INTRODUCTION:

This manual is provided to all personnel caring for the injured pediatric patient. Since the Trauma Service at the University of Chicago Children’s Hospital is an interdisciplinary organization with resources from throughout the institution, an operational method is established to provide optimum care for the child who sustains a significant traumatic injury.

Grace Mak, MD directs the Pediatric Trauma Service. The duties of the Pediatric Trauma Director include directing the clinical trauma program, co-chairing the Pediatric Trauma Performance Improvement Committee with the Trauma Nurse Coordinator, reviewing all deaths, and reviewing the implementation of PI monitors, and coordinating Trauma Conference. Michele Harris-Rosado, RN, is the Trauma Nurse Coordinator. The Pediatric Surgery Fellow and/or the Senior Surgical Resident on the Pediatric Surgery Service under the supervision of the Pediatric Surgical Attending is responsible for the appropriate disposition of the injured patient. Injured children are admitted to the Pediatric Surgery Service. All injured children will be seen in follow-up in the Pediatric Surgery Clinic.

PEDIATRIC TRAUMA CASCADE:

When a child is identified as requiring trauma resuscitation, the trauma cascade is activated and Trauma Team members are notified. The Trauma Team includes: Pediatric Trauma Surgery Attending, Comer Emergency Medicine (EM) Attending, Comer Emergency Room Nurses, Trauma Nurse Coordinator, Pediatric Surgery Fellow, Pediatric Surgery Senior Resident, 3rd year General Surgery Resident, Pediatric EM Residents, Pediatric Intensive Care Unit Fellows, Respiratory Therapy, Radiology, Pharmacist, Social Work, Chaplain, Pediatric ICU, Anesthesia Attending-on-call, Child Life Specialist and Security. Social Work, Pediatric ICU, and Anesthesia Attending-on-call may not be physically present in the Trauma Suite.

The trauma cascade page will appear as 156--# of patients—estimated time of arrival. Notification of a patients sustaining penetrating injury will include PEN at the end of the page. For example, 156-01-05 PEN indicates that one child will be arriving in 5 minutes with a penetrating injury.

Residents and fellows participating in the care of injured children will have successfully completed Advanced Trauma Life Support (ATLS).

TRIAGE:

The following pediatric trauma patients (patients who are 15 years and 364 days of age) are classified as Level I Trauma:

1. Any patient diverted to UCH because of our designation as a Trauma Center
2. Any patient meeting any of the “absolute” or “relative” trauma triage criteria in the field (see PEDIATRIC TRAUMA TRIAGE CRITERIA)
3. Any pediatric trauma patient brought to UCH by UCAN
In general, the Trauma Team shall be notified by the trauma cascade (dial 156) as soon as notification is received by the Comer ER. For patients being brought in by UCAN, the Trauma cascade will be activated prior to the landing of the helicopter. The patient shall be immediately evaluated in one of the trauma bays.

Pediatric patients who have been the victims of trauma but who do not meet any of the above criteria for initial resuscitation in a Trauma Suite must be evaluated by an Attending Emergency Medicine Physician or designee within 10 minutes after arrival in the ER. If, based upon the discretion of the Attending, it is felt that the child would be best served by resuscitation in a Trauma Suite (e.g. if there is concern about the possibility of serious injury, if it is felt that the child would benefit from the resources and expeditious care associated with the trauma bay, or if Pediatric ER staffing or resources are felt to be insufficient to manage the child), the trauma cascade will be activated and the child will be moved immediately to a trauma bay. Any pediatric trauma patients not meeting these criteria can be managed in the Pediatric Emergency Department if the Pediatric Emergency Medicine Attending feels they have the resources needed to do a complete trauma work-up. Pediatric Surgery should be consulted in these instances.

UNIVERSAL PRECAUTIONS:

All physicians likely to be in direct contact with the patient should follow blood barrier precautions on entry into the trauma bay.

