Monroe Carell Jr. Children's Hospital at Vanderbilt

Trauma Service Manual

2025 Edition

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This Trauma Manual was prepared for you by the Monroe Carell Jr. Children's Hospital at Vanderbilt Department of Pediatric Trauma

Chapter 1: Trauma Service Organization

Trauma Service Definition

The Trauma Service is a comprehensive, multidisciplinary, patient focused care delivery system comprised of pre-determined healthcare personnel assigned to care for trauma patients. Team member's function according to protocol, each with his/her specifically defined responsibilities. Overall authority and 24-hour accountability rests with the Trauma Service Medical Director.

Trauma Service Purpose

Our purpose is to provide a care delivery system specifically directed towards the care of injured patients who present to Monroe Carell Jr. Children's Hospital at Vanderbilt (MCJCHV). The team approach will be utilized, incorporating pre-hospital care providers, referring hospitals, patients and their families. The Trauma Service provides those physicians credentialed in trauma care according to the medical staff rules and regulations and the trauma protocol, a forum for educational opportunities and framework within which the group can work on those issues affecting the Trauma Service and any individual member of the service.

Trauma Service Objectives

The Trauma Service will establish and maintain protocols, procedures, and routine orders related to the provision of trauma care to Trauma Service patients. Trauma Service and its Trauma Performance Management & Improvement (PM&I) committee will review, monitor and evaluate quality improvement opportunities related to the care administered to trauma patients.

Mission Statement

The Trauma Service at MCJCHV is dedicated to improving injury-related survival while decreasing morbidity and disability by providing state-of-the-art comprehensive acute care. Quality patient care is maintained by educating healthcare professionals at all levels of care. The Trauma Service will advance the quality of care through research, and the discovery and evaluation of new diagnostic treatment methods. Trauma Service will be involved in the promotion of injury prevention strategies and provide education to children, parents, and the lay public to decrease incidence of injury and disability in our region.

Vision Statement

To be a national leader in pediatric trauma care recognized for providing and advancing the provision of outstanding family centered, quality focused and evidence- based care, and committed to the prevention of childhood injury.

Trauma Personnel Responsibilities

1. All Attending Surgeons Taking Trauma Call
   - Responds to all Level I activations according to guidelines.
     - Level I: prior to, or within 15 minutes of patient arrival
   - Responsible for overall care of the trauma patient in conjunction with the Pediatric Surgery Fellow or Trauma Senior Resident.
   - Secures back-up attending coverage when unavailable for call duties or is not in-house.
     - See Back-up Trauma Personnel Procedures (page 27).
   - Maintains the following:
     - ATLS certification
     - Attendance (>50%) of Trauma Multidisciplinary Peer Review Committee
       - Trauma Performance Management & Improvement (Trauma PM&I)
2. Pediatric Surgery Fellow
   - Responds to all Level I and II activations according to guidelines.
     - Level I: prior to, or within 15 minutes patient arrival when on-call
     - Level II: within 30 minutes of patient arrival when on-call
   - Responsible for overall care of the trauma patient in conjunction with the Trauma Attending.
   - Maintains the following:
     - ATLS certification
     - Attendance (>50%) of Trauma Multidisciplinary Peer Review Committee
       - Trauma PM&I
   - Responsible for notification of PICU Attending or Surgical Advanced Practice Providers (APPs) for all trauma admissions.
   - Assures that all trauma admission documentation (History & Physical, Summary, and MD orders with primary team identified) has been completed.
   - Accompanies Level I patients being transported to CT and/or the PICU as outlined in this manual.
3. Trauma Senior Resident (TSR)

- Responds to all Level I and II activations according to guidelines
    - Level I: prior to, or within 15 minutes patient arrival when on-call
    - Level II: within 30 minutes of patient arrival when on-call
- Assumes team leader position for all trauma care until arrival of Pediatric Surgery Fellow and/or Pediatric Surgery Attending.
- Maintains the following:
    - ATLS certification
    - Attendance of Trauma Multidisciplinary Peer Review Committee
        - Trauma PM&I
- Activates backup trauma attending surgeon as necessary.
- Responsible for notification of PICU Attending or Surgical Fellow for all trauma admissions.
- Assures that all trauma admission documentation (History & Physical, Summary, and MD orders with primary team identified) has been completed.
- Accompanies Level I patients being transported to CT and/or the PICU as outlined in manual.

4. Trauma Junior Resident (TJR)
    - Responds to all Level I and II pages according to guidelines
        - Level I: prior to patient arrival
        - Level II: within 30 minutes of patient arrival
    - Assists in trauma resuscitation secondary assessments – shoulders down and posterior.
    - Assumes responsibility for delegated procedures in the trauma suite with appropriate supervision.
    - Communicates findings and plan to TSR/Fellow/Attending.
    - Completes all admission documentation records (Admission H & P, Consult Notes).
    - Works in conjunction with the Trauma APPs on the dictation of discharge summaries on all trauma service patients regardless of length of stay.
5. Trauma Advanced Practice Providers (APPs)
    - Assists team in providing continuity of care for trauma patient.
    - Attends daily rounds and participates in patient care plans.
    - Enters orders discussed in daily rounds.
    - Confirms SBIRT screening in collaboration with Social Work on age-appropriate admitted patients.
    - Acts as liaison for patients: family/consult services/and discharge planners.
    - Educates patient, family and staff regarding injuries and anticipated needs.
    - Assists in development of practice guidelines as needed.

- Works in conjunction with the TJR on the dictation of discharge summaries on all trauma service patients regardless of length of stay.
- Participates in trauma meetings to include Trauma Multidisciplinary Peer Review Committee (Trauma PM&I) while on service.

6. Trauma Medical Director (TMD)
   - The Trauma Medical Director has overall authority and accountability for the Trauma Department.
   - Responsibilities include:
     - Technical skill in management of the traumatically injured patient.
     - Chairs multidisciplinary trauma peer review.
     - Authorizes trauma service privileges for the on-call panel.
     - Collaborates with nursing administration to support the nursing needs of trauma patients.
     - Develops treatment protocols in collaboration with the TPD.
     - Coordinates the performance improvement and peer review processes.
       - Chairs Trauma PM&I monthly meetings with the attendance requirement of >60%.
     - Authority to correct deficiencies in trauma care.
     - Coordinates budgetary process with assistance from TPD and hospital administration.
7. Trauma Program Director (TPD)
   - The TPD collaborates with the Trauma Service attending, Pediatric Surgery Fellow, Surgical Residents, Trauma APPs, Trauma Program Coordinators, Injury Prevention Manager, and Trauma Registrars for regulatory compliance, trauma policy and procedures, management of data, and education of staff. The TPD is the liaison to pre-hospital trauma care arena, and interfaces with State and National agencies regarding the development of trauma systems in the community, State or National level.
   - Responsibilities include:
     - Implementation and coordination of trauma system policies and guidelines.
     - Implements performance improvement initiatives.
     - Oversees data collection, analysis, and monitoring of trauma performance improvement programs.
       - Tracks and trends performance improvement issues.
       - Assists with chart review and identification of areas for improvement.
     - Oversees development of education programs for inter-facility and regional professional staff development.
     - Oversight of injury prevention and outreach programs in the community.

- Organize, attend, and participate in trauma conference, journal club, and all trauma committees.
- Manage operational, personnel and financial aspects of the Trauma Program
- Supervise trauma registry.
- Represents the trauma service at organization, state, and national levels.

8. Trauma Program Coordinator (TPC)
   - The TPC collaborates with the Trauma Service attending, Pediatric Surgery Fellow, Surgical Residents, Trauma APPs, TPD, and trauma registrars for regulatory compliance, trauma policy and procedures, management of data, and education of staff.
   - Responsibilities include:
     - Implements performance improvement initiatives.
     - Oversees data collection, analysis, and monitoring of trauma performance improvement programs.
     - Tracks and trends performance improvement issues.
     - Assists with chart review and identification of areas for improvement.
     - Oversees development of education programs for internal hospital, inter-facility, and regional professional staff development.
     - Represents the trauma service at organization, state, and national levels.
9. Trauma Registrar
   - Responsibilities include:
     - Abstracts and verifies information from medical record.
     - Analyzes patient chart information for accuracy and completeness; clarifies vague or incomplete diagnostic and/or procedural information with physicians and other health care providers when necessary.
     - Assists the TPD in preparing and reporting monthly statistical reports.
     - Assigns ICD10 codes to all patient injuries, co-morbidities, and procedures.
     - Prepares and provides reports for IRB approved studies.
     - Prepares and submits quarterly data summaries to the State Department of Health.

Trauma Junior Resident Orientation

1. Service Overview

   The Trauma Service is composed of attending surgeon, senior residents, junior residents and advanced practice providers. This makes up the core team that is responsible for the day to day care of the patients on the Trauma Service. In addition, the trauma team will

collaborate with the case manager and a social worker for psych/social aspects of care and the disposition planning of our patients.

