CRITICAL PHONE NUMBERS

• Patient Transfer: 1-800-822-2233
• Survival Flight 734-936-6035
• Pediatric Emergency Department: 734-936-4230
• Adult Emergency Department: 734-936-6666
• Mott OR: 734-763-2430
• Mott PACU: 734-763-2513
• Pediatric ICU: 734-763-2401
• Inpatient Units:
  10E (PICU) 734-763-2401
  10W 734-232-7000
  11W 734-763-3146
  12E 734-764-7102
  12W 734-232-7200
• Lab/Blood Bank: 734-936-6888
• Anesthesia: pager: 1534
• Gift of Life: 1-800-482-4881
• Child Protection Team: 734-763-0215
• Medical Examiner (Washtenaw Co): 734-232-1127
• Poison Control: 1-800-222-1222
• Buckle Up Car Seat Program: 734-763-2251
• Mott Bed Coordination Center: 734-936-6039
C. S. Mott is an American College of Surgeons Level I verified Pediatric Trauma Center. This means that each traumatically injured child that receives care at Mott will receive a multi-disciplinary, coordinated care approach that will optimize patient outcome and rehabilitation.

Mission Statement

C.S. Mott Children’s Hospital Pediatric Trauma Program provides excellence in clinical care, education, advocacy and research to advance the health of injured children and their families.

The trauma program is dedicated to reduce the burden of pediatric trauma through effective injury prevention programs in communities both statewide and nationally.

Philosophy of Care
**LEVEL/CLASS OF TRAUMA:**

**Level/Class I** – Highest Level Activation
Pediatric Surgery Fellow (or critical care fellow or PGY4+ resident) AND Attending must respond to the trauma bay within 15 minutes of patient’s arrival
PCCM/anesthesia fellow attendance

**Level I Criteria (<15 minutes response)**
- Hypotensive
- Respiratory compromise, obstruction, and intubation
- Transfer of patients from other hospitals receiving blood to maintain vitals
- Penetrating wounds to the abdomen, neck, and chest
- GCS < 8 with trauma mechanism
- ED department physician discretion

**Level/Class II**
Fellow, resident (PGY4+), or attending (upon request) must respond to the trauma bay within 30 minutes of patient’s arrival

**Level/Class III** – Trauma consult
See APPENDIX 1 for full activation criteria

**Level I and Level II Trauma:**
Announce your arrival to the trauma room so the time is clearly documented.
Call PICU Charge Nurse (647-5435) and arrange for bed if required.
Mott ER staff and residents participate in managing traumas and can help with trauma bay duties. Interns and physician assistants can also help manage traumas. The pediatric surgery team is responsible for writing admission orders.

**Consults:**
- **Spine**
  - Ortho if no neurological involvement
  - NSGY if neurological involvement or already involved in patient’s care
- **Peripheral Nerve Injuries** (not involving spine)
  - Ortho
- **“Face”**
  - Rotating call by plastics, ENT, or OMFS
- **“Hand”** (below elbow)
  - Covered by plastics or ortho
Procedures:
Emergent/urgent procedures should be done in trauma bay, otherwise try to perform all other procedures (facial laceration repairs, ventriculostomies, etc.) in the PICU to free up the trauma bay. If patient is going to general unit, then all procedures should be done expeditiously in the ED.

Inform the Relevant Admitting Team Members:
If going to the floor inform the intern about admission
If going to PICU – inform critical care fellow (if applicable) and pediatric surgery ICU staff

Other Tips:
Try to get TLS series before patient leaves the ER
Try to communicate with parents (social worker will help find them).
We are NEVER closed to trauma even if there is an ICU bed shortage.

Admissions:
All traumas get admitted to the pediatric surgery service. All head injury kids in the PICU are admitted to pediatric surgery service. Non-accidental traumas are admitted to pediatric surgery service. If stable after 24 hours, patient may transfer to general pediatrics. ALL Burns are admitted to Trauma Burn service. IF patient requires PICU admission (ventilated, hypotensive, etc.) admit to PICU under Trauma Burn with Pediatric Surgery as consulting service

Tertiary Survey:
Must be completed 12-36 hours after any trauma patient is admitted
It is a complete head to toe exam to ensure no injuries were missed with the primary or secondary survey
It is possible that an extremity abnormality or other minor injury may be missed if there is a more prominent injury (i.e. pt needs ex lap)
• Please find the otoscope and examine pt ears
• Need to roll patients and examine back if they still have T/L spine precautions
• It is very important to READ all FINAL radiology reports to ensure no new findings after pediatric radiology staff reviews. This final reads need to be listed on trauma tertiary survey note
• If we have imaging results from an outside hospital, need to have images read at Mott by pediatric radiologists
• The tertiary survey note can count as daily note as long as you include a subjective update and detail a care plan for both the tertiary exam and for the day
Appendix 1

C. S. Mott Children’s Hospital
Pediatric Trauma & Burn Activation Criteria

Traumatic Injury with Unstable Vital Signs (determined by age parameters below) OR:
- Gunshot wounds, impaled objects or penetrating wounds to the head, neck, chest or abdomen
- High voltage electric injury/lightning strike
- Threatened limb to include: amputation, near amputation, degloving, significant crush injury (i.e. lawnmower) or pulselessness extremity (any of these present in more than just fingers and toes)
- Any burn with unstable vital signs or inhalation injury with threat of airway compromise
- GCS < 8 with mechanism attributed to trauma
- Documented decline in neuro status
- Paralysis following traumatic injury
- Focal neurologic deficit
- Subdural/epidural (> 3cm thickness or w/midline shift) in patient transferred from another facility
- Respiratory compromise/obstruction
- Intubated trauma patients
- Rescue airway in place
- Transfer patients from other hospital receiving blood or fluids to maintain vital signs
- Physician discretion

<table>
<thead>
<tr>
<th>Age</th>
<th>Respiratory Rate</th>
<th>Systolic BP</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 to 1 years</td>
<td>&lt; 35% or &gt; 50/minute</td>
<td>&lt; 60 mmHg</td>
</tr>
<tr>
<td>2 to 5 years</td>
<td>&lt; 25% or &gt; 40/minute</td>
<td>&lt; 70 mmHg</td>
</tr>
<tr>
<td>6 to 12 years</td>
<td>&lt; 15% or &gt; 35/minute</td>
<td>&lt; 80 mmHg</td>
</tr>
<tr>
<td>&gt;12 years</td>
<td>&lt; 10% or &gt; 30/minute</td>
<td>&lt; 90 mmHg</td>
</tr>
</tbody>
</table>

Traumatic Injury with Stable Vital Signs (determined by age parameters below) with:
- Multi-system injuries
- Open long bone fractures
- Burns >20% (full- or partial-thickness)
- Full-thickness circumferential burns
- ALL solid organ injury
- Depressed or open skull fracture
- GCS 9-12 (not related to medication administration)
- No change in GCS from initial evaluation
- No focal finding
- Stable respiratory status
- No respiratory distress or need for emergent invasive airway
- No signs or symptoms of shock (SBP within range below)
- No ongoing fluid infusion to maintain
- Physician discretion

<table>
<thead>
<tr>
<th>Age</th>
<th>Respiratory Rate</th>
<th>Systolic BP</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 to 1 years</td>
<td>35-50/minute</td>
<td>Or &gt; 60 mmHg</td>
</tr>
<tr>
<td>2 to 5 years</td>
<td>25-40/minute</td>
<td>Or &gt; 70 mmHg</td>
</tr>
<tr>
<td>6 to 12 years</td>
<td>15-35/minute</td>
<td>Or &gt; 80 mmHg</td>
</tr>
<tr>
<td>&gt;12 years</td>
<td>10-30/minute</td>
<td>Or &gt; 90 mmHg</td>
</tr>
</tbody>
</table>

- Isolated injury
- Burns >5% partial thickness burns >2% full-thickness
- Any burn to face, hand, foot, genitalia, perineum or joints
- ALL pediatric patients that will be admitted with a mechanism of injury that has the potential for suspected child abuse

- Isolated Head Injury with cardiovascular instability or suspicion for multi-system injury are designated Class I or Class II as outlined above
- Isolated Blunt Head Injury secondary fall from standing height or less & low suspicion of multi-system injury despite neurologic/respiratory status will have Neurosurgery consult only.
- Near Drowning and Hanging Injuries are to be classed as trauma patients using the physiologic parameters outlined above for classification
- Pregnant Patients with injuries will be classed as designated above based on severity of injury to the mother
- All Pregnant Patients >20 weeks gestation will have immediate OB consultation in ED (except in isolated distal extremity injuries). Fetal monitoring will be initiated upon arrival to the ED via modem to Labor and Delivery.

Class I Trauma
- Physician consideration of Class I activation based on MOI:
  - Auto/pedestrian/cyclist/throw, run over, or with significant (>20 mph) impact
  - Motorcycle crash >20 mph
  - High-energy dissection or rapid decelerating
  - Injuries such as:
    - Ejection from vehicle, motorcycle, ATV, animal
    - Stabbing, firearm or with or without 0.25mm
    - Blunt or explosion

Class II Trauma
- Physician consideration of Class II activation based on MOI:
  - Falls/child >10 ft or 3x height of child
  - Blunt abdominal injury with firm or distended abdomen or injury evidence (fasten seat belt, signs handlebar sign)
  - High/flight auto crash
  - Intrusion of vehicle >12" in occupant compartment or >18" in other site
  - Death in same passenger compartment

Class III Trauma Consult
GOAL = Patient disposition decided in under 30 minutes. Leave ED in ≤ 1 hour
ROLES AND RESPONSIBILITIES - LEVEL I

Who is in charge = Pediatric Surgical Attending – LEVEL I

The Pediatric Surgical Attending is responsible for the overall conduct of the resuscitation. The Pediatric Surgical Attending directs overall plan with input from all health care providers and ultimately decides on consults and disposition. The Pediatric Surgical Attending should facilitate communication between the Surgical Fellow and Pediatric ED Fellow for decision making and education purposes. The Pediatric Surgical Attending has the final say on patient care. When patient is deemed stable, may delegate care to pediatric surgical fellow.

Pediatric ED Attending – LEVEL I

The Pediatric ED attending is responsible for the assessment of and securing of the airway and cervical spine. The Pediatric ED attending will delegate A/W and cervical spine responsibility to the Pediatric ED fellow when appropriate and will decide with the pediatric surgical attending whether anesthesiology is required. The Pediatric ED attending should facilitate communication between the Pediatric Surgical Fellow and Pediatric ED Fellow for decision making and education purposes. When patient stable can delegate care to Pediatric ED fellow.

Pediatric Surgical Fellow – LEVEL I

The Pediatric surgery fellow is responsible for primary and secondary survey. FAST, major blood draws, Foley, NG and central line insertion when appropriate. The pediatric surgical fellow assumes control of patient from surgical staff when appropriate. Remains with patient until stabilized or leaves ED. Directs any junior surgical house staff or physician assistants that are present.