DESIGNATION OF ATTENDING RESPONSIBILITIES:

PEDIATRIC TRAUMA SURGERY ATTENDING OR DESIGNEE:

1. Provides supervision for all resuscitative, diagnostic and therapeutic aspects of care and is ultimately responsible for the patient.
2. Must be in consultation with the Pediatric Surgery Fellow or Senior Surgical Resident within 30 minutes of the patient being classified as a Level 1 Trauma patient
3. Must be available for all trauma patients going to the Operating Rooms from the Trauma Suite

COMER EMERGENCY MEDICINE ATTENDING:

1. Responsible for the care of the patient until the Pediatric Trauma Surgery Attending is physically present or a management plan has been mutually agreed upon by the Pediatric Trauma Surgery Attending, Emergency Medicine Attending, and supervisory resident
2. Serves as consultant to Trauma Team with regard to pediatric dosages, child abuse, and general issues pertinent to the pediatric patient

PEDIATRIC INTENSIVE CARE UNIT ATTENDING:

1. In situation of multiple trauma patients, assumes role of Comer Emergency Medicine Attending in managing the airway

NOTE: At night or on weekends when the PICU attending may not be “in-house”, and airway assistance is required, anesthesia on-call will be contacted.
DESIGNATION OF NURSING RESPONSIBILITIES:

TRAUMA NURSE #1:
1. Carries trauma pager and passes it on to next nursing shift
2. Upon trauma cascade activation goes directly to trauma bay; is present prior to arrival of patient
3. Ensures that the trauma cascade has been activated (dial 156); if patient has arrived and there is no representation from pediatric surgery and additional “156-1-0” page is sent.
4. Prepares for patient arrival: sets up monitor and trauma pack, prepares “spiked” IV bag, ensures appropriate immobilizer is available depending on patient age/weight, and ensures Broselow tape on bed.
5. Announces to the team his/her role as Trauma Nurse #1
6. Documents on trauma flow sheet and assures completion of all elements
7. Draws up medications for intubation, resuscitation, analgesia, or sedation
8. Verifies which labs and radiographs are needed
9. Accompanies patient to CT, OR, Pediatric ER, ICU, or floor
10. Brings appropriate resuscitation equipment and medications to all transports.
11. Calls report
12. Maintains run sheet with patient’s chart

TRAUMA NURSE #2:
1. Announces to the team his/her role as Trauma Nurse #2
2. Places monitor leads and pulse oximeter on patient
3. Obtains vital signs, including temperature; reports to Trauma Nurse #1
4. Confirms that Respiratory Therapy has applied supplemental oxygen
5. Confirms appropriate i.v. access
6. Draws blood for hgb/glucose, laboratory studies, type + screen/cross.
8. If patient has indwelling urinary catheter, sends urinalysis on all patients and pregnancy test on all girls ≥ 10 years of age
9. Appropriately warms patient
10. Prepares and assists with procedures, e.g. Intubation, chest tube insertion, peritoneal lavage, thoracotomy
11. Restocks Trauma Suite upon completion of resuscitation
DESIGNATION OF FELLOW / RESIDENT RESPONSIBILITIES:

PEDIATRIC SURGERY FELLOW/SENIOR SURGICAL RESIDENT:

1. Assumes responsibility for patient and direction of all involved personnel under the supervision of the attending physician present. The Senior Surgical Resident must have 4 years of General Surgery residency training and have current ATLS verification.
2. Defines priority of diagnoses.
3. Defines order of therapy.
4. Directs Radiology technologist to take x-rays.
5. Tells Trauma Nurse #1 which laboratory studies to send. The following laboratory studies should be obtained on all patients: CBC, coagulation profile, ER I, ER II, amylase, lipase, type and screen, urinalysis. All females ≥ 10 years of age need a pregnancy test. ETOH testing required on all drivers in motor vehicle crashes. Tox screen on any pt with symptoms not associated with mechanism.
6. In the event that the patient appears not to have sustained significant injuries and there is not a significant mechanism of injury, makes the decision (in consultation with the Pediatric Surgery Attending, Comer Emergency Medicine Attending, and the Senior EM Resident) to have the child initially managed in the Pediatric Emergency Department.
7. It is the Pediatric Surgery Fellow/Senior Surgical Resident's responsibility to ensure IV access in all trauma patients. If a patient arrives without an IV, then it is the responsibility of the Pediatric Surgery Fellow/Senior Surgical Resident to ensure that IV access is found within three attempts or 90 seconds. After three tries or seconds have elapsed since the initial attempt at IV insertion, an intraosseous (if the child is under 6 years of age), venous cutdown, or a central venous line should be considered as directed by the Pediatric Surgery Fellow/Senior Surgical Resident.