2. Resuscitation
    - Responsible for participating in all Level I and II's.
    - Should be present in the room before the trauma patient arrives, if possible, but at least 15 minutes from the time of patient arrival for level I's and 30 minutes from time of arrival for level II's.
    - In the trauma suite you are responsible to:
        - Check in to the Scribe RN with name and your title.
        - Assist in exposing the patient.
        - Perform a secondary survey on the patient from the shoulders down.
            - The findings are relayed to the scribe nurse after the PED resident relays their findings of the head and neck.
        - Assist in rolling the patient and perform a rectal exam while the patient is rolled (if indicated), after spine exam.
        - May perform procedures at the discretion of the TSR or attending trauma surgeon/pediatric fellow.
        - Complete or assist in completing the trauma documentation (Admission H&P, Consult Note, Daily Progress Note, etc.)
3. First 24 Hours of Patient Care
    - For suspected abdominal trauma patients, serial abdominal exams are ordered to be done and documented q6hr for the first 24hr after admission.
    - For patients with solid organ injuries, HCT on admission and/or 6hr after injury.
        - Repeat if <21 or change in VS observed.
    - For patients that are NPO overnight on admission, MIVF should be started upon admission.
    - Adequate pain control is assessed by patient comfort, incentive spirometry values, and patient's ability to generate a good cough.
    - LFTs, Amylase, and Lipase are ordered as part of the laboratory work up of suspected abdominal trauma patients.
4. Day to Day Functions
    - The vast majority of Trauma Level I and II's are admitted to the Trauma Service. A trauma patient admitted to another service is done only at the discretion of the trauma attending or fellow.
        - This other service must be a surgical service.
    - Patients are evaluated each morning and completed trauma progress notes are placed in the electronic medical record.

- Transfers off the Trauma Service only occur if there is an isolated system injury present.
  - The Trauma APP or TJR will contact the accepting service to sign out the patient. An order is then written in EPIC with the names of the accepting service and attending
- Discharge summaries will be completed on all patients seen by the Trauma Service.
  - Discharge summaries are helpful for continuity of care in follow-up Trauma Clinic.
- All discharge summaries are forwarded to the attending on record for sign off.
- Any complication during the patient's stay should be communicated to the Trauma Program Staff.
  - These complications will be recorded and presented in Trauma Conference.

5. Clinical Guidelines
   - Refer to Chapter 3 in this manual.
6. Documentation
   - Trauma Admission History and Physical (completeness include x-rays, CT and labs).
   - Trauma Tertiary Examination
   - Trauma Consultation Note
   - Trauma Daily Progress Note
   - Trauma admission orders

Trauma Service Education Requirements

Trauma Orientation

Trauma orientation is completed at the beginning of the rotation by all residents involved in trauma care. The purpose of the orientation is to provide a systematic and objective approach to the care of the injured patient. Protocols and processes are discussed with the group.

Trauma Performance Management and Improvement

Trauma Conference involves all interested disciplines in the management of trauma patients. This includes liaisons from the PED, Radiology, Anesthesia, Orthopedics, Neurosurgery, Critical Care, and nursing management along with all Trauma Attendings and Fellows. The trauma faculty conducts Trauma Conference on every forth Wednesday (0700-0800) in 11539 and via Teams. One (1) category one CME will be awarded to attending staff for attendance and completion of the quarterly evaluation form.

Continuing Education

The Trauma Medical Director must obtain 36-hours of trauma-related CME in a 3-year period. The liaisons from Neurosurgery, Orthopaedic Surgery, Emergency Medicine, and Critical Care Medicine must each have a Maintenance of Certification transcript or complete 36-hours of trauma-related CME in a 3-year period.
The other general surgeons, Orthopaedic surgeons, Neurosurgeons, Emergency Medicine physicians, and Critical medicine care physicians who take trauma call must be knowledgeable and current in the care of injured patients. This requirement may be met by a Maintenance of Certification transcript.

ATLS Certification

Trauma surgeons, pediatric surgery fellow, and senior residents on the trauma service will be current ATLS providers and/or instructors and provide documentation to trauma program manager for credentialing purposes.

Chapter 2: Operational Guidelines

The Transfer and Transport of a Trauma Patient

Process

To arrange transfer and transport of the injured child from an outside facility, the Access Center may be reached at (615) 936-4444 or (615) 936-7811. An ED Attending or Fellow will then speak to the outside facility and will then accept the patient based on the communication with the outside provider. If transport arrangements have not already been made, the Access Center and FlightCom will collaborate to provide a means of transportation for the patient based on patient status.

When the transport team is 15 minutes out, a member will notify FlightCom and relay a patient report along with an ETA. Our FlightCom Program is a Regional Communication Center designated by the state of Tennessee. It is staffed on a 24-hour basis, by a dedicated and thoroughly trained dispatcher and can be reached at (615) 322-3211.

Prearranged transfer agreements for pediatric patients needing specialized care are available. We are a resource for transfer from basic, primary, and general facilities for definitive care. If requested, we will provide transport service to all our hospitals. Our air medical service also responds to scene calls via the EMS system.

Medical Command

As a Comprehensive Regional Pediatric Center in the state of Tennessee, MCJCHV will assist with the provision of regional pre-hospital direct medical control for pediatric patients. MCJCHV provides 24-hour consultation to all lower-level facilities for the care of ill and injured children.

Definition of a Trauma Patient

Purpose

To provide optimal identification of patients who require prompt assessment and intervention from the trauma resuscitation team. A three-tiered trauma team system provides safe and effective care while optimizing appropriate resource allocations.

Decision Criteria

It is the responsibility of the FlightCom communicator to make the decision to activate a Trauma Level I, Trauma Level II, or Trauma Level III based on EMS report. Collaboration with pre-hospital personnel and the ED attending/ fellow may occur in the process. Decision is based on the following guidelines of physiologic signs, obvious anatomical injury, mechanism of injury, and concurrent disease. If a patient with traumatic injury meets any single criteria listed below, then the corresponding activation needs to be made.

Activation Criteria

Level I	Level II (Scene)	Level II (Transfer)	Level III

Airway/Breathing • Any intubated patient • Unstable airway: artificial airway, being bagged, obstruction • Significant facial or neck injury causing airway compromise Breathing • Respiratory distress/ compromise: increased work of breathing Circulatory • Age-specific hypotension: SBP <70 mm Hg + (2 x age in years) • Cardiac arrest/CPR (in field or en route) • Blood transfusion en route • Significant blood loss or hemorrhage • Hemorrhage ONLY controlled by tourniquet utilization • Penetrating injury (head, neck, torso) • Excludes any penetrating injury isolated to the eye • Limb threatening injuries: • Amputation (near/complete), degloving, crush injury proximal to wrist/ankle • Pulseless extremity with duskiness, cyanosis, or paralysis Disability • GCS ≤ 8 or "P" or "U" or deteriorating by 2, with mechanism attributed to trauma • Paralysis or quadriplegia Other • ≥15% TBSA combined with other trauma/injury • ED physician discretion	Airway • Sub-Q emphysema of chest and above Breathing • NRB necessary to maintain SaO2 >93% with mechanism attributed to trauma Circulatory • Controlled art. bleeding, stable VS • ≥2 femur/hurmerus fxs • Femur or pelvic fx with significant mechanism • Amputation (near/complete), degloving, crush injury distal to wrist/ankle excluding digits • Penetrating injury to extremities excluding digits Disability • GCS 9-13 or "V" (combative, disoriented) • Open or depressed skull fx • Closed head injury with sz activity or LOC >5 min • Suspected c-spine or spinal cord injury without or resolved paralysis Other • Abdominal wall bruising: seat belt sign or handlebar bruise • Abdominal pain/ tenderness • MVC with: rollover, ejection, death of passenger, or spider windshield • MCC, ATV with rollover or ejection • Fall >20 feet (2nd story) • Struck, dragged, or run over by vehicle • Burns 10-15% TBSA combined with other trauma/injury or high-voltage burns • ED physician discretion	Airway • Sub-Q emphysema of chest and above Breathing • Pneumo/hemothorax • NRB necessary to maintain SaO2 >93% with mechanism attributed to trauma Circulatory • Controlled art. bleeding, stable VS • Bilateral femur fxs • Complex pelvic fxs • Amputation (near/complete), degloving, crush injury distal to wrist/ankle excluding digits • Penetrating injury to extremities excluding digits Disability • GCS 9-13 or "V" (combative, disoriented) • Open or depressed skull fx • Stable EDH/SDH/SAH • C-spine or spinal cord injury without or resolved paralysis Other • Abdominal wall bruising: seat belt sign or handlebar bruise • Abdominal pain/ tenderness • Confirmed intra-abdominal injury • Burns 10-15% TBSA combined with other trauma/injury or high-voltage burns • ED physician discretion	• Trauma patients not meeting L1/L2 criteria including patients immobilized with no significant injury • 2nd and/or 3rd degree thermal burns <15% TBSA • All 1st degree burns • Suspected inhalation injury • Amputation (near/complete), degloving, crush injury of digits • Penetrating injury to digit or isolated eye