Pediatric ED Fellow or Senior ED Resident - LEVEL I

The Pediatric Ed fellow is responsible for the securing the A/W. Work with surgical fellow to develop patient plan (educational). Must stay with patient with the surgical fellow in the Radiology suite if required until disposition occurs. Can work with Surgical fellow on any ED procedure (central access, tube thoracostomy, etc…) Directs any junior ED house staff that are present.

FAST= should be performed on all patients and US machine used for any central line
Nursing – LEVEL I & LEVEL II

Prior to patient arrival:

Assist in room preparation

- Ultrasound machine
- Procedure tables cleared of extraneous equipment
- Appropriate trays with equipment (central line, chest tube) available in room or in place on procedure table
- Adjust room temperature if necessary
- Check airway equipment with ED resident
- Ambu bag with appropriate size mask
- Airway adjunct: oral airway
- Review plan for intubation: proficient with arrest / airway cart equipment
- Discuss plan for difficult intubation: knowledge of difficult airway cart
- Discuss with team each person’s role

After patient arrival:

Assess patency of pre-hospital IVs: label as such

Place large bore IVs if needed

- IV fluid bag labeled appropriately (number, any added medications)
- Ensure IO access is documented as such

Monitor temperature of patient

- Blankets
- Bair hugger
- IV fluid warmer

Administer medications, fluids as ordered

Communicate medications and I&O to recording nurse

Consider need for:

- NGT/OGT as appropriate
- Foley

Assist with log rolling patient

Prepare/plan for patient transport

- Monitor fluids, oxygen, BVM, medications, orders
- Accompany patient to CT/OR/ICU (anticipate need for extra staff i.e. tech, RT, MD)
Prior to patient arrival:

- Range warmer for all patients in room, ready with IV fluids
- Set up rapid infuser with 0.9NS as needed
- Place X-ray board on gurney
- Clear procedure tables for placement of procedure trays
  - Monitor set-up
  - EKG cables in tram
  - Pulse ox cable in tram
  - BP cuff in tram
  - Cable in place for temp sensing foleys / rectal temps
- Set up suction
  - Ensure suction is functioning
  - Yankauer in place
  - Suction tubing in place
- Ensure full oxygen tank under cart

After patient arrival:

- Place patient on monitor
  - EKG
  - Pulse ox
  - BP cuff-appropriate size
  - Manual BP for each arm prior to NTBP
- Obtain temperature on patient
- Assess patency of pre-hospital IVs
- Start large bore IVs as needed
- Obtain blood via IV start or peripheral stick as appropriate for trauma classification
- Remove clothing and jewelry (document who received items)
- Apply warm blanket / Bair hugger
- Assist with procedures as needed
- Assist with log rolling as needed
- Retrieve blood as needed
- Assist with fracture immobilization
- Assist with preparing patient for travel:
  - Place patient on monitor
  - Full O2 tank under cart
GOAL = Patient disposition decided within 60 minutes. Leave ED in < 2 hours
ROLES AND RESPONSIBILITIES – LEVEL II

Who is in Charge = Pediatric ED Attending – LEVEL II

The Pediatric ED attending is responsible for the overall conduct of the resuscitation. The Pediatric ED attending directs overall plan with input from all health care providers, decides on consults and disposition. The Pediatric ED attending should facilitate communication between the Pediatric Surgical Fellow and Pediatric ED Fellow for decision making and education purposes. The Pediatric ED attending has the final say on patient care. When patients stable can delegate care to pediatric surgical fellow. Can request to upgrade, downgrade or call in pediatric surgical attending

Surgical Fellow – LEVEL II

The Pediatric Surgical Fellow is responsible for primary and secondary survey. FAST, blood draw and central line insertion when appropriate. The Pediatric Surgical Fellow takes over care of patient from surgical staff. The Pediatric Surgical Fellow remains (as does the Pediatric ED Fellow) with patient until stabilized or leaves ED. Directs any junior surgical house staff that are present.

Pediatric ED Fellow or ED Resident as assigned by ED Attending – LEVEL II

The Pediatric ED Fellow is responsible for the securing the A/W. Work with surgical fellow to develop patient plan (educational). The Pediatric ED Fellow must stay with patient with the surgical fellow in the Radiology suite if required until disposition occurs. Can work with Pediatric Surgical fellow on any ED procedure (central access, tube thoracostomy, etc...). Directs any junior ED house staff that are present.

FAST= should be performed on all patients and US machine used for any central line

Responsibilities for Nursing and ED Tech same for Level I & II activations
POLICY 42: MANAGEMENT OF TRAUMA PATIENTS INITIALLY TONED TO INCORRECT SERVICE AND TRAUMA PATIENTS TRANSFERRED TO MICHIGAN MEDICINE

I. Policy

Management of Trauma Patients Initially Toned to Incorrect Service and Transferred to Michigan Medicine

II. Purpose

To define the management of patients initially toned to incorrect service and transferred to Michigan Medicine

III. Policy Standard

In rare situations the age of a patient may be incorrectly identified during initial evaluation. This misidentification may result in an incorrect tone out for trauma response. For example, the adult trauma team may be called to initially treat a patient that is subsequently determined to be pediatric (or the reverse may be true for the pediatric team.) It is challenging for both respective Trauma Services to respond to the other ED due to the significant distance and lack of daily interactions with those teams. Importantly, the Peds ED team does not have knowledge of the Adult Trauma Team or Policies, and the Adult ED does not have knowledge of the Pediatric Trauma Teams or Policies. As such, the following form a single policy to manage all of the trauma situations that are listed below, where the Trauma Service linked with the ED will initially respond and care for the trauma patient, and then will communicate with the other Trauma Service to confirm appropriate and timely disposition of the trauma patient. In addition, there have been inconsistencies regarding service assignment of trauma patients transferred from other institutions at a remote time from the initial trauma. The purpose of this policy is to clarify that assignment.

There are 3 potential trauma scenarios:

1. Trauma patient is erroneously classed PRIOR TO ARRIVAL (Adult trauma patient in Peds ED – or - Peds trauma patient in Adult ED)

   Trauma Service linked with ED will initially respond and provide initial care for the patient (Peds Trauma Team for Peds ED; Adult Trauma Team for Adult ED)
Management of Patients Initially Toned to Incorrect Service

Trauma Service evaluating the patient will call the other Trauma Service and discuss optimal admission and/or disposition of the patient (transfer patient to appropriate ED, or transfer when ready to be admitted).

2. **Trauma patient is toned out correctly based on ASSUMED aged of the patient. We find out later that the patient is either younger or older than initially thought after Class I or II Trauma Activation.**

   This usually occurs later in the acute evaluation of the trauma patient – and is covered in the attached Adult Trauma Policy 42 (attached).

   Trauma Service linked with ED will initially respond and provide initial care for the patient (Peds Trauma Team for Peds ED; Adult Trauma Team for Adult ED)

   Trauma Service evaluating the patient will call the other Trauma Service and discuss optimal admission and/or disposition of the patient (transfer patient to appropriate ED, or transfer when ready to be admitted).

3. **Trauma patient is NOT initially toned out as Class I or II Trauma Activation, but clinical condition changes, and the patient is toned out AFTER ARRIVAL (Adult trauma patient in Peds ED or Peds trauma patient in Adult ED)**

   Trauma Service linked with ED will initially respond and provide initial care for the patient (Peds Trauma Team for Peds ED; Adult Trauma Team for Adult ED)

   Trauma Service evaluating the patient will call the other Trauma Service and discuss optimal admission and/or disposition of the patient (transfer patient to appropriate ED, or transfer when ready to be admitted).

   Ongoing excellent communication is especially important between the Pediatric and Adult Trauma Teams for Class I Trauma Activations since these patients may have rapid deterioration in their clinical condition.

We also think it is important to confirm with the Transfer Center our policy regarding Trauma Transfers as there have been some recent errors:

**TRANSFER REQUESTS for TRAUMA PATIENTS:**

In patient transfer requests for Michigan Medicine for Trauma Patients from referring hospitals will always be routed to the appropriate trauma team (adult trauma team for age >/= 18 years; pediatric trauma team for < 18 years) independent of how remote the trauma was in time.
## Normal Heart Rates in Children

<table>
<thead>
<tr>
<th>Age</th>
<th>Awake Heart Rate (bpm)</th>
<th>Sleeping Heart Rate (bpm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Neonate</td>
<td>100-190</td>
<td>80-160</td>
</tr>
<tr>
<td>Infant</td>
<td>100-180</td>
<td>75-160</td>
</tr>
<tr>
<td>Toddler</td>
<td>80-140</td>
<td>60-90</td>
</tr>
<tr>
<td>Preschooler</td>
<td>70-120</td>
<td>60-90</td>
</tr>
<tr>
<td>School-age</td>
<td>65-110</td>
<td>60-90</td>
</tr>
<tr>
<td>Adolescent</td>
<td>60-100</td>
<td>50-90</td>
</tr>
</tbody>
</table>

## Normal Blood Pressures in Children

<table>
<thead>
<tr>
<th>Age</th>
<th>Systolic Pressure (mmHg)</th>
<th>Diastolic Pressure (mmHg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Neonate</td>
<td>50-70</td>
<td>25-45</td>
</tr>
<tr>
<td>Infant</td>
<td>70-100</td>
<td>50-70</td>
</tr>
<tr>
<td>Toddler</td>
<td>80-110</td>
<td>50-80</td>
</tr>
<tr>
<td>Preschooler</td>
<td>80-115</td>
<td>50-80</td>
</tr>
<tr>
<td>School-age</td>
<td>80-120</td>
<td>55-80</td>
</tr>
<tr>
<td>Adolescent</td>
<td>90-130</td>
<td>60-88</td>
</tr>
</tbody>
</table>

## Normal Respiratory Rates in Children

<table>
<thead>
<tr>
<th>Age</th>
<th>Rate (breaths per minute)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Neonate</td>
<td>30-60</td>
</tr>
<tr>
<td>Infant</td>
<td>30-60</td>
</tr>
<tr>
<td>Toddler</td>
<td>24-40</td>
</tr>
<tr>
<td>Preschooler</td>
<td>22-34</td>
</tr>
<tr>
<td>School-age</td>
<td>18-30</td>
</tr>
<tr>
<td>Adolescent</td>
<td>12-16</td>
</tr>
</tbody>
</table>

