Scenario Title:

Pediatric Trauma -Snow Storm: Managing Unstable Pelvis, Abdominal Distention, and Hypothermia

Scenario Overview:

A 5-year-old child was involved in a vehicle accident during a snowstorm. Vehicle located by a passerby on the I 40. Weather is clear on arrival of first due EMS. Unknown time of accident.

The child was seated in the back seat of a car, wearing a seatbelt, when the vehicle collided with another car at highway speeds. The vehicle then traveled into the tree line along the highway. The child is to be found unresponsive at the scene along side the heavily damaged vehicle in the snow. Patient appeared to be restrained at the time of the incident and a bystander removed her from the vehicle placing her on the ground to check for breathing status as directed by 911 dispatchers.

Patient History:

- **Age:** 10 years
- **Gender:** Female
- **Mechanism of Injury:** High-speed motor vehicle collision after a snowstorm, unstable pelvis, abdominal trauma, and possible internal bleeding.
- **Symptoms:** Unresponsive at the scene, tachycardic, hypotensive, abdominal distention, positive seatbelt sign, and hypothermic.

Initial Assessment/Primary Survey (ABCDE):

1. **Airway:**
    - Intubated in the field due to unresponsiveness and suspected respiratory compromise (e.g., GCS 8). Via RSI, or Igel insertion.
    - Ensure the airway is patent; consider cervical spine precautions due to potential mechanism of injury.
2. **Breathing:**
    - Bilateral breath sounds present diminished due to hypoventilation for decreased LOC, assess for any signs of pneumothorax or hemothorax during examination.
    - Immediate acknowledgement of signs of respiratory distress and decrease work of breathing.
3. **Circulation:**
    - The patient is hypotensive (BP 80/50 mmHg), tachycardic (HR 150 bpm), and showing signs of shock.
    - Peripheral pulses are weak.

- Focus on fluid resuscitation (normal saline or Ringer's lactate), but **blood product transfusion** is required given signs of possible internal bleeding and worsening abdominal distention
- Limbs are blue and cold to the touch.

4. **Disability:**
    - GCS 8, unresponsive to verbal stimuli, and pupils equal and reactive.
    - Check for signs of a traumatic brain injury (TBI), including changes in mental status, focal deficits, or signs of increased intracranial pressure.
5. **Exposure:**
    - Remove clothing to fully expose the patient for further assessment, taking care not to exacerbate hypothermia.
    - **Rapid extrication to warmer environment. (Ambulance)**
    - **Hypothermia**: Temperature is measured at 93°F (34°C) — actively warm the patient using blankets and heated fluids. Identification of hypothermia is key.
    - Getting the patient into a warmer environment safely is also key.

Secondary Survey:

1. **Abdominal Exam:**
    - **Abdominal distention** noted — suspect intra-abdominal injury, such as spleen or liver laceration.
    - Positive seatbelt sign: bruising over the abdominal area consistent with trauma from the seatbelt during the crash, which can indicate significant abdominal or thoracoabdominal injury.
2. **Pelvic Exam:**
    - **Unstable pelvis**: A positive pelvic compression test shows a concerning finding for pelvic fractures. Crepetis on exam.
    - Pelvic binder or external fixation should be applied to stabilize the pelvis and reduce bleeding risk.

Management Plan:

1. Immediate Resuscitation:

- **Fluid resuscitation:** EMS may start with boluses of isotonic fluids (e.g., Normal Saline or Ringer's Lactate at weight appropriate dose). Continue to monitor the patient's response to fluids (e.g., BP, heart rate, urine output, further abdominal distention). But understand that hemodilution is a serious consideration for exacerbating shock given reduced blood volume in circulation.

- **Blood products:** Given the signs of hemorrhagic shock (tachycardia, hypotension), initiate **blood product transfusion** with warmed products. Use of a **Warrior Lite** or a similar device to warm blood products to prevent exacerbating hypothermia. Extra points for immediate blood usage vs. isotopic products.

2. Hypothermia Management:

- **Active warming:** In addition to warmed fluid/ blood products, utilize blankets and external warming devices (e.g., forced-air warming systems) to increase core temperature. (Ambulance heaters on high, heat packs etc.)
- Native Air utilization for Warmed Blood Products via Warrior Lite.
- **Avoid rapid rewarming:** To prevent vasodilation and cardiovascular instability, aim for a slow, controlled rewarming process. Given rural EMS capabilities this may look different across Northern Arizona, but it may give discussion on better practices in the future of EMS departments as a whole.

3. Pelvic Fracture Management:

- Apply a **pelvic binder** to stabilize the pelvis and reduce further internal bleeding. If a pelvic binder is unavailable, external fixation is the next option. (Sling and stick etc.)
- **(Inclusion for arrival to the hospital for MD and hospital staff) Imaging:** Consider pelvic X-ray or CT scan to assess the extent of the pelvic injury. However, stabilize before moving the patient for imaging. Circulatory collapse stabilization is key.

4. Abdominal Trauma:

- Given the positive seatbelt sign and abdominal distention, consider the possibility of **blunt abdominal trauma**.
- **(Inclusion for hospital staff) FAST ultrasound** or **CT scan** (if stable) can help identify solid organ injuries, such as liver or splenic lacerations.
- (Inclusion for hospital staff) If **hemoperitoneum** is suspected, prepare for possible laparotomy depending on the severity of the injury.

5. Ongoing Monitoring and Interventions:

- **Monitoring:** Continuous monitoring of vital signs (HR, BP, SpO2), urine output, and temperature. Trending worsening Shock symptoms without intervention.
- **Medications:** Consider pain management (opioids as per PALS guidelines), and use of vasopressors if blood pressure remains unstable despite fluid resuscitation and blood products.

6. Transport or Transfer:

- Once all identified risk factor have been managed- Early activation of HEMS is key. Native Air carries whole blood products, as well as Warrior Lite devices for safe warming of blood

products for this patient traumatic injuries, and hypothermic status. On arrival Rapid Air transport utilization via Native Air- Weather deterioration result in ground transport with Native Air Crew to the closest pediatric trauma center with surgical capabilities for definitive care.- FMC ground transport time 30 minutes.

Key Learning Points:

1. **Trauma Management in Pediatrics:**
    - Pediatric trauma patients require rapid assessment and intervention. Follow the ABCDE approach with a focus on airway, breathing, circulation, and addressing life-threatening injuries.
    - Pelvic fractures are particularly concerning in pediatric trauma and should be stabilized early to prevent significant hemorrhage.
2. **Hypothermia Treatment in Trauma:**
    - Managing hypothermia in pediatric trauma patients is critical. Rapid, controlled warming and avoidance of hypothermia exacerbation are necessary.
3. **Blood Product Management:**
    - When blood products are required, they should be warmed, especially in the setting of hypothermia. The use of devices like the Warrior Lite is essential to avoid further cooling and worsening shock.
4. **Coordinated Trauma Team Response:**
    - Ensure that trauma team members are working together efficiently, with clear communication and roles. This includes coordination between the emergency, trauma, and surgical teams on arrival to FMC.

Simulation Debrief:

- During the debrief, the focus on the decision-making process for resuscitation, prioritization of interventions, and teamwork in managing a critical pediatric trauma patient. Discuss the use of appropriate equipment like the Warrior Lite for warming blood products, as well as the role of stabilization prior to advanced imaging in the management of abdominal and pelvic trauma.