*Any patient can be upgraded to a higher level at the discretion of the attending MD (Trauma or PEM). *

** Patients can only be downgraded upon arrival at the discretion of the attending or fellow MD (Trauma or PEM)**

Normal Ranges for Pediatric Vital Signs

AGE (KG)	HR min – max	SBP min 70+(age in years x 2)
Premie (1-2)	90-180	70
Newborn (3.5)	90-180	70
6 months (7)	85-180	70
1 year (10)	80-160	72
3 year (15)	80-160	76
6 year (20)	70-140	82
8 year (25)	70-140	86
10 year (30)	65-140	90
12 year (40)	60-130	90
15 year (50)	55-130	90
18 year (65)	50-130	90

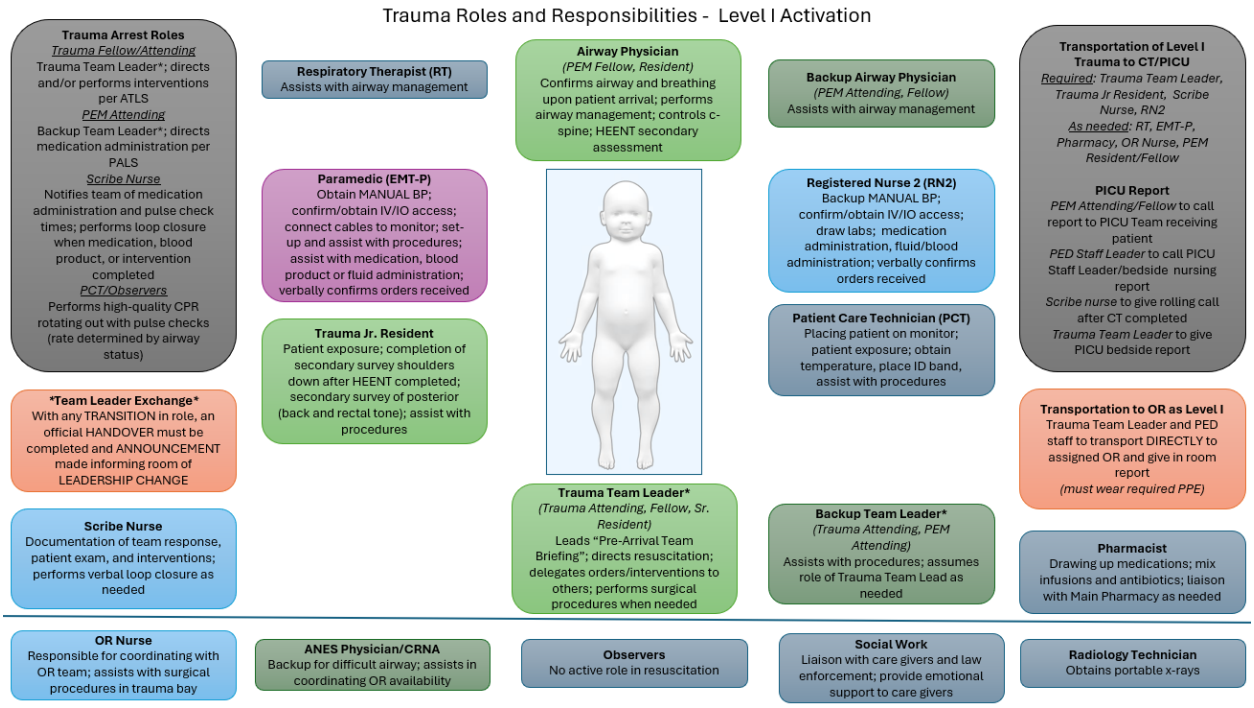
Activation of the Level I Trauma Team

Purpose:

To assure that patients arriving in the Emergency Department with a recognized threat to life or limb will receive rapid assessment and immediate treatment.

Trauma Team Members

Level I Trauma Team Activation		
Trauma Attending Trauma Fellow or Surgery Resident (PGY3, PGY5) Trauma Intern ED Attending Peds EM Fellow Peds EM Resident or Intern	ED RN (x2) ED EMT-P ED PCT OR RN	X-Ray Tech Respiratory Therapy Pharmacist Child Life Social Work Administrative Coordinator Registration



Level I Trauma Resuscitation Roles

1. Trauma Team Leader (TTL)- Pediatric Trauma Fellow, Pediatric Trauma Attending
    a. Role: Directs the overall trauma resuscitation. All orders will come from the TTL during the trauma resuscitation; orders and trauma assessment survey will be verbalized to Scribe RN. If the Pediatric Trauma Attending or Fellow presents after the patient's arrival, there will be clear handoff from the Pediatric Emergency Medicine (PEM) Attending or Fellow to Trauma. Once this handoff occurs, the Pediatric Trauma Attending or Fellow assumes the role of TTL.
2. Pediatric Emergency Medicine (PEM) Attending
    a. Role: Completes pre-game timeout with trauma team and acts as TTL until arrival of the Trauma Service. The PEM Attending actively participates and assists with patient assessment and resuscitative efforts in collaboration with the TTL. During code situations, the PEM attending is responsible for ordering PALS medications in collaboration with the TTL.
3. Airway MD (EM Resident or Pediatric EM Fellow)
    a. Role: Responsible for assessment of airway, breathing, and circulation upon arrival of the patient. Completes any airway intervention determined by the patient's condition. Responsible for ensuring correct spinal immobilization. Completes secondary survey of the head and neck.
4. Trauma Intern

   a. Role: Assists in the removal of all clothing. Performs secondary survey of the shoulders down along with posterior exam. Assists with any procedures as needed. Complete all necessary documentation in collaboration with Trauma Senior.
5. Anesthesia
   a. Role: In difficult airway situations, the Anesthesiologist is available at the bedside and will establish and maintain a definitive airway in times when the Airway MD is unable to. Anesthesia will accompany patient to the OR if necessary.
6. Scribe Nurse
   a. Role: Responsible for all patient documentation, documentation will be done on the trauma flow sheet. Will remain with patient until surgery or receiving unit takes over care and hand off is complete. All trauma patients are transferred to receiving unit via RN as per intra hospital transfer policy.
7. RN 2
   a. Role: On patient arrival will check patency of pre-hospital IV access. ED or Transport RN will initiate IV access, patient must have two large bore IV's or IO if unable to obtain IV access. Responsible for running IV fluids through the fluid warmer as indicated; will obtain blood samples for lab and administer/draw all medications, blood products, and IV fluids.
8. EMT- P
   a. Role: On patient arrival will immediately obtain initial set of vital signs (manual blood pressure) and connect patient to cardiac monitor. Will set up and assist with any bedside procedures. Ensures application of patient identification band.
9. ED Patient Care Technician
   a. Role: Responsible for prepping trauma bay prior to patient arrival, running for blood products for all team activations, and assists with placing patient on monitor and obtaining a patient temperature.
10. Pharmacist (If available)
    a. Role: Provide medication information as needed and prepare emergency medications.
11. OR Nurse
    a. Role: Will communicate information from trauma bay to the OR regarding need for surgery and equipment that will be needed; responsible for confirming the immediate availability of surgery suite.
12. PED Clinical Staff Leader (CSL)
    a. Role: Responsible for the overall management of the emergency department. The CSL will liaison with Nursing Administration for additional resources and the

disposition of the patient. Responsible for assigning roles and changing out staff as additional providers respond to the activation.

13. X-Ray Technologist
    a. Role: Respond with portable x-ray machine to obtain radiologic exams during trauma activation.
14. Respiratory Technologist
    a. Role: Provides airway support and supplemental oxygen when necessary. Responsible for connecting vent if appropriate, assisting with establishing definitive airway, and providing ventilations via bag valve when necessary.
15. Social Work
    a. Role: Responds to trauma bay if in building or paged as needed if out of the building. Acts as the liaison to family members during trauma team activation and provides emotional and/or spiritual support for patient and family; will assist in locating family as needed.
16. Child Life Specialist
    a. Role: When in house, responds to trauma room for any pediatric trauma team activation and provides age-appropriate psycho-social support.
17. Registration
    a. Role: Responsible for completing quick registration process and providing patient ID band and patient chart.
18. CT Technologist
    a. Role: Clears the scanner ASAP and will not start a new case until cleared by TTL. Tech will wait in the CT control room and monitor for CT imaging orders.