## Glasgow Coma Scale:

<table>
<thead>
<tr>
<th>Infants</th>
<th>Child</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Eye Opening</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Spontaneous</td>
<td>Spontaneous</td>
<td>4</td>
</tr>
<tr>
<td>To speech</td>
<td>To speech</td>
<td>3</td>
</tr>
<tr>
<td>To pain only</td>
<td>To pain only</td>
<td>2</td>
</tr>
<tr>
<td>No response</td>
<td>No response</td>
<td>1</td>
</tr>
<tr>
<td><strong>Best Verbal Response</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Coos and babbles</td>
<td>Oriented, appropriate</td>
<td>5</td>
</tr>
<tr>
<td>Irritable cries</td>
<td>Confused</td>
<td>4</td>
</tr>
<tr>
<td>Cries to pain</td>
<td>Inappropriate words</td>
<td>3</td>
</tr>
<tr>
<td>Moans to pain</td>
<td>Incomprehensible sounds</td>
<td>2</td>
</tr>
<tr>
<td>No response</td>
<td>No response</td>
<td>1</td>
</tr>
<tr>
<td><strong>Best Motor Response</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Moves spontaneously and purposefully</td>
<td>Obeys commands</td>
<td>6</td>
</tr>
<tr>
<td>Withdraws to touch</td>
<td>Localizes to painful stimulus</td>
<td>5</td>
</tr>
<tr>
<td>Withdraws in response to pain</td>
<td>Withdraws in response to pain</td>
<td>4</td>
</tr>
<tr>
<td>Abnormal flexion posture to pain</td>
<td>Flexion in response to pain</td>
<td>3</td>
</tr>
<tr>
<td>Abnormal extension posture to pain</td>
<td>Extension in response to pain</td>
<td>2</td>
</tr>
<tr>
<td>No response</td>
<td>No response</td>
<td>1</td>
</tr>
</tbody>
</table>
Intravenous Fluids:
Newborn (<5 kg):
  Maintenance IV fluid = D10 in 1st 24 hours, otherwise D10¼ NS +/- 10 mEq KCl
Infants (5-20 kg):
  Maintenance IV fluid = D5¼ NS w/ 20 mEq KCl
  Resuscitative IV fluid = D5½ NS w/ 20 mEq KCl (at up to 1.5-2x mIVF)
Children (> 20 kg):
  Maintenance IV fluid = D5½ NS w/ 20 mEq KCl
  Resuscitative IV fluid = D5NS or NS (at up to 1.5-2x mIVF)

Calculating Maintenance Rate
  4 mL/kg/hr for 1st 10 kg
  2 mL/kg/hr for 2nd 10 kg
  1 mL/kg/hr for everything after that
Calculating Maintenance Fluid Requirements in Children (4/2/1 Rule):

<table>
<thead>
<tr>
<th>Weight</th>
<th>Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-10 kg</td>
<td>4 ml/kg/hr</td>
</tr>
<tr>
<td>11-20 kg</td>
<td>40 mL/hr for 1st 10 kg + 2 mL/kg/hr for kg 11-20</td>
</tr>
<tr>
<td>&gt; 21 kg</td>
<td>60 mL/hr for 1st 20 kg + 1 mL/kg/hr for kg &gt; 21</td>
</tr>
</tbody>
</table>

Bolus = 10-20 mL/kg 0.9% NS or 10-20 mL/kg blood or 5% albumin

Any infant NPO > 4 hours needs an IV and IV fluids

Urine Output:
Neonates/Infants: UOP = 1-2 mL/kg/hr – prefer 2-4 mL/kg/hr
Children: UOP = 1 mL/kg/hr
Adolescent/Adult: UOP = 0.5 mL/kg/hr

Low UOP – increase MIVF by 25-50% and re-evaluate in 4 hrs
Can monitor for urinary retention with bedside bladder scan

Calculation of Circulating Blood Volume in Children:

<table>
<thead>
<tr>
<th>Age</th>
<th>Blood Volume (ml/kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Neonate</td>
<td>85-90</td>
</tr>
<tr>
<td>Infant</td>
<td>75-80</td>
</tr>
<tr>
<td>Child</td>
<td>70-75</td>
</tr>
<tr>
<td>Adult</td>
<td>65-70</td>
</tr>
</tbody>
</table>

Blood volume ≈ 8% body weight (80 mL/kg)
PRBC transfusion – (Hgb goal – Hgb current) x kg x 3 (or change in Hct x kg)
INITIAL THERAPY FOR PEDIATRIC TRAUMA HEAD INJURY BUNDLE

Inclusion Criteria:
Age: 0-17, TBI, GCS ≤ 8, Intubation, admitted to PICU

Clerk to notify Pediatric Surgery Fellow and Neurosurgery that patient in PICU

MD and Nurse to coordinate placement of:
- ICP Monitor
- Arterial Line
- Central Line

MAIN PRIORITIES

Cerebral Perfusion Pressure (CPP=MAP-ICP)

GOALS:
- CPP ≥ 50 for ≤ 10 years old
- CPP ≥ 60 for 10-17 years old

If low CPP:
Consider raising MAP
- OR
  Fluid
  Map Adequate →
  Consider Intropes and vasopressors

Intracranial Pressure
GOAL: ICP ≤ 20, PaO₂ > 100, PaCO₂ 30-35

Sustained Elevated ICP>5min
MD/Nurse to Ensure
- Temperature normal
- Sedation adequate
- Head of bed 30 degrees* - in alignment
- Send blood gases
- Quiet environment

MD to CONSIDER

Hyperosmolar Therapy
- Mannitol 0.5g/kg bolus then 0.23g q4-6hr
- 3% saline 2-5 ml/kg bolus then 0.5ml/kg/hr

Have MD consider draining CSF

Is Therapy Effective?

Yes
Monitor Osmolal q8h keep <320
Resusc Labs
Na q8h keep <170
ICP ≤ 20

NO
Continue therapy

No
Continue with Hyperosmolar Therapy

SECOND LINE THERAPY

Please call Pediatric Surgery fellow on call
Pediatric Surgery fellow to discuss with Neurosurgery

Sedation (Nurse to confirm sedation goal with MD)

Light Sedation Goal For Patient Safety / Comfort
- Versed, Fentanyl Drips*
  Nurse to confirm with MD when to stop for clinical exam
  Example: Follow an Epidural:
  - Patient Will Move
  - Patient Will Require Frequent Exams
  - Quiet When Not Disturbed
  - To Help Tolerate ET Tube
  - Non-combative

Deep Sedation Goal For ICP Management
- Versed, Morphine Drips*
  Have Drug Range Been Set?
  Patient: Insomniac, appropriate CPP and BP

Is Therapy Effective?

Yes
Continue Patient sedated, ICP, CPP in goal range

NO
Call Pediatric Surgery / Neurosurgery
Fellow to consider

Failure
- Morphine: start at 0.1 mg/kg bolus then 0.1 mg/kg/hr, max 200 mg/kg/hr
- Fentanyl: start at 1 mcg/kg bolus then 0.5 mcg/kg/hr, max 5 mcg/kg/hr
- Naloxone: start at 5 mcg/kg bolus then 2 mcg/kg/hr, max 200 mcg/kg/hr
- Vecuronium: start at 0.1 mg/kg bolus then 0.1 mg/kg/hr
**Blunt Thoracic Aortic Injury**

**A.** For patients with very suspicious chest radiograph with hypertension OR diagnosis of BTAI on helical chest CT or angiogram:

Start Antihypertension regimen:

1. Infuse esmolol bolus then maintenance rate for a goal BP (syst) 100-120 mmHg, heart rate <100
2. Add second agent such as Nitroprusside if BP (syst) still elevated despite esmolol

**B.** Treat ongoing *life-threatening* hemorrhage from other injuries prior to treatment of BTAI (unless patient actively bleeding from aorta).

**C.** Treat coagulopathy if present.

**D.** Once diagnosis of BTAI established consult Cardiac Surgery and evaluate the following to determine early or delayed repair.

**Reasons for delayed repair:**

1. Pa02/Fi02 ratio less than 150
2. CNS injuries which should be delayed:
   a. massive contusion
   b. evidence of shift on Head CT
   c. large areas of intracerebral blood
   d. high ICP (consistently >20)
   e. need for systemic heparinization for full bypass felt to be contraindicated by Neurosurgery.
3. Ongoing major transfusion requirement or coagulopathy
4. Massive, open, contaminated wounds or burn where likelihood of wound sepsis is high.

**E.** If patient to be delayed for longer than 48 hours:

1. Continue beta-blocker therapy, convert to long-acting agent (labetalol or atenolol)
2. Add secondary long acting antihypertensives as necessary
3. BP (syst) may be liberalized at 7 days to 150-160 mmHg
4. Physical therapy may begin at day 5

**F.** Any additional concerns or problems should be discussed at the attending level between the TB and Cardiac surgeons.
### SOLID ORGAN INJURY CLINICAL PATHWAY GUIDELINE

<table>
<thead>
<tr>
<th>CT Grade</th>
<th>I</th>
<th>II</th>
<th>III</th>
<th>IV</th>
</tr>
</thead>
<tbody>
<tr>
<td>ICU LOS</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>24 hours +</td>
</tr>
<tr>
<td>CBC</td>
<td>Q 6 hours until stable*</td>
<td>Q 6 hours until stable*</td>
<td>Q 6 hours until stable*</td>
<td>Q 2-4 hours until stable*</td>
</tr>
<tr>
<td>Vitals</td>
<td>Q4 hours x24 On monitor</td>
<td>Q4 hours x24 On monitor</td>
<td>Q2 hours x 8 then q4 on monitor</td>
<td>Per ICU</td>
</tr>
<tr>
<td>Bedrest</td>
<td>Until CBC is stable</td>
<td>Until CBC is stable</td>
<td>Until CBC is stable</td>
<td>48 hours</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Then ambulation for 12 hours prior to D/C</td>
</tr>
<tr>
<td>Minimum Hospital LOS</td>
<td>1 day</td>
<td>2 days</td>
<td>3 days</td>
<td>4 days</td>
</tr>
<tr>
<td>Routine pre/post discharge imaging**</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>Restricted Activity non contact</td>
<td>4 weeks</td>
<td>4 weeks</td>
<td>4 week</td>
<td>4 weeks</td>
</tr>
<tr>
<td>Restricted Activity contact</td>
<td>3 months</td>
<td>3 months</td>
<td>3 months</td>
<td>3 months</td>
</tr>
<tr>
<td>Return to School</td>
<td>&lt;1 week</td>
<td>1 week</td>
<td>2 weeks</td>
<td>2 weeks</td>
</tr>
<tr>
<td>Follow up</td>
<td>1 month</td>
<td>1 month</td>
<td>1 month</td>
<td>1 month</td>
</tr>
</tbody>
</table>

*Stable is when 3 HCT/HB are within 10% of each other

** US imaging may be performed if injury involved hilar area and concerned about pseudoaneurysm. Please note that this is not supported or refuted in the literature.