ALGORITHM FOR VENOUS ACCESS:

a. Trauma nurse #2 attempts percutaneous peripheral venous access; if unsuccessful →
b. Trauma nurse #1 attempts percutaneous peripheral venous access; if unsuccessful →
c. Pediatric Surgery Attending should be informed of difficulty in obtaining venous access. Discuss whether intraosseous, venous cutdown, or central venous line should be placed.

8. If the child arrives with a single IV, the Senior Surgical Resident decides the necessity for a second IV depending upon the hemodynamic status of the child. Discusses with Trauma Nurse #2.
9. Determines the necessity for a naso-/oro-gastric tube and/or indwelling urinary drainage catheter.
10. Contacts the Pediatric ICU Charge Nurse or PICU fellow to plan for patient’s final disposition after completion of diagnostic tests.
11. Ensures written completion of Pediatric Surgery Trauma/ Resuscitation/Critical Care Admission Note by the Surgical Team.
12. Senior Surgery Resident determines, in conjunction with Trauma Nurse #1, the need for a physician during transport.

**CRITERIA FOR DETERMINING MEDICAL PERSONNEL NEEDED DURING TRANSPORT OF THE PEDIATRIC TRAUMA PATIENT:**

When the patient is ready to leave the Trauma Suite for his/her destination, the Sr. Surgical resident will determine who will accompany the patient to this destination using the following criteria:

1. Patients going to OR/ICU
2. Patients who are intubated
3. Any child 3 yrs. of age or less who has been sedated or received analgesia
4. Patients with GCS < 15
5. If Trauma Nurse #1 feels uncomfortable taking the patient alone during transport, or Senior Surgical Resident feels that M.D. accompaniment is necessary
6. Patients who have been hemodynamically unstable in the prehospital setting or during the trauma resuscitation

Patients not falling under the above criteria may be transported by a nurse without Physician accompaniment to another area. If the nurse accompanying the patient without a physician requires immediate assistance, he/she should then contact the Comer ED charge nurse phone.

13. Consults with the Pediatric Trauma Surgery Attending (if the attending is not present) on the status of the patient and the plan of care (including the need for specialty consultation). This must be done within 30 minutes of the patient’s arrival to the trauma bay.

14. Obtains consensus when the EM Residents and Respiratory Therapist are no longer required at the resuscitation (e.g. patient stabilized, no airway issues)

15. Maintains crowd control in trauma bay

**3RD YEAR JUNIOR SURGICAL RESIDENT:**

1. Conveys appropriate findings to Trauma Nurse #1 during primary and secondary survey, e.g., “bilateral breath sounds,” “large stellate laceration on forehead”
2. Completely exposes patient
3. Places naso-/oro-gastric tube and/or indwelling urinary drainage catheter or designates insertion by another team member
4. Completes 8 hour observation orders for those patients being observed in the Pediatric ER
5. Assumes responsibility for patient and direction of all involved personnel under the supervision of the attending physician present until the arrival of the senior surgical resident
6. Responsible for giving “report” to EM resident in Pediatric Emergency Department or PICU fellow.
COMER SENIOR EMERGENCY MEDICINE RESIDENT (EM-2/3/4) or PEDIATRIC EMERGENCY FELLOW
1. Prior to patient arrival, checks airway management equipment.
2. Maintains position at head of bed
3. Assesses and reassesses airway; obtains control of airway if necessary.
4. Administers supplemental oxygen
5. Performs primary survey in conjunction with 3rd year Surgery Resident and head and
   a. neck exam portion of secondary survey
6. Places or designates placement of sump tube for gastric decompression; route of insertion
   (nasal versus oral) will be discussed with Senior Surgical Resident.
7. Remains with patient during resuscitation until consensus is determined with Senior Surgical
   Resident that further management of the airway is not necessary, and that the patient has been stabilized
8. In situations of multiple trauma patients, assumes Senior Surgical Resident role