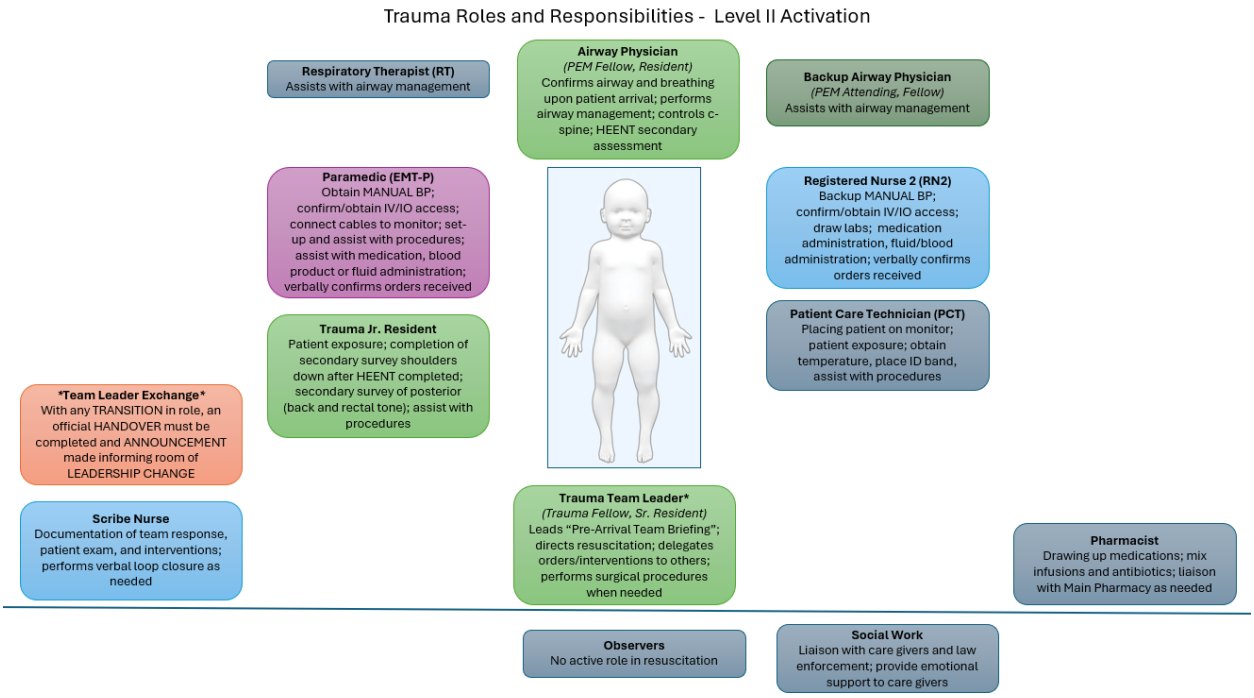
Activation of the Level II Trauma Team

Purpose:

To assure that patients arriving in the Emergency Department with a recognized threat to life or limb will receive rapid assessment and immediate treatment.

Trauma Team Members

Level II Trauma Team Activation		
Trauma Fellow or Senior Resident Trauma Intern PEM Attending PEM Fellow PEM Resident or Intern	ED RN (x2) ED EMT-P ED PCT	Resp. Therapy Child Life Social Work Registration



Level II Trauma Resuscitation Roles

I. Trauma Team Leader (TTL) (Trauma Fellow or Senior Resident)
   a. Role: Directs the overall trauma resuscitation. All orders will come from the TTL during the trauma resuscitation; orders and trauma assessment survey will be verbalized to Scribe RN. If the Pediatric Trauma Attending or Fellow presents after the patient's arrival, there will be clear handoff from the Pediatric Emergency Medicine (PEM) Attending or Fellow to Trauma. Once this handoff occurs, the Pediatric Trauma Attending or Fellow assumes the role of TTL.

II. Airway MD (PEM Resident or Fellow)

a. Role: Responsible for assessment of airway, breathing, and circulation upon arrival of the patient. Completes any airway intervention determined by the patient's condition. Responsible for ensuring correct spinal immobilization. Completes secondary survey of the head and neck.

III. Trauma Intern
   a. Role: Assists in the removal of all clothing. Performs secondary survey of the shoulders down along with posterior exam. Assists with any procedures as needed. Complete all necessary documentation in collaboration with Trauma Senior.

IV. Scribe Nurse
   a. Role: Responsible for all patient documentation, documentation will be done on the trauma flow sheet. Will remain with patient until surgery or receiving unit takes over care and hand off is complete. All trauma patients are transferred to receiving unit via RN as per intra hospital transfer policy.

V. RN 2
   a. Role: On patient arrival will check patency of pre-hospital IV access. ED or Transport RN will initiate IV access, patient must have two large bore IV's or IO if unable to obtain IV access. Responsible for running IV fluids through the fluid warmer as indicated; will obtain blood samples for lab and administer/draw all medications, blood products, and IV fluids.

VI. EMT- P
   a. Role: On patient arrival will immediately obtain initial set of vital signs (manual blood pressure) and connect patient to cardiac monitor. Will set up and assist with any bedside procedures. Ensures application of patient identification band.

VII. PED Patient Care Technician
   a. Role: Responsible for prepping trauma bay prior to patient arrival, running for blood products for all team activations, and assists with placing patient on monitor and obtaining a patient temperature.

VIII. PED Clinical Staff Leader
   a. Role: Responsible for the overall management of the emergency department. The ED Charge Nurse/ANM will liaison with Nursing Administration for additional resources and the disposition of the patient. Responsible for assigning roles and changing out staff as additional providers respond to the activation.

IX. Respiratory Technologist
   a. Role: Responsible for connecting vent if appropriate, assisting with establishing definitive airway, and providing ventilations via bag valve when necessary.

X. Social Work

a. Role: Responds to trauma bay if in building or paged as needed if out of the building. Acts as the liaison to family members during trauma team activation and provides emotional and/or spiritual support for patient and family; will assist in locating family as needed.

XI. Child Life Specialist
   a. Role: When in house, responds to trauma room for any pediatric trauma team activation and provides age-appropriate psycho-social support.

XII. Registration
   a. Role: Responsible for completing quick registration process and providing patient ID band and patient chart.

Trauma Resuscitation Protocol

Rules:

1) Each team member must identify themselves and their department to the Scribe RN; they must understand their individual tasks and function within their role, unless otherwise directed by the team leader.
2) The team leader determines and directs necessary diagnostic studies and interventions.
3) The team leader receives key pre-hospital information after completion of the primary survey.
4) It is the responsibility of the team leader to maintain noise control. Overall noise level should be minimal so that communication and control is maintained throughout the resuscitation.
5) The team leader clearly announces assessment, plan, and interventions for the purpose of ongoing communication and complete documentation.
6) The primary and secondary surveys are repeated frequently to ascertain any deterioration of patient condition and need for immediate intervention.
7) Initial blood pressure should be manual and called out to the team.
8) Protocols are based on the recommendations of the current Advanced Trauma Life Support Manual.

Preparation of Resuscitation Suite and Personnel Prior to Patient Arrival

1) Documentation of all personnel and their arrival time.
2) Donning of full protective gear is required of all members of the trauma team. Personal protective equipment includes:
   a. Gown

   b. Mask/eye shield
   c. Shoe covers
   d. Gloves
   e. Surgical cap
   f. Lead apron
3) FAST ultrasound machine in room
4) Check for resuscitation equipment including:
   a. Towel roll, Ambu bag, and GlideScope
   b. Suction
   c. Ranger warmer and rapid infuser
   d. Bair hugger
5) Team leader/Communication RN will review pre-assigned roles and any pertinent pre-hospital information.
6) Assure portable x-ray equipment is immediately available (radiology tech).

Primary Survey Protocol

1) Airway maintenance with cervical spine protection: In any patient with airway compromise, a definitive airway should be placed. The decision to place an airway is based on clinical findings and includes apnea, inadequate respiratory effort, severe head injuries, and/or GCS <8. Establishment of an airway is done in accordance with ATLS protocol.
2) Breathing and ventilation: Airway physician will expose chest to evaluate any compromise of ventilation. Inspect for chest excursion or appearance, palpate for subcutaneous air or crepitus, auscultate for symmetric breath sounds. Intervene for any acute impairment of ventilation identified in primary survey.
3) Circulation with Hemorrhage Control:
   - Blood Volume: Assess skin color and palpate central pulses for quality, rate, and regularity. Absent or thready rapid pulses indicate the need for immediate resuscitation.
   - Bleeding: Rapid external blood loss is managed with direct manual pressure. Occult blood loss in the torso or extremities may present with hypotension and tachycardia. Intravenous access with immediate administration of intravenous fluid should be instituted. Patients with significant injuries and hypotension {SBP < [70mmHg + (2 x age in years)]} determined to require operative treatment should be transferred to the operative room immediately.

4) Disability (Neurologic Evaluation): A rapid evaluation is conducted; this exam will include a Glasgow Coma Scale, pupillary responses, and reflexes. Frequent neurologic reevaluations are important to detect any changes in mental status.
5) Exposure/Environmental Control: As a team, completely undress the patient by cutting off clothing if needed, for a thorough evaluation and assessment. Cover patient with warm blankets to help prevent hypothermia. IV fluids should be warmed. Examine back of patient and remove backboard. Rectal exam is performed while patient is rolled (if indicated). C-spine immobilization is maintained by the team member positioned at the head of the bed during a log roll maneuver. Examine for any deformities, step-offs, or tenderness with palpation. A Bair Hugger is available for rewarming.