Hospital LOS / Minimum Stay = Grade of Injury
ISOLATED Spleen (Liver) Injury Clinical Pathway Guideline

Child arrives in ED with traumatic Injury (Class I or II)

ATLS Trauma resuscitation per protocol

Abdominal Trauma? By history Pain on Exam Hematuria Unconscious or unable to cooperate intubated

No abdominal injury, treat as indicated

Abdominal CT IV contrast Radiologist reads and Grades injury

No; Further Work up as indicated

Liver Spleen Injury Grade I-IV

*If patient is hemodynamically unstable consider operating room or embolization
Child Maltreatment Screening Tool

History/Signs/Symptoms present at any point during CES course*

- SW Assessment (CPS, LE, IPV, Substance Abuse, mental health history)

  - Concern for Sexual Abuse
  - Concern for Neglect
  - Concern for Physical Abuse

  - SW Assessment completed
  - Provider Evaluation completed

  - Suspicion Abuse/Neglect

    - Contact CPI for discussion
    - UNSURE
    - NO
    - YES

    - Disposition per CES provider
    - No 3280 Filed with CPS
    - 3280 Filed with CPS

    - Admissions:
      - Admit to Peds Surgery for any suspected abuse with injury
      - Admit to Medical service for other abuse/neglect

    - CPT-SSW/SW input regarding other forms of maltreatment

    - Patient discharged when medically able and only after approved by CPS

    - Child Protection Team - MD consult placed by Peds Surgery service for abuse with injury

History/SMS/ASSESSMENTS PRESENT AT ANY TIME
dURING CES COURSE

INJURY
- Bodily injury (including the loss of a limb or organ)
- Burns
- Chemical/medication injury
- Injuries due to falls
- Injuries due to burns
- Injuries due to electrical injuries
- Injuries due to laceration
- Injuries due to penetration
- Injuries due to blunt trauma
- Injuries due to piercing and laceration

HEAD INJURY
- Intracranial injury at any age (not related to MVC or Sports)
- Skull fracture (unrelated to MVC or Sports)
- Injury consistent with age, developmental level or history provided

FRACTURES
- Fracture < 34 months or spine injury (i.e. pediatric fracture)
- Fracture in an ambulatory child
- Multiple fractures in child of any age (unrelated to MVC or Sports)
- Injury inconsistent with history provided

SIBLING
- Inguinal
- Non-adherence to medical care
- Failure to thrive with unknown etiology
- Injuries as result of lack of supervision
- Near drowning
- Unusual

SEXUAL ABUSE
- Concerns for sexual abuse

OTHER
- Referral by CPS or law enforcement
- Delay in seeking medical care
- Suspicion abuse or neglect by outsider provider
- Stevedore concerns for abuse or neglect
- Concerns about patient's lifestyle, caregiver's behavior, and/or their interactions
- Concerns about the safety of the patient or other family members
- Unexpected death of infant/child even if abuse/neglect is not suspected

CONSIDER
- SIB (Sudden Infant Death Syndrome)

INJURY ASSESSMENT SCREENING QUESTIONS**

- What is the injury happen or where was the child last known to be without signs/symptoms of the injury?
- Was there a delay in seeking medical care?
- When did the event occur?
- When was the child seen by a medical provider?
- What were the circumstances that caused the injury? (e.g., fall, surface, fall, disease)
- What was the child's immediate response?
- What was the caregivers' response to the injury?
- Was medical care previously sought for this problem?
- What are the child's developmental capabilities? Is able to do what is reported?
- Has he or she done anything else that required medical attention?

NOTE: CPT and/or SW may be contacted consulted at any time in order to discuss a patient or family
CPT SW = page 2728
CPT MD = page 35039

C.S. MOTT CHILDREN'S HOSPITAL
MICHIGAN MEDICINE

CPT = Child Protection Team
CPS = Children's Protective Services
IPV = Intimate Partner Violence
LE = Law Enforcement
Massive Transfusion Protocol (MTP) – Pediatric < 50 KG

**Appropriate Initial Interventions:**
- Intravenous access – by weight (kg):
  - 1-5 kg: 22-24 gauge
  - 6-10 kg: 20-24 gauge
  - 11-25 kg: 18-22 gauge
  - 25-50 kg: 16-20 gauge

**Admission weight (kg):**

**Admission labs:**
- T&S, CBC, INR/ PT, PTT, Fibrinogen, Electrolytes, BUN/Cr, ionized calcium, ABC, lactate
- Continual monitoring of vital signs
- Aggressive re-warming
- Prevent / Reverse acidosis
- Minimize crystalloid – avoid dilutional coagulopathy

**Other considerations:**
- Anticipate hypocalcemia with CaGluconate or CaCl
- 25 units/kg, INR>4-6, 35 units/kg, INR>6, 60 units/kg; repeat doing not recommended
- Antifibrinolytic therapy:
  - Amicar 100 mg/kg bolus then 33.3 mg/kg/hour
- Cell salvage: Anes Tech via Mott OR Front Desk 76-32430
- Additional help:
  - Anesthesia: pager 1534
  - Pediatric Surgical Fellow – pager via web or operator
  - Rapid Response Team pager 90147 or call stat pgs 141

**General Guidelines for Lab-based Blood Component Replacement in Children with Massive Bleeding:**

<table>
<thead>
<tr>
<th>Product</th>
<th>Consider For</th>
<th>Dose</th>
</tr>
</thead>
<tbody>
<tr>
<td>RBCs (360 ml/unit)</td>
<td>N/A</td>
<td>30 ml/kg</td>
</tr>
<tr>
<td>FFP (250 ml/unit)</td>
<td>INR &gt; 1.5</td>
<td>20 ml/kg</td>
</tr>
<tr>
<td>Platelets (50 ml/bag)</td>
<td>&lt; 100,000</td>
<td>20 ml/kg</td>
</tr>
<tr>
<td>Cryoprecipitate (15 ml/unit)</td>
<td>Fibrinogen &lt; 100</td>
<td>0.2 units/kg</td>
</tr>
</tbody>
</table>

**Identify and Manage Bleeding**
(Surgery, Angiographic Embolization, Endoscopy)

≥ 30 ml/kg and ongoing uncontrolled bleeding

**Clinical Team Activates MTP & Designates Clinical Contact**

**Clinical Contact phones Blood Bank (BB) at 936-6888 and:**
- Provides name of clinical contact person to BB
- Provides MR#, sex, name, location and weight of patient
- Records name of BB contact, calls if location/contact information changes
- Sends person with patient name and MRN to pick up the cooler
- Ensures that MTP protocol electronic order is entered in CareLink

**BB Prepares MTP Pack**
MTP Pack: 5U RBCs; 5U FFP; 5 Random Platelets or one apheresis platelet
This will result in an approximate 1:1:1 ratio

**Hemostasis & resolution of coagulopathy?**

- **YES**
  - Stop MTP
    - Notify BB & return any unused blood ASAP
    - Resume standard orders
    - DIC MTP Electronic order
  - With Orange Card
  - Repeat Labs
    - CBC, Platelets
    - INR/PT, PTT
    - Fibrinogen
    - ABG (ionized Calcium, Potassium, Lactate, Hematocrit)
- **NO**
  - Clinical Contact calls BB at 6-6888 for another Peds MTP pack
  - MD can adjust pack based on labs PRN

If persistent coagulopathy consider:
rFVIIa 90 μg/kg dose
Massive Transfusion Protocol (MTP) – ADULT

50 KG

University of Michigan 7/5/16 Rev 7

Identify and Manage Bleeding

(Surgery, Angiographic Embolization, Endoscopy)

Adult: 4U RBCs in <4 hours and ongoing bleeding

Clinical Team Activates MTP & Designates Clinical Contact

Clinical Contact phones Blood Bank (BB) at 936-6888 and:
- Provides name of clinical contact person to Blood Bank (BB)
- Provides MR#, sex, name, location of patient
- Records name of BB contact, calls if location/contact information changes
- Sends person with patient name and MRN to pick up the cooler
- Ensures that MTP protocol electronic order is entered in CareLink

BB Prepares MTP Pack

MTP Pack: 5U RBCs; 5U FFP; One 5-pack Platelets or one apheresis platelet

This will result in an approximate 1:1:1 ratio

Hemostasis & resolution of coagulopathy?

Clinical Contact calls BB at 6-6888 for another MTP pack

** MD can adjust pack based on labs PRN

Repeat Labs
- CBC, Platelets
- INR/PT, PTT
- Fibrinogen
- ABG (ionized calcium, potassium, lactate, hematocrit

Stop MTP
- Notify BB & return any unused blood ASAP
- Resume standard orders
- D/C MTP Electronic order

If persistent coagulopathy consider:

rFVIIa, 90 μg/kg dose

4 Factor PCC; Koneta INR 2-4 25units/kg, INR>4.6, 35 units/kg, INR>6, 50 units/kg; repeat doing not recommended

General Guidelines for Lab-based Blood Component Replacement in Adults:

<table>
<thead>
<tr>
<th>Product</th>
<th>Consider for</th>
<th>Dose</th>
</tr>
</thead>
<tbody>
<tr>
<td>RBCs</td>
<td>N/A</td>
<td>MD discretion</td>
</tr>
<tr>
<td>FFP</td>
<td>INR &gt; 1.5</td>
<td>4 units FFP</td>
</tr>
<tr>
<td>Platelets</td>
<td>&lt; 100,000</td>
<td>One 5-pack Plts</td>
</tr>
<tr>
<td>Cryoprecipitate</td>
<td>Fibrinogen &lt; 100</td>
<td>Two 5-packs Cryo</td>
</tr>
</tbody>
</table>

Other considerations:
- Anticipate hypocalcemia and infuse 1g calcium gluconate per 1-2 units PRBC’s transfused
- Cell salvage: Aes Tech via front desk 53-64270 (Main & CVCOR)
- Heparin reversal: Protamine 1mg IV/100 U heparin
- Warfarin reversal: Vitamin K 10 mg IV; Consider Prothrombin Comp
  4 Factor PCC Koneta INR 2-4 25units/kg, INR>4-6, 35 units/kg, INR>6, 50 units/kg; repeat doing not recommended
- Chronic Renal Failure + VW Factor; DDAVP 0.3 μg/kg IV x 1 dose
- Consider antifibrinolytics:
  - Tranexamic acid 1 gm bolus plus infusion 1 gm over 8 hrs
  - Amicar 5 gm IV bolus then 1 gm/hr IV infusion
- Additional help
  - Anesthesia: Page 8003; Trauma Chief (via web or operator)
  - Rapid Response Team pager 90911 or call stat page 141

Appropriate Initial Interventions:
- Intravenous access – 2 large bore IVs and Central Venous Cath
- Labs: T&Cs, CBC, Plts, INR, PT, PTT, Fibrinogen, Electrolytes, BUN/creatinine, ionized calcium, ROTEM
- Continual monitoring: VS, U/O, Acid-base status
- Aggressive re-warming
- Prevent / Reverse acidosis
- Correct hypocalcemia: CaGlucose or CaCl
- Target goal ionized calcium 1.2 – 1.3
- If use CaCl 1 gm, give slowly IV
- Repeat lab testing to evaluate coagulopathy
- Stop crystalloid - avoid dilutional coagulopathy
POLICY - 1: GUIDELINES FOR THE INITIAL MANAGEMENT OF PEDIATRIC INJURED PATIENTS PRESENTING TO C. S. MOTT CHILDREN’S HOSPITAL EMERGENCY DEPARTMENT

| Title: | Guidelines for the Initial Management of Pediatric Injured Patients Presenting to the C. S. Mott Children's Hospital Emergency Department |
| Keywords: | Pediatric patients, initial management, Pediatric trauma, policies, procedures, guidelines, |
| Authors: | Pediatric Trauma Surgery |
| Applies To: | |
| Last Reviewed: | 12/15/2017 | Last Revised: | 12/15/2017 |
| Policy #: | Patient Care Policy - 1 |

I. Policy
Guidelines for the Initial Management of Pediatric Injured Patients Presenting to the C. S. Mott Children’s Hospital Emergency Department.

II. Purpose
To define the guidelines for the initial management of pediatric injured patients presenting to the Michigan Medicine Emergency Department.