JUNIOR/INTERMEDIATE EMERGENCY MEDICINE RESIDENTS (EM-1/EM-2):
1. Assists the Senior EM Resident/PEM Fellow in the management of the airway, head and
   neck evaluation, and associated procedures at the head of the bed
2. Performs procedures at the direction of the Pediatric Surgery Fellow/Senior Surgical
   Resident. This may include placement of a nasogastric tube or Foley catheter
3. Remains with the patient until no longer required at the resuscitation
4. Responsible for completion of the Comer Trauma Pack history and physical examination
   form with particular attention to recording a complete primary and secondary survey and
   initial diagnostic impressions and management plans
5. May be requested to accompany patient to CT or other diagnostic tests, or to the PICU

PICU FELLOW:
1. The management of the airway, head and neck evaluation, and associated procedures at
   the head of the bed is a cooperative function of the PICU fellow and EM resident (EM-
   2/EM-3)/PEM Fellow under the supervision of the Comer Emergency Medicine attending.
1. In situations of multiple trauma patients, assumes role of EM-2/3/4 at the head of the bed.
2. May be requested to accompany patient to CT or other diagnostic tests, or to the PICU
3. All orders will be communicated through the senior surgical resident or EM-2/EM-3, the
   Pediatric Trauma attending or the Comer Emergency Medicine attending.
4. When patient arrives in PICU, PICU fellow takes “report” from fellow/surgical resident.

CONSULTATIONS:
1. For any trauma patient requiring specialty consultation with Neurosurgery, Ob/Gyn, or
   Cardiovascular Surgery, the specialist(s) called are required to arrive within 30’ of
   notification that their services are needed
2. For patients with isolated injury requiring consultation with appropriate specialists, the
   specialists are required to arrive within 60’ of notification that their services are needed
3. If there is suspicion of inflicted injury (child abuse), call the CPS hotline and/or the Social
   Worker on-call. The child can be admitted for social reasons if the social worker indicates
   that this is necessary.
4. INDICATIONS FOR NEUROSURGICAL CONSULTATION:
   a. GCS < 15 at any time (in transport or in Trauma bay)
   b. History of loss of consciousness or amnesia for event
   c. If patient is admitted for 23 hour observation and not ready for discharge
      because of persistent headache, altered mental status, sleepiness, etc.
   d. Patient admitted for significant mechanism for traumatic brain injury (e.g. fall > 3
      body lengths) with GCS = 15 and normal head CT
   e. All patients being admitted with a mechanism of injury that involves head trauma
      will receive normal saline and repeat serum electrolytes will be drawn the next
      morning
   f. All multisystem trauma patients going to the operating room for non- neurosurgical
      procedures.
PEDIATRIC TRAUMA TRIAGE CRITERIA
The following are criteria for Level I pediatric trauma—physiologic and/or anatomic criteria with traumatic mechanism of injury:

PHYSIOLOGIC:

Shock
- Systolic BP ≤ 70 + 2x age
- Pulse ≥ 140
- Capillary refill > 2 seconds

Respiratory distress
- Respiratory rate > 30 < 10
- Inability to maintain airway
- Stridor

Altered mental status
- Loss of consciousness with traumatic mechanism of injury (see below)
- Amnesia for event
- GCS < 12
- Deterioration of clinical condition as indicated by change in vital signs, neurologic status, or evidence of shock, or respiratory distress.