This completes the PRIMARY Survey and a concise EMS report is now received.

Primary Interventions during or after Primary Survey: (Hospital Protocol)

1) Establish 2 large bore IV/IO for possible fluid resuscitation. (Rapid, warm NS/LR Solution, unless contraindications exist). After rapid infusion of 20 cc/kg x2 or 2 liters, trauma blood must be considered along with possible emergent surgical interventions (O neg then type specific when available).
2) An NG tube is placed if there is no major facial trauma and is indicated in the judgment of the team leader.
3) In the case of significant facial trauma, an oral gastric should tube be placed.
4) Continuous cardiac monitoring and pulse oximetry. Frequent vital signs including temperature, heart rate, blood pressure, respiratory rate, and GCS should be obtained according to protocol.
    - Level I traumas: record VS q5m x 4, q15m x 4, q30m x 4, then q1h until otherwise ordered.
    - Level II traumas: record VS q15m x 4, q30m x 4, then q1h until otherwise ordered.
5) Focused Abdominal Ultrasound (FAST) exam completed when appropriate.
6) After Primary Survey and interventions are complete, AP chest and pelvis is obtained as requested by the team leader.

Secondary Survey:

Initiated after Primary Survey is complete, resuscitative efforts are well established, and the patient demonstrates normalization of vital functions)

1) Head to toe evaluation (as per ATLS protocol).
2) Blood samples are obtained and sent immediately to the lab for analysis.

3) The team leader collects as much history as possible, including but not limited to allergies, current meds, past medical problems, last meal, etc.

Adjuncts to Secondary Survey:

Radiographs and special diagnostic procedures often require transportation to another area of the hospital where fewer personnel are available for life saving measures. Therefore, specialized tests should not be performed until the patient's hemodynamic status has been normalized and complete exam performed.

Frequent reevaluations of Primary and Secondary Survey are necessary to assure new findings are not overlooked.

Tertiary Survey:

1) Patient should have a tertiary survey within 24-48 hours of admission.
2) Tertiary exam must be completed prior to transferring patient to a non-surgical service.
3) Patients who have been intubated, sedated, or have a decreased LOC should receive another tertiary survey once they are extubated and their LOC is improved.

Trauma Team Documentation

Purpose:

Trauma History and Physical: The purpose of this form is to provide an organized, comprehensive, and standardized document which will communicate an initial patient history, assessment, resuscitation interventions and plan of care as outlined by the trauma team.

Logistics and Responsibilities of Trauma Team Members:

1) All documentation is completed in the medical record.
2) Nursing documentation in the ED must be done in trauma narrator. This must include the following information:
    a. Request/ Arrival Time:
        i. Trauma Team Leader (Trauma Attending, Fellow, or Senior resident)
        ii. Pediatric Trauma Surgical Fellow/Resident
        iii. PEM Fellow/Resident
        iv. PEM Resident
        v. Nurses

vi. Subspecialties as requested by TTL

b. Activation Information:
   i. Date of presentation
   ii. Activation time
   iii. Arrival time
   iv. Activation level
   v. Injuries sustained/ Reasoning for meeting designated activation criteria
   vi. Time and date injuries occurred
   vii. Mechanism of injury
c. Patient Information:
   i. Age
   ii. Sex
   iii. Weight
   iv. Allergies
   v. PMH
d. Pre-Hospital Information:
   i. Mode of transportation
   ii. Treatment prior to arrival
e. Initial Patient Exam:
   i. Initial “Trauma Score”
   ii. Initial VS
   iii. Includes manual BP, HR, RR, SaO2, EtCO2 (if applicable), cap refill, pupil size and reactivity, and core body temperature
   iv. Primary exam and interventions to address deficits
   v. Secondary exam and interventions to address deficits
f. Input and Output:
   i. Includes IV fluids, blood products, NGT/OGT output, urine output, etc
g. Medications:
   i. Include dose, route, and time administered
h. Work-Up:
   i. Document any lab work or radiographical studies (time ordered, time to, and time completed)
i. Vital Signs:
   i. Level I traumas: record VS q5m x 4, q15m x 4, q30m x 4, then q1h until otherwise ordered.
   ii. Level II traumas: record VS q15m x 4, q30m x 4, then q1h until otherwise ordered.
j. Disposition:

i. Time and transfer location must be documented on every trauma patient in the "Disposition" portion of the narrator.
ii. Spinal immobilization status must be documented in the "Disposition".
iii. "Critical Care Nursing Time" and a "Revised Trauma Score" should be completed on every trauma patient.

3) The Trauma History and Physical will be completed by the admitting Trauma Intern with contributions from the Trauma Senior Resident, Trauma Fellow, or Trauma attending.
4) Specific information required in H&P includes:
    a. Mechanism of injury
    b. List of known injuries and actions
    c. Names of consulting physicians and services, as well as recommendations made
    d. Grade all injuries (see appendix of manual)

Guidelines for Patient Admission/Transfer

Purpose:

To clearly define criteria for admission to and transfer from the trauma service so that specialized patient care is appropriately delivered.

Patient Criteria:

1) Admitted through the Pediatric Emergency Department for traumatic injury requiring hospitalization.
2) Most Level I and Level II patients will be admitted to the Trauma Service. After 24 hours the Trauma Service may elect to transfer the patient to a specific surgical specialty service, provided the patient is hemodynamically stable and has an isolated, single system injury (e.g., CHI or femur fracture). Patients may be admitted to a surgical specialty service if approved by the trauma attending. The Trauma Service will be able for consultation throughout the patient's admission.

Admission/Transfer Rules:

1) It is mandatory that physician to physician communication occurs with any trauma transfer. The pediatric surgery fellow or senior resident will confirm patient acceptance.
2) Daily attending to attending communication between all surgical services and PICU services is mandatory.

Backup Trauma Procedure

Purpose:

To assure availability of trauma care personnel for trauma call and indicate status of trauma readiness for trauma surgery.

Trauma care personnel involved:

1) Attending Pediatric Surgeon on Trauma Call
2) Senior Surgical Resident (PGY3 or PGY4) on Trauma Call
3) Surgical Intern on Trauma Call

Procedure:

- Pediatric Trauma Surgeon: When the pediatric trauma surgeon on call determines she/he cannot meet Level I trauma activation response time guidelines, the surgeon will contact the backup trauma surgeon on call from the call schedule published in the Synergy by the Department of Pediatric Surgery. The pediatric trauma surgeon will notify the backup surgeon needs to respond to Level I trauma activations and perform the duties of trauma attending surgeon until relieved.

Example of need for trauma surgeon back-up activities:

- Member (attending and/or fellow) of pediatric trauma service is actively engaged in an operation and/or emergent surgical procedure that is expected to last more than 15 minutes and/or is unable to respond to Level I activation.

Specialty Service Guidelines

Purpose:

The multi-injured trauma patient often requires coordination of several hospital services for optimal patient care and outcomes. The purpose of this guideline is to define the relationships and responsibilities of the Trauma Service and each specialty service.

Responsibilities for all specialty consulting services: (Orthopedics, Neurosurgery, Plastics, FACE, ENT, Vascular)

1) The trauma team initiates a prompt consultation of specialty services as indicated by patient injuries, including the time of consult call.
2) All consulting services communicate through daily progress notes regarding patient condition and plan. Verbal communication is required from the consultant to the trauma fellow or senior resident if there is a change in the patient care plan.
3) Trauma Service writes all orders for patients not in the ICU. If the patient is hemodynamically stable, and ongoing care is isolated to a specialty service, the Trauma Service may decide to transfer primary care to that surgical service.
4) Clear discharge instructions and specific follow up plan should be communicated between services. Names and pager numbers of residents and attending staff will be documented in the chart.

Scheduling Emergent Trauma Cases

The Operating Room is open and staffed 24 hours a day, 365 days of the year. There are 2 teams available.

Level 1 Emergency (Emergent):

Critical condition which is an immediate threat to life, permanent organ damage, limb loss or possible imminent loss of functionality (i.e., paralysis). To be placed immediately in any unoccupied room. The case is expected to arrive imminently and will go directly to the designated room upon arrival. Must be in the OR in 15 minutes or less from the time of boarding the procedure.

Services boarding Level 1 emergencies must transport the patient to the OR. The attending surgeon is expected to arrive in the OR with the patient and actively participate in the procedure from the start until the clinical situation has been stabilized. The attending surgeon is expected to notify the AIC personally of any Level 1 case and confirm the operation to be done, with an exception for any situation where the attending is unable to do so because (s) he is actively involved in resuscitating the patient. The OR Board notifies the Attending Surgeon whose case is being bumped by a Level 1 case. The OR Board notifies Holding Room shift leader of bumped patient status and preliminary plan to realign bumped patient into schedule.