III. Policy Statement
The Pediatric Trauma Service, in conjunction with Emergency Medicine, has developed and implemented an injured patient classification system (refer to “Trauma Response” section). Based upon this classification system, a Trauma Response to the Emergency Department (ED) has been developed that involves all services in the initial management of pediatric injured patients.

The initial management of the pediatric injured patient will follow the standards of the American College of Surgeons Committee on Trauma (ACS-COT) Advanced Trauma Life Support (ATLS) guidelines.

This policy has been reviewed, agreed to, and approved by:

Approved: ________________________ Title: Medical Director, Pediatric Trauma
Approved: ________________________ Title: ________________________
Approved: ________________________ Title: ________________________
Approved: ________________________ Title: Chairman, Department of Emergency Medicine
POLICY - 2: GUIDELINES FOR THE INITIAL MANAGEMENT OF CLASS I PEDIATRIC PATIENTS PRESENTING TO THE C. S. MOTT CHILDREN'S HOSPITAL EMERGENCY DEPARTMENT

<table>
<thead>
<tr>
<th>Title:</th>
<th>Guidelines for the Initial Management of Class I Adult Patients</th>
</tr>
</thead>
<tbody>
<tr>
<td>Keywords:</td>
<td>Pediatric Trauma, Class I Pediatric patients, policies, procedures, guidelines,</td>
</tr>
<tr>
<td>Authors:</td>
<td>Pediatric Trauma Surgery</td>
</tr>
<tr>
<td>Applies To:</td>
<td></td>
</tr>
<tr>
<td>Last Reviewed:</td>
<td>12/15/2017</td>
</tr>
<tr>
<td>Last Revised:</td>
<td>12/15/2017</td>
</tr>
<tr>
<td>Policy #</td>
<td>Patient Care Policy - 2</td>
</tr>
</tbody>
</table>

I. Policy

Guidelines for the Initial Management of the Class I Injured Patient Presenting to the C. S. Mott Children's Hospital Emergency Department.

II. Purpose

To define the guidelines for the initial management of the Class I injured patient presenting to the C. S. Mott Children’s Hospital Emergency Department (CES).

III. Policy Statement

A Class I patient is defined as any patient that has significant alteration in neurological, respiratory, and/or cardiovascular function. It is expected that the Pediatric Trauma Attending on-call and any other appropriate service Attending Staff meet the patient in the Children’s Emergency Department (CES) or operating room (OR) within 15 minutes of the patient's arrival.

These patients require rapid initial resuscitation, evaluation, and definitive care. The following are initial management guidelines for the resuscitation, evaluation, and definitive care of patients based on the mechanism of injury, patient classification, and notification lead time.

1. Initial Management Option # 1 – The transporting agency is directed to bypass the ED and proceed to the OR
   a. The decision to proceed directly to the OR will be made by the Pediatric Trauma Attending, based upon the information provided by the pre-hospital transporting agency or referring facility. The OR response should be activated utilizing the Trauma Radio/Paging system (refer to “Trauma Response” section.) It is the responsibility of the Pediatric Trauma Attending to communicate the need for an immediate operating room to the OR Charge Nurse and Anesthesiology Service.

   b. If an emergency evaluation is indicated in the OR, it should follow the American College of Surgeons Committee on Trauma Advanced Trauma Life Support (ACS-COT ATLS) guidelines. If operative intervention is indicated, the procedures implemented will be based upon the patient's clinical presentation. These patients may require further radiological evaluation following surgical intervention. The radiological evaluation can follow operative intervention or stabilization of the patient in the Pediatric Intensive Care Unit (PICU). If interventional radiological evaluation follows operative intervention, the Anesthesiology Service and an PICU nurse will accompany the trauma patient to the Radiology department. These patients will then be admitted to PICU.

Guidelines for the Initial Management of the Class I Adult and Pediatric Injured Patients Presenting to the UMHS Emergency Department 1
2. Initial Management Option # 2 – The transporting agency is directed to the CES
   a. A rapid, focused, and limited evaluation is performed following ACS-COT ATLS
guidelines, and may include: primary survey, insertion of IV lines, an OG tube and
   Foley catheter (if not contraindicated), FAST exam, chest x-ray, pelvic x-ray before
   proceeding to the operating room. These studies will be performed in the CES (refer
to “Trauma Response” section). The patient is then transported to the OR. The OR
   response should be activated utilizing the Trauma Radio/Paging system (refer to
   “Trauma Response” section).

   b. During the evaluation phase, it is the responsibility of the Pediatric Surgery Fellow or
   the Pediatric Trauma Attending to communicate the need for an operating room and
   the approximate time of patient arrival to the OR Charge Nurse and the
   Anesthesiology Service. If operative intervention is indicated, the procedures
   implemented will be based upon the patient's clinical presentation. These patients
   may require further radiological evaluation following surgical intervention. The
   radiological evaluation can follow operative intervention, or stabilization of the patient
   in the Pediatric Intensive Care Unit (PICU). If interventional radiological evaluation
   follows operative intervention, the Anesthesiology Service and an PICU nurse will
   accompany the trauma patient to the Radiology department. These patients will then
   be admitted to PICU.

This policy has been reviewed, agreed to, and approved by:

   Approved:  
   Approved:  
   Approved:  
   Approved:  
   Title:     Medical Director, Pediatric Trauma
   Title:     
   Title:     
   Title:     

Chairman, Department of Emergency Medicine
POLICY - 3: GUIDELINES FOR THE INITIAL MANAGEMENT OF CLASS II PEDIATRIC PATIENTS PRESENTING TO THE C. S. MOTT CHILDREN'S HOSPITAL EMERGENCY DEPARTMENT

| Title: | Guidelines for the Initial Management of Class II Pediatric Patients Presenting to the C. S. Mott Children's Hospital Emergency Department |
| Keywords: | Pediatric Trauma Surgery, Class II Pediatric patients, policies, procedures, guidelines, |
| Authors: | Pediatric Trauma Surgery |
| Applies To: | Patient Care Policy - 3 |
| Last Reviewed: | 12/15/2017 |
| Last Revised: | 12/15/2017 |

I. **Policy**
Guidelines for the Initial Management of Class II Pediatric Patients Presenting to the Michigan Medicine Emergency Department.

II. **Purpose**
To define the guidelines for the initial management of Class II pediatric patients presenting to the Michigan Medicine Emergency Department (ED).

III. **Policy Statement**
A Class II patient is defined as any patient that is multiply injured but has no life threatening alteration in neurological, respiratory, and/or cardiovascular function. It is expected that the Pediatric Trauma Service Fellow and any other appropriate service Attending Staff meet the patient in the Children’s Emergency Department (CES) or operating room (OR) within 30 minutes of the patient's arrival. Pediatric Class II patients do not require Pediatric Trauma Attending Staff response; response is per the Pediatric Trauma Attending Physician’s discretion.

These patients require rapid initial resuscitation, evaluation, and definitive care. The following are initial management guidelines for the resuscitation, evaluation, and definitive care of patients based on the mechanism of injury, patient classification and notification lead-time.

1. All Class II patients will be evaluated in the CES. Resuscitation and evaluation will follow the American College of Surgeons Committee on Trauma Advanced Life Support (ACS-COT ATLS) guidelines. These patients may require further plain films (long bone, cystogram, one shot IVP, etc.) These films will be performed in the ED. Specialized studies, if needed (e.g. angiogram, MRI, and/or CT scan), will be performed in the Radiology Department, only after the patient has had appropriate evaluation that rules out exsanguination from the abdomen and/or chest. If after evaluation, operative intervention is indicated, it will be performed expeditiously and the procedures implemented will be dependent on the patient's clinical presentation. During the evaluation phase, it is the responsibility of the senior pediatric trauma fellow or the Pediatric Trauma Attending Staff to communicate the need for an operating room and the approximate time of patient arrival to the OR Charge Nurse and the Anesthesiology Service.
a. These patients may require further radiological evaluation following surgical intervention. The radiological evaluation can follow operative intervention or stabilization of the patient in the OR or in the Pediatric Intensive Care Unit (PICU). If radiological evaluation follows operative intervention, the Anesthesiology Service and an PICU nurse will accompany the trauma patient to the Radiology department. These patients will then be admitted to the PICU.

This policy has been reviewed, agreed to, and approved by:

<table>
<thead>
<tr>
<th>Approved:</th>
<th>Title:</th>
</tr>
</thead>
<tbody>
<tr>
<td>[Signature]</td>
<td>Medical Director, Pediatric Trauma</td>
</tr>
<tr>
<td>Approved:</td>
<td>Title:</td>
</tr>
<tr>
<td>[Signature]</td>
<td></td>
</tr>
<tr>
<td>Approved:</td>
<td>Title:</td>
</tr>
<tr>
<td>[Signature]</td>
<td></td>
</tr>
<tr>
<td>Approved:</td>
<td>Title: Chairman, Department of Emergency Medicine</td>
</tr>
</tbody>
</table>
**POLICY - 4: GUIDELINES FOR THE INITIAL MANAGEMENT OF CLASS III PEDIATRIC PATIENTS PRESENTING TO THE C. S. MOTT CHILDREN'S HOSPITAL EMERGENCY DEPARTMENT**

<table>
<thead>
<tr>
<th>Title:</th>
<th>Guidelines for the Initial Management of the Class III Pediatric Patients Presenting to the C. S. Mott Children's Hospital Emergency Department</th>
</tr>
</thead>
<tbody>
<tr>
<td>Keywords:</td>
<td>Pediatric Trauma, Class III Pediatric patients, policies, procedures, guidelines,</td>
</tr>
<tr>
<td>Authors:</td>
<td>Pediatric Trauma Surgery</td>
</tr>
<tr>
<td>Applies To:</td>
<td></td>
</tr>
<tr>
<td>Last Reviewed:</td>
<td>12/15/2017</td>
</tr>
<tr>
<td>Last Revised:</td>
<td>12/15/2017</td>
</tr>
<tr>
<td>Policy #:</td>
<td>Patient Care Policy - 4</td>
</tr>
</tbody>
</table>

**I. Policy**

Guidelines for the Initial Management of Class III Pediatric Patients Presenting to the C. S. Mott Children’s Hospital Emergency Department.

**II. Purpose**

To define the Guidelines for the Initial Management of the Class III injured patient presenting to the C. S. Mott Children’s Hospital Emergency Department (CES).

**III. Policy Statement**

A Class III patient is defined as any patient that has an apparent isolated injury with no alteration in neurological, respiratory, and/or cardiovascular function, but sustained a mechanism of injury that is suspicious for significant injury.

These patients will be resuscitated and evaluated by the CES Staff following the ACS-COT ATLS guidelines. The Pediatric Trauma Surgery Service will be consulted if Emergency Medicine or the primary admitting service request evaluation. If these patients are admitted, they will be admitted to the Pediatric Surgery Service unless an isolated surgical injury is diagnosed (i.e. Isolated humeral fracture may be admitted to Pediatric Orthopedic Service)

If these patients are discharged from the ED and require follow-up, they may be referred to their primary physician. If they do not have a primary pediatrician, these patients will be referred to the Pediatric, specialty or Pediatric Surgery clinic.