ANATOMIC:

- Facial/neck injury with airway compromise
- Significant injuries above + below diaphragm, e.g. minimum of proximal long-bone fractures, above + below diaphragm or a combination of head, neck, or thorax injuries with abdominal, pelvic, or femur injuries.
- Burns ≥ 20% BSA
- Penetrating injury to head, neck, torso, or groin
- Injury to an extremity with evidence of vascular injury (expanding hematoma, absent pulses, loss of neurologic function)
- Paralysis

MECHANISM OF INJURY:

- Fall ≥ 3 body lengths
- Ejected from motor vehicle
- Death of occupant
- Prolonged extrication (> 20 minutes)
- Pedestrian (+/- bicycle) struck by motor vehicle > 10 mph, or thrown
- Passenger in motor vehicle crash ≥ 35 mph
- Struck by lightning
- Amputation proximal to wrist or ankle
- Hanging / strangulation
- Unwitnessed drowning
PEDIATRIC MASSIVE TRANSFUSION PROTOCOL updated 2010

In conjunction with the blood bank, a Massive Transfusion Protocol has been established. In the event that we are anticipating “massive transfusion” therapy for a pediatric trauma patient, we need to instruct the nurse that is sending the sample to the blood bank that we are activating the “massive transfusion protocol”. The ED nurse will contact the blood bank and provide the following information:
1. Activation of the protocol
2. Where to send the blood products (Comer OR / GOR)

Activation of the protocol will result in the preparation of 6 units PRBC, 4 units FFP, + 1 pheresis pack (6-pack) of platelets.

After “1 round” has been sent to the operating room, the blood bank will call the operating room to determine if the protocol needs to remain activated.

There are 4 units of O-negative PRBC in the Comer ED, Comer OR, and GOR that can be used to start a case.
RECOMMENDATIONS FOR ANALGESIA IN PEDIATRIC TRAUMA PATIENTS

The administration of analgesia should be considered in all pediatric trauma patients with long bone fractures. Morphine may be administered in pediatric trauma patients after the completion of the primary survey and after assessment of response to fluid resuscitation, e.g. a decrease in the heart rate. Consideration should be given to administering analgesia prior to completing the secondary survey where log-rolling the patient or frog-legging the patient for the rectal exam can exacerbate pain from the fracture. Analgesia should be administered prior to manipulation of all fractures.

Morphine 0.05 mg/kg i.v. may be administered after documentation of vital signs. Vital signs should be documented 15 minutes after the initial dose. If necessary this dose may be repeated. If a second dose of 0.05 mg/kg is not administered in the trauma room, it should accompany the patient to CT.
PEDIATRIC ORAL CONTRAST DOSAGE CHART
2.5% SOLUTION OF GASTROGRAFFIN or OMNIPAQUE
* Only ordered at the discretion of Surgical Attending*

<table>
<thead>
<tr>
<th>WEIGHT (kg)</th>
<th>GASTROGRAFFIN (ml)</th>
<th>TOTAL VOL. (ml)</th>
<th>VOLUME TO BE ADMINISTERED (ml/oz)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-7kg (10-15lbs.)</td>
<td>4.5</td>
<td>180</td>
<td>120 ml/4 oz.</td>
</tr>
<tr>
<td>7-20kg (30-40lbs.)</td>
<td>7.0</td>
<td>240</td>
<td>180 ml/6 oz.</td>
</tr>
<tr>
<td>20-45kg (70-90lbs.)</td>
<td>8.0</td>
<td>300</td>
<td>240 ml/8 oz.</td>
</tr>
<tr>
<td>&gt;45kg (90-110lbs.)</td>
<td>11.5</td>
<td>420</td>
<td>360 ml/12 oz.</td>
</tr>
</tbody>
</table>

NOTE: Mix with water if administering by NG tube; mix with apple juice, or fruit punch (a clear liquid that is not a carbonated beverage) if administering p.o.
PEDIATRIC TRAUMA C-SPINE CLEARANCE PROTOCOL

PATIENTS < 9 YRS. OF AGE

CONSCIOUS UNDISTRACTED
- (1) NECK PAIN/TENDERNESS
  → LATERAL AP

CONSCIOUS UNDISTRACTED
- (2) NECK PAIN/TENDERNESS
  → LATERAL AP
  FUCH'S (SUBMENTAL)

UNCONSCIOUS
- (3) FOCAL DEFICITS
  → LATERAL AP

UNCONSCIOUS
SIGNIFICANT TRAUMATIC MECHANISM
  → LATERAL AP
  HEAD CT

ALTERED MENTAL MOVING ALL 4 EXTR
SIGNIFICANT TRAUMATIC MECHANISM
  → LATERAL AP
  FUCH'S (SUBMENTAL)