Examples: Hemodynamic instability, shock / active bleeding, airway obstruction, intracranial injury with imminent herniation, GSW to chest or head, severe cardiorespiratory decompensation.

Level 2 Emergency (Urgent)

The attending surgeon believes the patient's condition will deteriorate significantly if the procedure is not done urgently. The case should start as soon as possible, and in any event, no later than 2 hours from boarded time. The patient will be sent for immediately. The case will be placed preferentially in the room of same surgeon or service.

The attending surgeon is expected to notify the AIC personally of any Level 2 case and confirm the operation to be done. The Attending Surgeon must speak with the AIC directly to assure communication about the patient's needs and the surgical plan. If a resident calls to schedule a Level 2 emergency, the board will accept the information and send for the patient at once but list the case as a Level 3 until the attending surgeon communicates with the OR Board and AIC. The attending boarding Level 2 emergencies is also expected to inform the attending surgeon(s) of any cases being bumped. When there are multiple case changes from the placement of an emergency case, the OR Board and AIC should help facilitate communication to the various attending surgeons whose cases have been changed.

Examples: Acute spinal cord compression, bladder rupture, traumatic bowel perforation, compartment syndrome, embolization for acute hemorrhage, ischemic limb/cold extremity (compromised arterial flow), Open globe, replant fingers, hand, or arm, Vascular compromises.

Level 3 Emergency (Urgent)

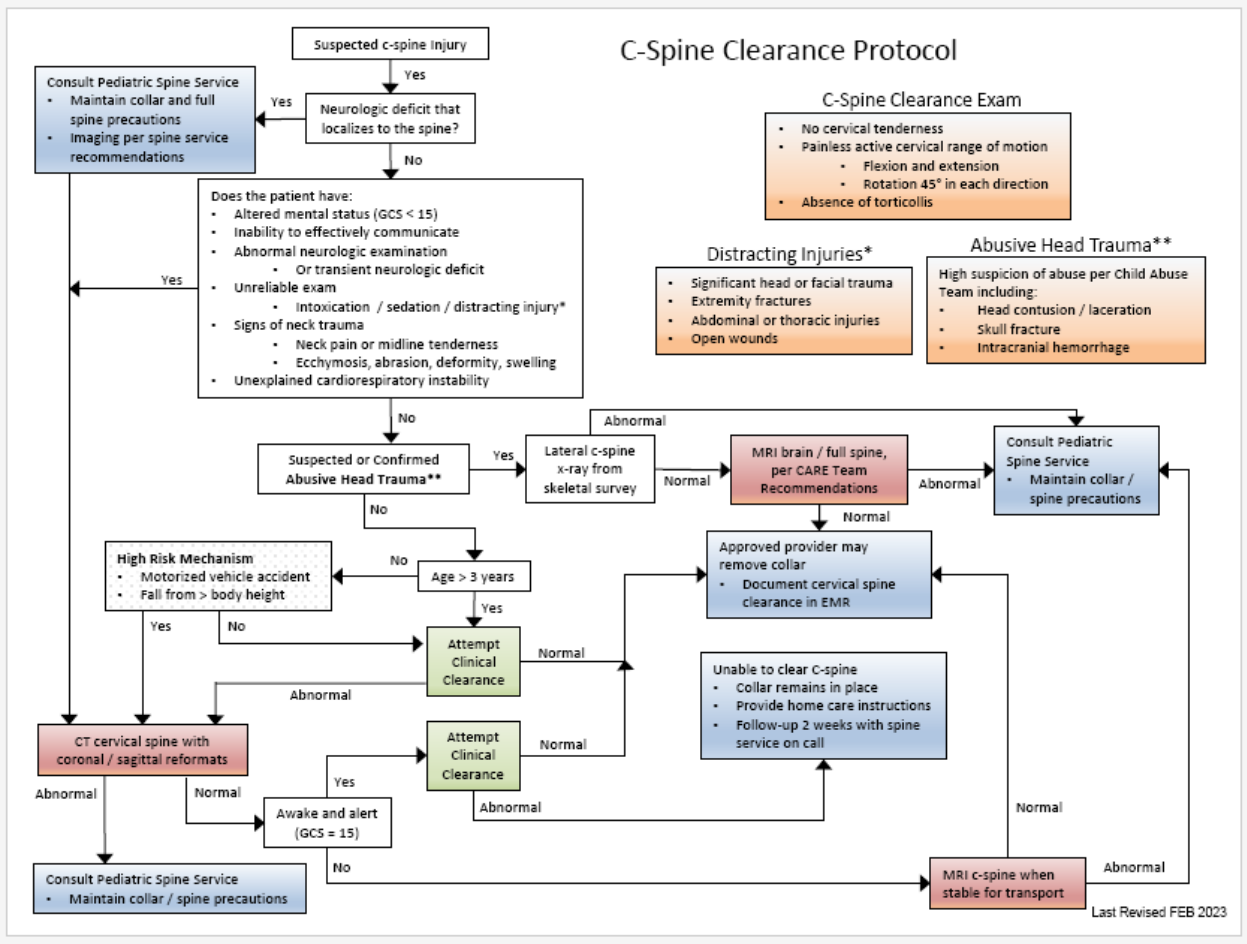
The nature of condition is time sensitive but not emergent and permits delay of surgery of up to 6 hours. The patient will be sent for well in advance of 6 hours and may be sent for immediately if an open room is available at the time the case is boarded. Case to go preferentially in room of same surgeon/service.

Attending of the Service boarding the Level 3 emergency must inform the attending surgeon of any case being bumped. They must also communicate with the AIC.

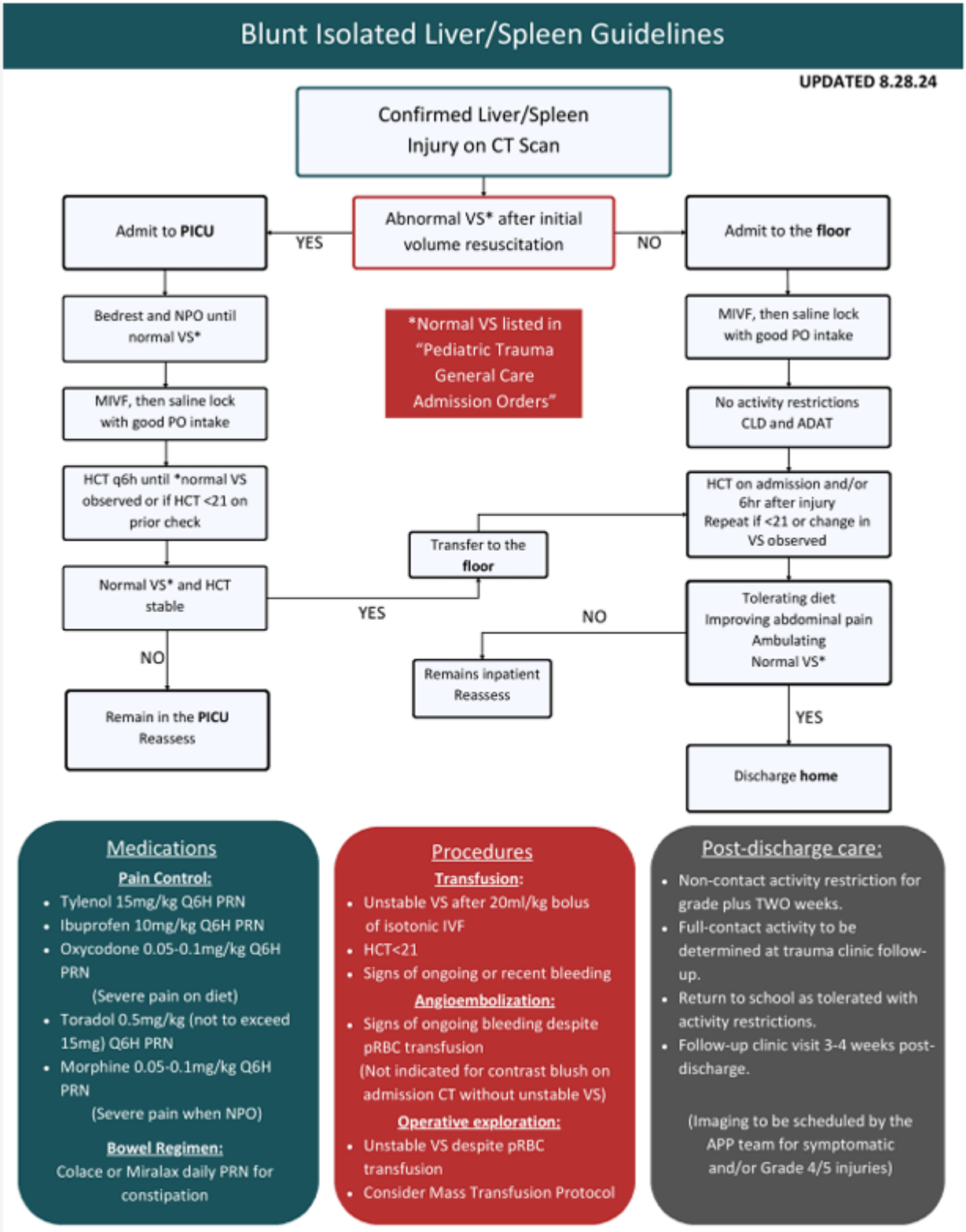
Examples: Massive soft tissue injury, traumatic dislocation of hip, unstable neurosurgical condition, fracture grade III