This policy has been reviewed, agreed to, and approved by:

- **Approved:** [Signature]  
  **Title:** Medical Director, Pediatric Trauma

- **Approved:** [Signature]  
  **Title:** Chairman, Department of Emergency Medicine

Guidelines for the Initial Management of the Class III Adult and Pediatric Injured Patients Presenting to the UMHS Emergency Department
UMHHC Policy 02-02-008
Pediatric Spinal Precautions

Date of Issue: 11/04 Last Revised: 07/16 Last Reviewed: 07/16:

I. POLICY

All pediatric patients who have been placed on spinal precautions due to a known or suspected spinal injury and do not have a written order stating that the spine has been cleared will have spinal precautions maintained. All subsequent movement between even surfaces will be done using logroll maneuver and a slideboard to facilitate movement from one surface to another.

II. POLICY PURPOSE

To provide guidelines for the safe movement and transport of pediatric patients who have been placed on spinal precautions.

III. DEFINITIONS

A. Backboard: a rigid board (wood or composite) that provides support along the entire length of the patient’s body.

B. Rigid collar/stiff neck (cervical collar): a collar, often manufactured from a rigid plastic (with or without padding), that provides immobilization of the cervical spine.

C. Cervical spine: vertebrae that include C1 through C7 located in the neck.

D. Log roll: a technique that is used to move the patient as one unit, maintaining spinal alignment to protect the patient from injury.

E. Padded rigid collar: a padded collar in various sizes used in-hospital which provides immobilization of the cervical spine (example: Miami J cervical collar)

F. Pediatric patient: patient under 18 years of age

G. Slideboard: a firm, flexible, body length board used in the inpatient setting to facilitate transfers between surfaces (primarily bed to stretcher, stretcher to exam table)

H. Spine precautions: A process that maintains spinal alignment until spinal injury has been ruled out by radiologic and/or clinical examination.

I. TLS spine: thoracic, lumbar and sacral vertebrae

IV. POLICY/GUIDELINE STANDARDS

A. These guidelines pertain to all pediatric inpatients in University Hospital and C. S. Mott Hospital who have a known or suspected spinal injury and have had spinal precautions instituted by the service caring for the patient.

B. Proper spinal precautions will be achieved by maintaining the patient in a neutral position, with no rotation or bending of the spinal column.
V. PROCEDURE ACTIONS

A. Proper spine precautions will be achieved by maintaining the patient in a neutral position, with no rotation or bending of the spinal column. Following the primary assessment, the backboard will be removed (if previously applied per pre-hospital provider) and the patient will be returned to the supine position on the stretcher. A slideboard will be used to facilitate patient transfers from one surface to another. Slideboards should be cleansed with hospital approved disinfectant between surface to surface transfers.

B. Pediatric patients with known or suspected cervical spinal injuries will be placed (or remain if previously applied) in a cervical collar. This cervical collar shall remain in place until there is a written order stating that the collar may be removed. Rigid unpadded collars, if previously applied, should be replaced with a padded rigid cervical collar (Miami J).

C. Pediatric patients with known or suspected spinal injuries will be placed on spine precautions and movement of the patient will be performed with logroll maneuvers. Spine precautions will be instituted and maintained until there is a written order stating that these are no longer necessary.

- Those pediatric patients whose TLS spine films have been cleared and have a physician order stating so may not require logrolling. Spine precautions may only be discontinued if there is a physician order stating so.

- The physician may discontinue logroll maneuvers while maintaining cervical collar use if the pediatric patient’s TLS spine has been cleared and the cervical spine films are not cleared or cervical spine injury is identified.

D. Logrolling will be performed utilizing a minimum of four staff members. The positioning and function of each staff members shall be as follows:

- The leader is positioned at the head of the patient. The leader's role is to maintain the alignment of the patient's head and to direct logrolling the patient.

- Assistant 1 is positioned near the patient’s head and upper body; and places hands on the patient’s shoulder and hip.

- Assistant 2 is positioned beside assistant 1, near the patient’s hips and legs; and places hands on the patient’s hip and legs.

- Assistant number 3 is positioned on the opposite side of the patient, and is in charge of positioning the slideboard behind the patient.

- Leader uses mnemonic "Ready, Steady, Roll", or "1, 2, 3" to guide the procedure. On "Roll" or the count of "3" the leader directs Assistants 1 and 2 to gently roll the patient as a unit allowing the slideboard to be placed behind the patient by Assistant 3. Leader maintains stabilization of head during movement.

- Once the slideboard has been placed, use a flat sheet to slide the patient across the slideboard as one unit while maintaining spinal alignment.

E. Ceiling lifts cannot be used to lift patients to the slideboard. Ceiling or floor lifts and a repositioning sheet only may be used to assist with turns in addition to utilizing the logroll maneuver.
F. If unable to use the slideboard safely, patients may be placed on a backboard for transfers and transport. Slideboards should not be left under the patient during patient transport.

G. Documentation:

1. All pediatric patients requiring spine precautions shall have this documented in the electronic health record (EHR) in the appropriate area.

2. Pediatric patients shall be identified as having spine precautions during hand-off communication and transport.

3. Pediatric patients being transported shall have documentation indicating that spine precautions were maintained throughout the transport and procedure.

4. A neurological exam including motor and sensory shall be completed prior to and after the transport is complete. Any changes should be reported to the physician.

5. During nursing report the patient should be noted on spine precautions.

VI. EXHIBITS

None

VII. REFERENCES


Authors: Mary Berry-Bovia RN BSN ENC Emergency Department
Annette Scott RN MSN Pediatric Intensive Care Unit

Policy owner/Department: Amy Randall, MSN, RN Pediatric Trauma Program Manager

Approved by: Approved by Integrated Nursing Council.; Peter Ehrlich, MD Pediatric Trauma; Hugh Garton, MD Pediatric Neurosurgery

Approved by: Director and CEO, UMHHC – February 18, 2008

Reviewed by: Hugh Garton MD- August 15, 2013; no changes
POLICY - GUIDELINES FOR THE SUBSTANCE ABUSE AND ALCOHOL SCREENING, BRIEF INTERVENTION AND REFERRAL TO TREATMENT OF PEDIATRIC TRAUMA PATIENT PRESENTING TO C. S. MOTT CHILDREN'S HOSPITAL

Title: Guidelines for the Initial Management of Pediatric Injured Patients Presenting to the C. S. Mott Children's Hospital Emergency Department

Keywords: Pediatric patients, Substance Abuse, Pediatric trauma, policies, procedures, guidelines,

Authors: Pediatric Trauma Surgery

Applies To: Patient Care

Last Reviewed: 10/15/2017

Last Revised: 10/15/2017

Policy # Patient Care #

I. Policy

Guidelines for the Substance Abuse and Alcohol Screening, Brief Intervention and referral to Treatment of Pediatric Trauma Patients Presenting to C. S. Mott Children's Hospital

II. Purpose

To identify pediatric trauma patients at risk for alcohol and substance abuse and to provide a brief intervention and referral to treatment as needed. Alcohol and drug use by adolescents is a widespread concern for health care providers and is connected to a number of negative health and social outcomes. Adolescents receiving care for traumatic injuries are often linked with risky use of drugs or alcohol. The trauma system has widely adopted the use of screening, brief intervention, and referral to treatment (SBIRT) for preventing drug or alcohol related injury recidivism and other negative outcomes.

III. Policy Statement

All patients > 12 years old who present as a trauma activation (Level I or II and meet criteria listed below) will be screened for alcohol and drug use by laboratory testing. All pediatric trauma patients admitted to an inpatient unit that are > 14 years old will have a brief intervention conducted and documented regardless of results of laboratory testing (if patient medically able to participate in intervention screening). Patients who have positive screening and/or positive presence of alcohol and/or drugs will receive a referral for treatment.

IV. Definitions

SBIRT – Screening, Brief Intervention, and Referral to Treatment is an evidence-based practice used to identify, reduce, and prevent problematic use, abuse and dependence on alcohol and drugs. The SBIRT model components are defined as:

Screening: using a standardized screening tool, a healthcare professional assesses a patient for risky substance use behaviors.

Brief Intervention: a healthcare professional engages a patient showing risky substance use behaviors in a short conversation, providing feedback and advice

Referral to Treatment: a healthcare professional provides a referral to brief therapy or additional treatment to patients who screen in need of additional services

CRAFFT – the CRAFFT is a short behavioral health screening tool for use with adolescents which is designed to screen for substance-related risks and problems.
V. Procedure

Every effort will be made to assess all pediatric trauma patients presenting for care to C. S. Mott Children's Hospital for concerns for use of drugs or alcohol.

A. Any trauma patient activated as a Level I or II trauma, greater than or equal to 12 years old, will have a Urine Toxicology (UTOX) and Blood Alcohol (ETOH) level evaluated as part of their routine trauma order set. Any patient with a positive screen for any level of drugs and/or alcohol will receive a referral to social work for evaluation and intervention. A Level III trauma patient (trauma consult) may have the UTOX and ETOH tests ordered at the discretion of the physician.

B. Every traumatically injured patient greater than or equal to 14-years-old that is admitted to a surgical service will receive one of the following interventions:

i. Patients with full admission status and at least an 24-hour in-patient stay will receive a CRAFFT screening by an assigned Social Worker. Interventions will be carried out based on the outcome of the screening and at the discretion of the Social Worker in conjunction with the patient's care team.

ii. Patients with an observation admission status or admission to the operating room only, every effort will be made to initiate CRAFFT screening by the department’s Social Work team member. If the length of stay is counterproductive to completion of the screening, the Social Work team will mail the “Social Work Admission Follow Up Letter” to the patient’s home, providing information and resources related to substance use and abuse.

iii. Patients that are evaluated by the surgical team and discharged from the Emergency Department, every effort will be made to initiate CRAFFT screening by the department’s Social Work team member. If the length of stay is counterproductive to completion of the screening, the Social Work team will mail the “Social Work Admission Follow Up Letter” to the patient’s home, providing information and resources related to substance use and abuse.

C. Level I and Level II trauma activations who are 12 years of age or older and were injured engaging in risky activities often associated with substance abuse are to have a serum blood alcohol content level (BAC) and a urine drug screen (UDS) collected during their evaluation. Examples of risky activities include:

i. Drivers of a vehicle, with or without passengers

ii. Passengers of an impaired driver

iii. Victims of violent trauma

iv. Inappropriate use of motorized vehicles (ie. “car surfing”)

v. Any other scenario deemed concerning for substance abuse by the trauma team

D. All pediatric trauma patients who are 14 years of age or older and admitted to an inpatient unit will be screened for substance abuse by the Surgical Physician Assistant using the CRAFFT (Car, Relax, Alone, Forget, Friends, Trouble) Screening tool (appendix 1).

i. CRAFFT Screening will be completed as soon as medically appropriate

ii. Completion of the interview will be documented as a Plan of Care note in MiChart.

