically necessary.

Contact Physician determines MTP activation is required.

Team Contact (Charge RN) calls Transfusions to activate MTP. *Transfusions will initiate the overhead page when required.* (Refer to Massive Transfusion Protocol Nursing Guidelines in Code Blue Binder for other Team Contact duties).

Collect baseline bloodwork per MTP requisitions (sent by Transfusions with first box).

Transfuse blood products as provided

Box 1A: 4 packed red cells (sent immediately)
Box 1B: 4 thawed plasma + 1 adult platelet (sent in 20-25 minutes)
Note: MTP boxes will be available from Transfusions every 30 minutes until the MTP is discontinued. The physician can always ask for more products in addition to the boxes.

TRANSFUSE CONTENTS OF MTP BOXES

Box 1: 4 red cells + 4 plasma + 1 adult platelet dose

Box 2: 4 red cells + 4 plasma + 6 units cryoprecipitate

These will alternate every 30 minutes until the MTP is discontinued.

Collect bloodwork (MTP panel) every 30-60 minutes and review results for additional treatment considerations. *Use MTP requisitions.*

MTP Panel Includes:
CBC
INR/aPTT
Fibrinogen
Arterial Blood Gases
Ionized Calcium
Lactate

Treatment Considerations

- **Use a blood warmer** and consider other measures to warm the patient. **Monitor** core temperature. **Goal temp > 36°C.**
- Consider the use of **tranexamic acid** for ALL trauma patients who are within 3 hours from time of injury. Dose – 1 g IV load in 100 mL NS over 10 min, then 1 g IV in 250 mL NS over 8 hr.
- Consider use of a **Cell-Saver** (contact Perfusionist on call via switchboard).

Transfusions
RGH 4474
Pasqua 2227

I am activating the Massive Transfusion Protocol at _____ (location).

The patient's name is _____.

The MRN is _____.

The gender is _____.

The requesting physician is _____.

Dedicated MTP Transport Contact Numbers

RGH	Pasqua
0709	8488

Treatment Considerations Based on Lab Results

- If INR ≥ 1.7 or aPTT > 40 seconds, consider an additional 4 units of plasma.
- If fibrinogen < 1.5 g/L (or < 2.0 g/L in obstetrical patients), consider an additional 6 units of cryoprecipitate.
- If platelets < 75 x 10^9/L, consider an additional adult dose of platelets.
- If ionized Ca^{++} <1 mmol/L, give 1 g calcium gluconate.
- Monitor pH closely, consider lactate to monitor effect of resuscitation.
- If patient is on anticoagulants or other transfusion advice is required, consult Hematopathologist on call via switchboard.

Back to Case…

- Thankfully, was on the phone with OR already
- MHP immediately called
- Grabbed QuickClot and applied directly to wound
  - Decreased bleeding significantly
- Straight to OR
  - Arterial branch off carotid injured- ligated
  - External jugular also injured- also ligated
- Patient survived and was discharged POD4

Rural MHPs

- Limited/no blood products available
- Treatment goals for non tertiary facilities may need to focus on stabilization and transportation rather than definitive care
- EARLY recognition critical
  - Not as easy as you may think

Examples

- Traumatic amputation on a farm
- Flail chest in awake patient with intercostal bleeding after a fall from a roof
- Unconscious patient with iliac vein injury post crush in a high speed MVC
- Conscious patient with significant abdominal pain/distension after MVC
- Stabbing to the back with the knife still embedded in the chest

The 6 Places to Exsanguinate

- External
- Long Bone
- Pelvis
- Thorax
- Intraperitoneum
- Retroperitoneum

- Critical to ANY MHP
- Trauma surgeons unfortunately are only in trauma centers
- So what can you do in their absence?

Topical Agents

- Kaolin coated gauze to help with external hemorrhage
- Number one hemostatic agent as recommended by the Committee on Tactical Combat Causality Care (COTCCC)
- Combat Gauze
- Quick Clot

Tourniquets

Tranexamic Acid (TxA)

- CRASH-2
  - Over 20,000 patients
  - Muticenter, randomized placebo-controlled trial
  - 15% reduction in death from bleeding
  - 9% reduction in death from all causes
  - Subgroup analysis showed TIME was critical
    - Within 1 hour, within 3 hour, after 3 hours

Fibrinogen Concentrate and Cryo

- Fibrinogen is the first factor to drop in trauma patients
  - Blood loss, consumption, hyperfibrinolysis, dilution, acidosis and hypothermia
- Critical for both primary hemostasis (ligand between glycoprotein molecules on activated platelets) as well secondary (for fibrin formation)
- Studies have shown increased survival if high fibrinogen to RBC ratio maintained (small, non civilian)
- Fibrinogen concentrates the “magic bullet”?

MHP in Rural Sites

- Tailored specifically to individual site and resources available
  - ?blood products
  - ?surgical support
  - ?distance to closest trauma center

- Commonalities regardless
  - EARLY recognition of bleeding
  - EARLY initiation of transfer
  - Close/swift communication with trauma team in tertiary center
  - Delays are deadly

Deadly Delays

- When time is of the essence for victims of trauma, there are multiple delays facing the trauma patient in the rural setting that can affect survivability rates:
  - Delay in discovery/calling for help
  - Delay in prehospital mobilization/response/transport
  - Delay in identification of life threatening injuries
  - Delay in transport to definitive care
- Many are out of the control of the rural center

Rural Trauma Team Development Course

- Brings trauma education to any ED that may potentially have to treat an injured patient
- Unlike, ATLS, it is designed for ALL and ANY hospital personnel that may be involved in the care of a trauma patient
- Aim is to educate the TEAM approach to recognizing and treating severely injured patients, accepting the challenges and limitations unique to each site
- Course is done at the rural center, not the tertiary center (unlike ATLS)

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RURAL TRAUMA TEAM
DEVELOPMENT COURSE

- First course in SK going to be held the end of the month
- Goal is to be able to offer in every rural site that wishes to have it

Summary

- MHP's are an integral part of the care of the severely injured patient
- Continuously evolving as new studies and evidence emerge as best practice for survivability
- Rural sites can still benefit from modified MHPs, site specific

Questions?

Thank you