Chapter 3: Trauma Clinical Practice Guidelines

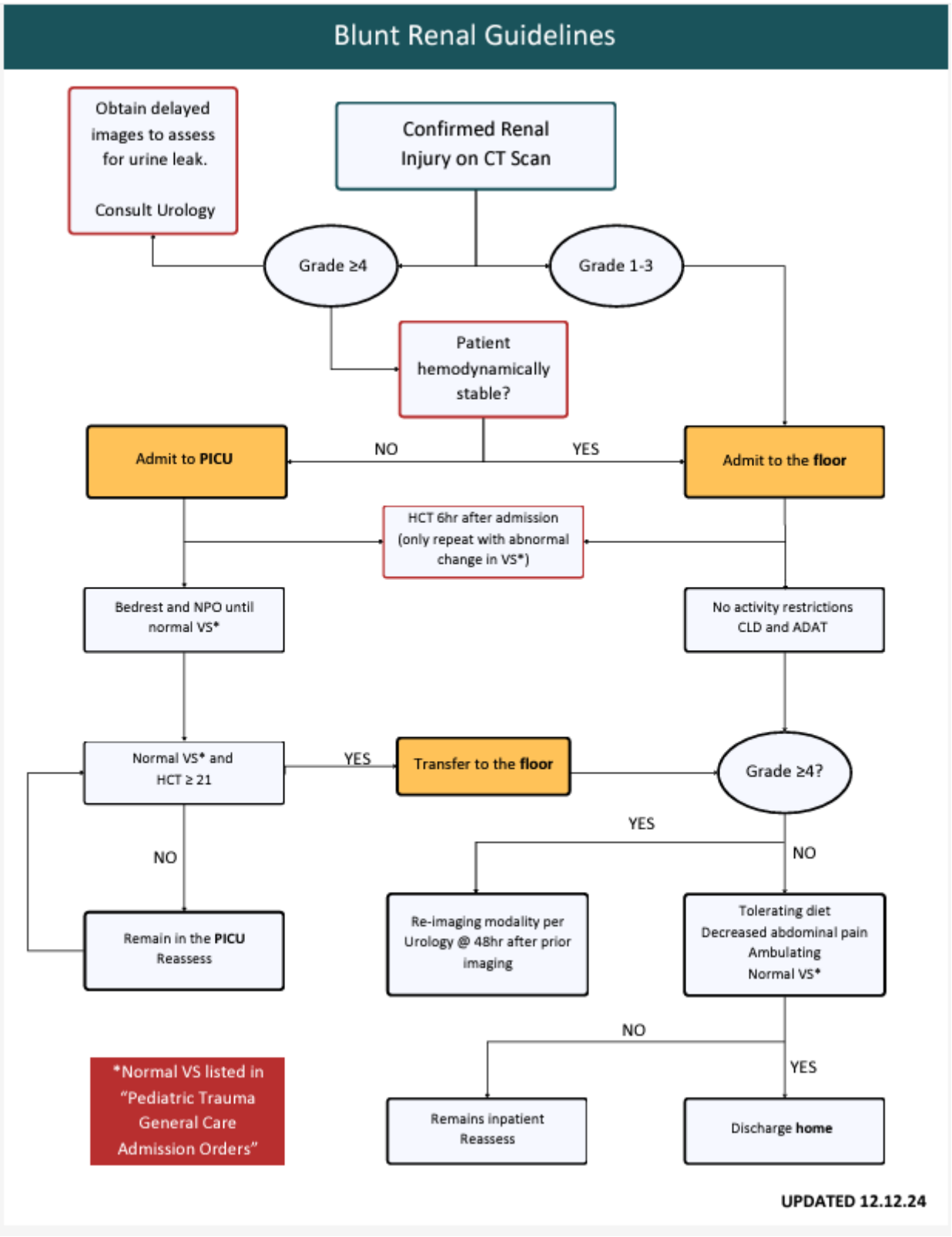
C-Spine Clearance Protocol



Blunt Isolated Liver/Spleen Guidelines



Blunt Renal Trauma Guidelines



Blunt Renal Guidelines

Medications

Pain Control:

- Tylenol 15mg/kg Q6H PRN
- Oxycodone 0.05-0.1mg/kg Q6H PRN (Severe pain on diet)
- Morphine 0.05-0.1mg/kg Q6H PRN (Severe pain when NPO)

Bowel Regimen:

Colace or Miralax daily PRN for constipation

Procedures

Transfusion:

- Unstable VS after 20ml/kg bolus of isotonic IVF
- HCT<21
- Signs of ongoing or recent bleeding

Angioembolization:

- Signs of ongoing bleeding despite pRBC transfusion

(Not indicated for contrast blush on admission CT without unstable VS)

Operative exploration:

- Unstable VS despite pRBC transfusion
- Consider Mass Transfusion Protocol

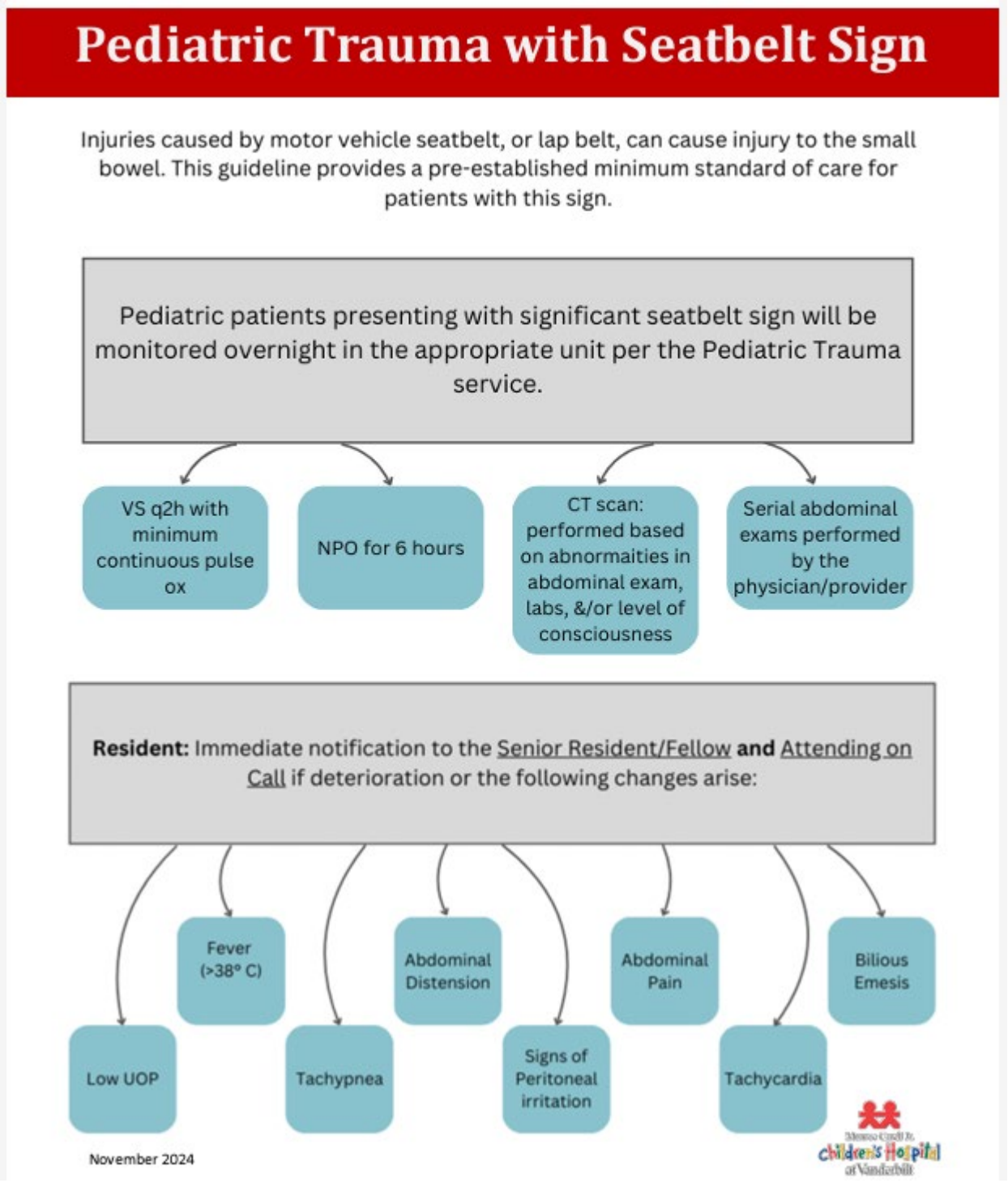
Operative Stent or Catheter:

- Treatment of ongoing urine leaks

Post-discharge care:

- Non-contact activity restriction for grade plus TWO weeks.
- At completion of restrictions, Gr 4-5 must be cleared by PCP prior to returning to full-contact activity.
- Return to school as tolerated with activity restrictions.
- Non-operative renal injuries Gr1-3 to follow up in Trauma Clinic in 4 weeks for physical exam and blood pressure checks.
- Gr 4-5 or operative renal injuries to follow-up in Urology Clinic in 4 weeks for physical exam, blood pressure checks, and possible further testing to be determined by the Urology Service.