E. A positive screen for substance abuse, either through BAC or UDS, or a CRAFFT score of 1 or higher will necessitate that the patient receives a brief intervention prior to discharge.
i. A score of 1 or higher on the CRAFFT questionnaire or a positive BAC or UDS will generate notification of the unit assigned social worker as identified by the MiChart Inpatient Careteam.

ii. The unit based social worker will provide the brief intervention and referral to treatment as needed.

iii. Pediatric Psychiatry or Psychology may be consulted for further assessment/intervention if needed.

iv. Patient confidentiality. Information regarding substance use or abuse is to be treated as confidential medical information. Results of alcohol and drug testing can be shared with parents or guardians of minor patients without their consent unless the patient is actively seeking treatment and articulates that he/she does not want the information shared. In this case, the information can still be shared with the parents/guardian when:
   1. Testing was done for medical purposes
   2. Patient is extremely young and/or lacks the capacity for rational choice
   3. Situation poses a substantial threat to life or physical well-being

This policy has been reviewed, agreed to, and approved by:

<table>
<thead>
<tr>
<th>Approved:</th>
<th>Title:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Medical Director, Pediatric Trauma</td>
</tr>
<tr>
<td></td>
<td>Chairman, Department of Emergency Medicine</td>
</tr>
</tbody>
</table>

Guidelines for the Initial Management Injured Patients Presenting to the UMHS Emergency Department
**Burns: TBSA Size and Degree Reference**

**Depth of Tissue Injury**
- **Epidermis**
- **Dermis**
- **Sub Q**

**Depth of Burn**
- **First**
  - Superficial
    - Red, pink in color, blanches, painful, no blisters
- **Second**
  - Partial
    - Deep red in color, blanches or slow blanching, very painful, blisters present, moist in appearance
  - Deep partial
- **Third**
  - Full thickness
    - White, black, brown, gray, or charred in color, no blanching, decreased or absent sensation, no blisters, dry, or leathery in appearance

**Body part**

<table>
<thead>
<tr>
<th>Body part</th>
<th>0 yr</th>
<th>1 yr</th>
<th>5 yr</th>
<th>10 yr</th>
<th>15 yr</th>
</tr>
</thead>
<tbody>
<tr>
<td>Neck</td>
<td>1%</td>
<td>a</td>
<td>b</td>
<td>c</td>
<td></td>
</tr>
<tr>
<td>Upper arm</td>
<td>2%</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lower arm</td>
<td>1.5%</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hand</td>
<td>1.5%</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Feet</td>
<td>1.75%</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Anterior</td>
<td></td>
<td></td>
<td>a</td>
<td>b</td>
<td>c</td>
</tr>
<tr>
<td>Posterior</td>
<td></td>
<td></td>
<td></td>
<td>b</td>
<td>c</td>
</tr>
</tbody>
</table>

**Relative % of body-surface area**

- a = 1/2 of head
- b = 1/2 of thigh
- c = 1/2 of lower leg
Guidelines for the Initial Management of the Pediatric Patient with a Burn Injury

A. Pediatric burn patients admitted to the Emergency Department (ED) will have the following evaluation, done by a burn surgeon:
   a. Determination of type/source of burn injury with appropriate treatment initiated (i.e. intubation or oxygen with inhalation injury, chemical burns irrigated, cardiac monitoring with electrical burns, etc.
   b. Estimation of extent and severity of burn injury
   c. Adequacy of fluid resuscitation (as appropriate)
   d. Neurovascular examination of circumferential burns

B. Pediatric burn patients will be admitted to the Burn (SBUR) Service in the Trauma/Burn Center (TBC) with other services following as consults as patient condition and injuries warrant (i.e. ophthalmology; cardiology; orthopedics; etc.) General care pediatric consults will be ordered as needed. SBUR ancillary support services (i.e. OT, PT, SW, and nutrition) will follow as automatic consults within 24 hours of patient admission. As outlined in Trauma Response Policy #20, burn patients will have first priority for admission to the TBC. ICU patients less than or equal to 12 years of age will have pediatric critical care services following as a consult.

C. If the patient meets criteria (see Trauma Response Policy #21), the patient will be admitted to the Pediatric Intensive Care Unit (PICU) in CS Mott Children’s Hospital until clinically appropriate to be transferred to the TBC. The SBUR Burn Attending Physician will determine when the transfer will take place.
   a. While admitted to the PICU, overall direction of burn and surgical care will be directed by SBUR burn service attending physicians with close collaboration from either the Pediatric Critical Care or Pediatric Surgical Critical Care teams, as appropriate, based on the patient’s catalog of injuries. Also while admitted to the PICU, burn surgeries will take place in CS Mott operating rooms and SBUR ancillary support services will project to CS Mott to manage care according to SBUR policies and protocols.
   b. If care needs arise after admission that require the patient to be transferred to the PICU from the TBC (i.e. ECMO,) the burn service attending physicians will continue to direct care related to the burn injuries in close collaboration with the Pediatric Critical Care team, who will manage the intensive care issues.
   c. Burn wounds will be cared for by the TBC Wound Team at all times and burn resuscitation will be managed by TBC Nursing staff.

D. Attending call coverage, operative responsibility, and daily clinical responsibilities for these patients will reside with the burn service attending physicians at all times.

E. The Burn Director will monitor the progress and plan of care for all admissions. Additionally, the Burn Director will provide clinical oversight and consultation, as necessary, to the other burn service attending physicians.

F. On discharge, pediatric burn patients will receive a follow-up appointment in the Burn Clinic within one week. If admission is not required, these patients will receive a follow-up appointment in the Burn Clinic within 72 hours.
Guidelines for Pediatric Burn Resuscitation

Documentation must include patient’s TBSA affected using Lund-Browder diagram (including only partial and full-thickness burns) and a weight in kilograms prior to initiating the protocol. For patients >30kg, follow the Adult Burn Resuscitation Protocol.

**FIRST 24 HOURS POST INJURY**

- **TBSA less than 20%**
  - Maintenance IVF only until the patient is taking adequate oral intake.
- **TBSA greater than or equal to 20% and weight less than 30kg**
  - Calculate initial 24 hour resuscitation fluid needs. If weight >10kg, fluid should be Lactated Ringers (LR), if <10kg, fluid should be D5LR
    - 3-4 ml x weight in kg x %TBSA
      - Administer half of calculated amount over the first 8 hours post burn *
      - Administer remaining half of calculated amount over the next 16 hours *
      - Fluids administered pre-hospital should be included in 24 hour total resuscitation fluid calculation
  
*Note: Hourly fluid resuscitation rate is titrated to urine output; see below.
- In addition to burn resuscitation fluid requirements, also infuse maintenance IVF:
  - 4ml/kg/hr D5LR for the first 10kg of body weight
  - 2ml/kg/hr D5LR for the next 10kg of body weight
  - 1ml/kg/hr D5LR for the remaining kg of body weight

*Note: DO NOT titrate maintenance fluids
- Target urine output is 1-2ml/kg/hr.
- If urine output is less than 1ml/kg/hour:
  - Increase resuscitation fluid infusion by 33%
  - Monitor urine output on an hourly basis
  - If urine output remains <1ml/kg/hr, increase resuscitation fluid infusion by another 33%, and call Burn Attending
  - If calculated fluid rate is >6ml/kg/%TBSA, transition to Difficult to Resuscitate Protocol.

  **Example:** If resuscitation fluid rate is 100ml/hour and urine output is <1ml/kg/hr, increase resuscitation fluid infusion to 133ml/hr. If after one hour, urine output remains <1ml/kg/hr, increase resuscitation fluid infusion to 177ml/hr.

- If urine output is greater than 2 ml/kg/hour:
  - Dip urine to exclude glycosuria. If positive, call burn attending
  - Decrease resuscitation fluid infusion by 33%
  - Continue to monitor urine output on an hourly basis
  - If urine output remains >2ml/kg/hr for 2 consecutive hours, call the burn attending

- Place enteral feeding tube within 12 hours of admission
Guidelines for Pediatric Burn Resuscitation (cont’d)

- TBSA greater than or equal to 20% and weight greater than or equal to 30kg
  - Calculate estimated fluid needs:
    - 2-4ml of LR x weight in kg x %TBSA burned:
      - Administer half of calculated amount over the first 8 hours post burn *
      - Administer remaining half of calculated amount over the next 16 hours *
  *Note: Hourly fluid resuscitation rate is titrated to urine output; see below.
  - In addition to burn resuscitation fluid requirements, also infuse maintenance IVF:
    - 4ml/kg/hr D5LR for the first 10kg of body weight
    - 2ml/kg/hr D5LR for the next 10kg of body weight
    - 1ml/kg/hr D5LR for the remaining kg of body weight
  - Target urine output is 0.5-1ml/kg/hr.
  - If urine output is less than 0.5ml/kg/hour:
    - Increase LR infusion by 33% of the hourly calculated fluid requirement
    - Monitor urine output on an hourly basis
    - If urine output remains <0.5ml/kg/hr, increase LR infusion by another 33% of the hourly calculated fluid requirement
    - If urine output remains <0.5ml/kg/hr for two consecutive hours, notify the burn attending
  - If urine output exceeds 2ml/kg/hr:
    - Dip urine to exclude glucosuria. If positive, call burn attending
    - Decrease LR infusion by 33% of the hourly calculated fluid requirement
    - Do not decrease total (resuscitation and maintenance) IVF rate below 150ml/hr
  - Place enteral feeding tube within 12 hours of admission

AFTER 24 HOURS POST INJURY, FOR ALL PEDIATRIC BURNS

- Check serum sodium and potassium every 6 hours on the second day post-injury. Adjust type of fluid by the serum sodium level
- After 24 hours of crystalloid infusion, if fluid requirements remain high, consider changing to 5% albumin. Changing to 5% albumin will only be done at burn service attending physician’s discretion.
- The goal is to decrease resuscitation fluid rate to one half of the rate infused over the previous 16 hours. IVF rate is estimated based on patient’s weight, TBSA burned, response to resuscitation, and estimated losses (seek Burn Attending input on calculating estimated losses)
  - Patients >30 kg, the urine output goal remains 0.5-1ml/kg/hour
  - Patients <30 kg, the urine output goal remains 1-2ml/kg/hour

AFTER 24 HOURS POST INJURY, FOR BURNS GREATER THAN 20% TBSA

- Start oxandrolone 0.1mg/kg BID and beta-blockade with oral propranolol 1-4mg/kg/day
Guidelines for Pediatric Burn Resuscitation (cont'd)

Add DSLR Maintenance IV fluid to resuscitation:
- 4ml/kg/hr DSLR for the 1st 10kg of body weight
- 2ml/kg/hr DSLR for the next 10kg of body weight
- 1ml/kg/hr DSLR for the remaining kg of body weight

Discontinue maintenance fluid when taking adequate oral intake
DO NOT TITRATE MAINTENANCE FLUID TO URINE OUTPUT

CONSIDERATIONS:
- Place enteral feeding tube insertion within 12 hours of admission
- Oxandrolone 0.1mg/kg BID & Oral Propranolol 1-4mg/kg/day at 24-48 hours post injury

Patient <30kg & TBSA calculated with Lund-Browder Chart (partial & full thickness burns ONLY)
* For pediatric patients weighing >30kg, follow the Adult Burn Resuscitation Protocol *

Greater than or equal to 20% TBSA

Calculate initial 24 hour resuscitation fluid needs:
3-4ml/kg/%TBSA. If weight >10kg, fluids should be Lactated Ringers (LR); if <10kg, fluids should be DSLR
(This DOES NOT include maintenance fluid)

Less than 20% TBSA

Maintenance IVF until patient taking adequate oral intake

Resuscitation total:
½ infused in 1st 8 hours (from the time of injury)
2nd ½ infused in remaining 16 hours
*Include pre-hospital fluids in total

Maintain urine output at 1-2ml/kg/hr

If <1ml/kg/hr
- Increase resuscitation fluid by 33%
- Monitor urine output every hour
  - If urine output remains <1ml/kg/hr, increase resuscitation fluid infusion by another 33% and call Burn Attending
  - If calculated fluid rate is >6ml/kg/%TBSA, transition to the Difficult to Resuscitate Protocol

If >2ml/kg/hr
- Dip urine to exclude glycosuria. If positive, contact Burn Attending
- Decrease resuscitation fluid rate by 33%
  - If urine output remains >2ml/kg/hr, contact Burn Attending

Last Revised 4/16/2014
**Pediatric Burn Difficult to Resuscitate Protocol**

In patients <30kg with persistent oliguria and estimated fluid resuscitation >6ml/kg/%TBSA, switch from Lactated Ringers (LR) infusion to 5% albumin (isotonic premixed 5% albumin or 200ml of 25% albumin in 800ml LR at the previous resuscitation fluid rate.