FLEXION-EXTENSION
(130° EXCURSION)

NO SPLINTING
→ REMOVE COLLAR
KEEP IN COLLAR
→ FOLLOW-UP IN
CLINIC IN 1 WEEK

*SIGNIFICANT TRAUMATIC MECHANISM INCLUDES: MVC (PEDESTRIAN OR PASSENGER)
  ALL AIRBAG DEPLOYMENTS
  FALLS > 3 BODY LENGTHS
  NEAR-DROWNING ASSOCIATED WITH SPORTS ACTIVITIES
PEDIATRIC TRAUMATIC SPINE CLEARANCE PROTOCOL

PATIENTS ≥ 9 YRS. OF AGE

- CONSCIOUS (⁺) NECK PAIN (⁺) NECK TENDERNES HEAD CT
  - LATERAL
  - LATERAL AP OPEN MOUTH
  - FLEXION-EXTENSION (±30° EXCURSION)
    - NO SPLITTING
      - REMOVE COLLAR
    - SPLITTING
      - KEEP IN COLLAR FOLLOW-UP IN CLINIC IN 1 WEEK

- CONSCIOUS (⁺) NECK PAIN (⁺) NECK TENDERNES HEAD CT
  - LATERAL
  - LATERAL AP OPEN MOUTH
  - MRI

- CONSCIOUS (⁺) NECK PAIN (⁺) NECK TENDERNES HEAD CT
  - LATERAL
  - LATERAL AP OPEN MOUTH
  - MRI

- UNCONSCIOUS (MULTIPLE TRAUMATIC MECHANISMS)
  - LATERAL AP OPEN MOUTH
  - MRI

- UNCONSCIOUS (SIGNIFICANT TRAUMATIC MECHANISM)
  - LATERAL AP OPEN MOUTH
  - MRI

- ALTERED MENTAL STATUS (SIGNIFICANT TRAUMATIC MECHANISM)
  - LATERAL AP OPEN MOUTH
  - MRI

*SIGNIFICANT TRAUMATIC MECHANISM INCLUDED: MVC (PEDESTRIAN OR PASSENGER)
ALL AIRBAG DEPLOYMENTS
FALLS > 3 BODY LENGTHS
NEAR-DROWNING ASSOCIATED WITH SPORTS ACTIVITIES
PROTOCOL FOR ISOLATED HEAD TRAUMA IN 16-18 YR. OLDS (REVISED 4/10/07):

As a Level 1 pediatric trauma center we accept multi-system trauma patients up to age 15 yrs. + 364 days.
1. When UCAN is called regarding the transfer of a patient ranging in age from 16 yrs. up to 18 yrs. + 364 days with isolated head trauma, the neurosurgery service is contacted for acceptance. If the neurosurgery service has any concern that this may be a multi-system trauma patient, the pediatric surgery attending on-call may be contacted for consultation. Multi-system trauma patients in the age range from 16 yrs. up to 18 yrs. + 364 days will not be accepted.
2. These patients will be direct admissions to the OR, or the PICU, pending resource availability in the PICU. (If a PICU bed will not be available within a reasonable amount of time, the patient will not be transferred.) If a PICU bed is being made available, but is not available when the patient arrives, the patient will go to the Pediatric ED.
3. The trauma cascade will not need to be activated. The neurosurgery service will be responsible for contacting the pediatric surgery service (the senior resident on the service or the general surgery resident on-call) for a trauma consultation. All transfers with isolated head trauma will have a pediatric trauma consultation. The pediatric surgery service will manage any missed intra-thoracic or intra-abdominal injuries that may be discovered after transfer. Missed orthopedic injuries will be managed by the pediatric orthopedic surgery service.
4. 16-18 yr. old patients with head/facial injuries who "walk-in" to the Mitchell ED or who are directly transferred from an outside ED, not involving UCAN, will be managed per the current EM management algorithm and will not involve the pediatric trauma service.