**Note:** For patients greater than 30kg, use adult difficult to resuscitate protocol

A. **Contact burn attending**

B. Initiate 5% albumin infusion at current resuscitation fluid rate. DO NOT titrate maintenance fluids

C. Initiate CVP and SvO₂ monitoring via central access. Monitor bladder pressure every 4 hours.
   a. **Contact burn attending for bladder pressures ≥20mmHg**

D. Targets –
   a. Urine output: 1-2 ml/kg/hr
   b. SvO₂: ≥60%
   c. CVP: 8-10mmHg
   d. Bladder pressure: <20mmHg

E. If urine output is 1-2ml/kg/hr after 1 hour and the patient is normotensive, continue difficult to resuscitate protocol. Every attempt should be made to minimize fluid administration while maintaining organ perfusion.

F. If urine output >2ml/kg/hr after 1 hour, decrease the albumin infusion rate by 20%

G. After 48 hours of albumin infusion, IVF type and rate to be determined by burn attending

H. If urine output is less than 1ml/kg/hr and the patient is hypotensive after 1 hour, follow hypotension guidelines and notify burn attending

I. If urine output is less than 1ml/kg/hr and the patient is normotensive after 1 hour
   a. **CVP = <8mmHg**
      1). Increase albumin infusion rate by 33%
      2). Check hemoglobin & hematocrit
      3). Consider albumin bolus of 10-20ml/kg
      4). Check urine output every 30 minutes
      5). If urine output = <1ml/kg/hr at q30 min assessments, increase albumin infusion rate by 33%
      6). If CVP remains <8 for 2 consecutive hours, contact burn attending & consider transfusion
Pediatric Burn Difficult to Resuscitate Protocol (cont’d)

b. CVP = ≥8mmHg

1). Add milrinone 0.25 mcg/kg/min. Titrate to a max of 0.75 mcg/kg/min for UOP 1-2ml/kg/hr
2). DO NOT increase albumin infusion rate
3). If urine output remains <1ml/kg/hr after 1 additional hour, add epinephrine 0.1mcg/kg/min and contact burn attending. Titrate to a maximum dose of 0.25mcg/kg/min
4). Consider ECHO, CRRT
5). Consider hypotension protocol

J. If CVP, SvO₂, and urine output reach goal, stop increasing fluids and contact burn attending

K. If the patient becomes hypotensive along with urine output <1ml/kg/hr, follow the pediatric burn hypotension guidelines, and notify burn attending

L. After 48 hours, infusion of albumin should be titrated down. IV fluid type and rate will be determined and ordered by burn attending
Pediatric Difficult to Resuscitate Protocol (cont’d)

Pediatric Burn Patient (<30kg) with persistent oliguria or Calculated 24 hour resuscitation >6mL/kg/8TBSA

- Contact Burn Attending
  - Replace resuscitation fluid with 5% albumin at current hourly resuscitation rate. *DO NOT titrate maintenance fluid rate
  - Initiate SvO₂ and CVP monitoring via central access
  - Monitor bladder pressure every 4 hours. Contact Burn Attending for bladder pressures ≥20mmHg

TARGETS: Urine output (UOP) 1 – 2 mL/kg/hr
CVP 8 – 10 mmHg
Bladder Pressure < 20 mmHg
SvO₂ > 60%

If UOP is <1 mL/kg/hr and the patient is normotensive after 1 hr.
- CVP ≥8mmHg
  - Add milrinone 0.25 mcg/kg/min. Titrate to a max of 0.75 mcg/kg/min for UOP 1-2mL/kg/hr
  - Do not increase albumin infusion rate
- CVP <8mmHg
  - Increase hourly Albumin rate by 33% DO NOT titrate maintenance fluid
  - Consider: Albumin bolus 10 – 20 mL/kg Check Hct/Hgb
  - If UOP remains < 1 mL/kg/hr after 1 additional hr., begin Epinephrine 0.1 - 0.25 mcg/kg/min and contact Burn Attending
  - Consider: ECHO and/or CRRT
  - Consider Pediatric Burn Hypotension Protocol

If UOP is <1 mL/kg/hr and the patient is hypotensive after 1 hr., follow hypotension guidelines and notify burn attending
- CVP ≥8mmHg
  - Increase hourly Albumin rate by 33% DO NOT titrate maintenance fluid
  - Consider: Albumin bolus 10 – 20 mL/kg Check Hct/Hgb
  - If UOP remains < 1 mL/kg/hr after 1 additional hr., begin Epinephrine 0.1 - 0.25 mcg/kg/min and contact Burn Attending
  - Consider: ECHO and/or CRRT
  - Consider Pediatric Burn Hypotension Protocol
- CVP <8mmHg
  - Check urine output Q30 minutes
  - At Q30min checks, if UOP < 1 mL/kg/hr, increase Albumin infusion rate by 33%

If UOP is ≥1 mL/kg/hr and the patient is hypotensive after 1 hr.
- CVP ≥8mmHg
  - Increase hourly Albumin rate by 33% DO NOT titrate maintenance fluid
  - Consider: Albumin bolus 10 – 20 mL/kg Check Hct/Hgb
  - If UOP remains < 1 mL/kg/hr after 1 additional hr., begin Epinephrine 0.1 - 0.25 mcg/kg/min and contact Burn Attending
  - Consider: ECHO and/or CRRT
  - Consider Pediatric Burn Hypotension Protocol
- CVP <8mmHg
  - Check urine output Q30 minutes
  - At Q30min checks, if UOP < 1 mL/kg/hr, increase Albumin infusion rate by 33%
  - If UOP remains < 1 mL/kg/hr after 1 additional hr., begin Epinephrine 0.1 - 0.25 mcg/kg/min and contact Burn Attending

After 48 hours of albumin infusion, IVF type and rate to be determined by burn attending

Continue difficult to resuscitate protocol

After 48 hours of albumin infusion, IVF type and rate to be determined by burn attending

Last Revised 4/16/2014
Guidelines for the Treatment of Hypotension in the Pediatric Burn Patient

The optimal minimum blood pressure for burn patients must be individualized. Some patients will maintain adequate organ perfusion (and thus have adequate urine output) with mean arterial pressures (MAP) less than 70mmHg; therefore true hypotension must be correlated with urine output and overall perfusion. If a MAP (generally below <55mmHg or below appropriate parameter for age) is not adequate to maintain the UOP target, the following steps are recommended:

A. Monitor for hypotension
   - Term Neonate (0-28 days) = SBP<60
   - Infants (1-12 months) = SBP<70
   - Children 1-10 years = SBP<70 + (age in years x 2)
   - Children >10 years = SBP<90

B. Contact Burn Attending AND Pediatric Surgery Critical Care Fellow

C. Initiate CVP monitoring via central access
   a. If CVP ≥8
      - Add epinephrine 0.05 – 1mcg/kg/min (titrate to age specific BP targets above) and call Burn Attending
         - Consider
            - ECHO
            - Missed injury/ongoing blood loss
            - Hydrocortisone 2mg/kg/dose Q8hours (max 100mg/dose)
            - Treat academia (pH <7.2) – consider bicarb/vent settings
            - Maintain ionized calcium >1.1
            - Consider cultures/antibiotics
            - CRRT
            - ECMO
      - If persistent hypotension, add norepinephrine 0.05-2mcg/kg/min (titrate to age specific BP targets above) and/or vasopressin 0.003units/kg/min. DO NOT titrate vasopressin.
         - Consider ECMO
   b. If CVP <8
      - Increase resuscitation fluid infusion by 33%
        - In addition, consider fluid bolus (10-20ml/kg)
      - Check urine output Q30min (target 1-2ml/kg/hr)
        - Increase IVF rate by 33% every 30 minutes until CVP >8, based on q30min urine output assessments
      - If patient remains hypotensive or CVP remains <8 after two consecutive hours, contact burn attending
         - Consider difficult to resuscitate protocol
Guidelines for the Treatment of Hypotension in the Pediatric Burn Patient (cont’d)

- Age Specific Vital Sign Parameters:
  - Term Neonate (0-28 days) = SBP < 60
  - Infants (1-12 months) = SBP < 70
  - Children 1-10 years = SBP < 70 + (age in years x 2)
  - Children >10 years = SBP < 90

- Patient hypotensive based on age specific parameters
- Contact Burn Attending AND Pediatric Surgery Critical Care Fellow
- Initiate CVP monitoring via central access

- CVP ≥ 8mmHg
  - Epinephrine 0.05 = 1mcg/kg/min and Contact Burn Attending
  - Consider:
    - ECHO
    - Missed injury/ongoing blood loss
    - Hydrocortisone 2mg/kg/dose q6hrs (max 100mg/dose)
    - Treat acidemia (pH < 7.2) - consider bicarb/vent settings
    - Maintain ionized calcium > 1.1
    - Cultures/antibiotics
    - CRRT
    - ECMO

- If patient remains hypotensive, add:
  - Norepinephrine 0.02 – 2mcg/kg/min, titrate to age specific SBP above
    - And/or
  - Vasopressin 0.003units/kg/min
    - (DO NOT titrate vasopressin)

- Contact Burn Attending

- CVP < 8mmHg
  - Increase resuscitation fluid by 33%
    - In addition to resuscitation fluid increase, consider fluid bolus 10-20ml/kg
  - Check urine output (UOP) every 30min
    - (Target UOP 1-2ml/kg/hr)
  - Increase resuscitation fluid by 33% if UOP calculated to be <1ml/kg/hr at 30 min checks
  - If patient remains hypotensive* or CVP remains <8mm Hg after 2 consecutive hours, contact Burn Attending

* If patient shows signs of hypovolemic shock