Pediatric Trauma with Seatbelt Sign



Mass Transfusion Protocol:

I. Purpose:
   a. To outline a standard process for safe, rapid preparation, delivery, and administration of blood products for patients experiencing massive hemorrhage.
   b. To provide guidance on the conservation of blood components while ensuring the safe and rapid administration of blood products.

II. Definitions:
   a. Massive transfusion is defined as the replacement of the patient's total blood volume over a 24-hour period or actual/anticipated administration of
      i. >40mL/kg PRBC for pediatrics in 2 hours or less.
      ii. >10 u blood products in 24 hours in adults

III. Specific Information:
   a. Massive Transfusion Protocol (MTP) should be considered for cases of massive blood loss with profound hemorrhagic/hypovolemic shock or conditions of disseminated intravascular coagulopathy (DIC).
      i. In the setting of massive transfusion, blood cells and other blood components (platelets, plasma, and fibrinogen) will become depleted, and ongoing laboratory monitoring (platelet count, prothrombin time, and fibrinogen level) will be necessary to replace these appropriately.
      ii. Commonly accepted age-specific blood volumes:
         1. Preterm infant: 90 - 100 mL/kg (may adjust for VLBW infants and gestational age).
         2. Term infant <3months: 80 - 90 mL/kg.
         3. Child >3months: 70 mL/kg.
   b. Indications for initiation of the MTP include severe blood loss (Class III/IV hemorrhagic shock with blood loss greater than 30-40% blood volume) with no imminent end to the bleeding. Actual hemorrhage does not have to occur before the determination is made to activate MTP. Anticipated large-volume blood loss is an appropriate MTP activation criterion.

IV. Patient Selection
   a. Patients with current, ongoing, or impending massive blood loss should be considered for activation of MTP.
   b. Activation of MTP should be strongly considered for adult patients who receive more than two units of blood products in the ED or who have an Assessment of Blood Consumption (ABC) score of 2 or greater.
      i. For pediatrics, an ABC-D score of 2 or greater prompts consideration of MTP activation.

ABCD SCORING			
Component	**No**	**Yes**	
*Penetrating mechanism	0	1	
Positive FAST	0	1	
*Elevated SIPA (Shock Index Pediatric Adjusted)	0	1	SIPA = Heart Rate/Systolic Blood Pressure □ 1-6yrs: ≥1.2 □ 7-12yrs: ≥1.0 □ >12yrs: ≥0.9
Lactate ≥3.2	0	1	
Base deficit ≤ -6.9	0	1	
Total Score			Score of **2** or higher to trigger activation of Massive Transfusion Protocol
Utilize prehospital mechanism and vital signs to determine need prior to arrival			

V. Procedures:

a. Activation

i. Upon identification of need, the attending physician or designee places an order for MTP via eSTAR.

ii. Note: Verbal MTP activation is allowable only when electronic MTP order entry is impossible due to patient condition or eSTAR downtime. ALL verbal MTP activations require subsequent eSTAR MTP orders to be placed by the provider or designee. Order MTP in eSTAR and call the blood bank to confirm.

iii. The Blood Bank may be called to confirm the MTP order was received.

iv. The following patient information is provided (electronically or verbally) to the Blood Bank:

1. Name (this may be an assigned STAT name)
2. Medical record number (MRN)
3. Sex
4. Approximate age (required to identify females of likely childbearing age)
5. For pediatric patients: Approximate weight (or < 40kg or >40 kg)
6. Location
7. Name of attending physician who initiated MTP. Note that when a surgical fellow activates MTP, the name of the attending is also required.

v. Type and Screen sample and ABO Verification sample (if indicated) is collected within 15 minutes of the MTP activation (if not already collected).

1. Each sample must be obtained with a minimum of 2 mL in accordance with VUMC policy, Blood Product Administration. This

sample cannot be diluted or drawn from a site with active infusion/transfusion running distally.

b. Cycle Process
    i. The Blood Bank reads back the information provided to the caller and announces the MTP verbally in the Blood Bank.
        1. The First cooler is ready within 10 minutes of the activation time and contains uncrossmatched trauma products based on the provided information. Subsequent coolers will be ready within 30 minutes from the previous cooler being picked up.
        2. Platelets and Cryoprecipitate cannot be infused with a rapid infuser or fluid warmers.
    ii. Coolers are set up with the product following amounts based on the type of MTP requested and available patient information:

Patient Weight	RBC	Plasma	Platelets
Patient <40 kg	2	2	1 (odd cycles only)
Patient ≥40 kg	4	4	1

    iii. At the discretion of the attending physician, consider these pharmacological interventions:
        1. Calcium repletion
            a. With each MTP cooler administration; or
            b. Ionized calcium of <1 mmol/l per the laboratory or <4mg/dL per POC VBG.
        2. Administration of Tranexamic Acid
        3. Administration of Prothrombin complex concentrate or other reversal agents of therapeutic anticoagulation
    iv. Cooler pickup and return.
        1. Blood products for MTP and any products prepared in a cooler are retrieved from the Blood Bank by a member of the receiving department's personnel.
        2. The transporting staff member (runner) presents a patient identification label which includes at least two identifiers and participates in a readback to verify patient identity prior to the release of the cooler.
        3. A verbal readback is performed at the Blood Bank window to verify the correct cooler is being picked up. Note: MTP may be running concurrently in multiple units/areas for multiple patients.

4. Returned coolers are given to the Blood Bank technologists and the time of return is noted on the MTP form.
    a. Unused products MUST be returned with the cooler they arrived in.
    b. Products waiting to be transfused remain in a closed cooler until needed.
    c. Marking the unit label or bag in any way is prohibited.
    d. Platelets and cryoprecipitate are never placed inside or on top of coolers.
5. The Blood Bank prepares the next cycle upon pickup of the current cycle.
    a. MTPs are not placed "ON HOLD;" when each current cycle is picked up, the next cycle is prepared and awaits pickup. This cycle preparation continues until the MTP is discontinued.
6. MTP coolers are intended to be given in their entirety until completed. If all products are not desired, strong consideration should be given to MTP discontinuation. A la carte blood products can be ordered upon MTP discontinuation.
7. When MTP cooler #5 is delivered, the designated team member receiving the cooler announces its arrival by stating, "MTP cooler number 5," prompting a multidisciplinary discussion on clinical futility.
    a. Attending physicians will, at this point, lead a discussion on the patient's overall clinical status, salvageability, and current status of hemorrhage control. Based on these factors, the attending physician(s) will decide whether to continue MTP or consider cessation of efforts based on futility.

VI. Laboratory Sample Collection and Patient Monitoring

a. Active monitoring of patient lab values: Consider every 30-60 minutes during the MTP event and at discontinuation if appropriate:
    i. CBC
    ii. Coagulation profile
    iii. Ionized calcium
    iv. Arterial blood gases (to include full panel if able)
    v. Vital signs (heart rate, blood pressure, respiratory rate, and temperature) are to be obtained and documented for each unit of product given.

b. Vitals should be captured at a minimum of 15-minute intervals.
c. Continuous temperature monitoring is preferred due to the risk of hypothermia and subsequent coagulopathy.

VII. MTP Discontinuation
a. The most reliable transfusion endpoint is a collaborative decision based on achieving hemorrhage control (operative field examination), laboratory results, and clinical parameters.
i. The attending physician must be aware of and in agreement with the decision to discontinue MTP.
1. The following indications for deactivation are considered:
a. Systolic Blood Pressure (SBP):
i. Greater than 70 plus (age in years x 2) in pediatric patients
ii. MAP > 60mmHg in adult patients
b. INR less than 1.5
c. Blood pH greater than 7.2
d. Improving base deficit
e. Urine Output (UOP) greater than 0.5mL/kg/hr
f. Improved clinical exam
g. Resuscitation is futile
h. Bleeding has been controlled
2. It is the responsibility of the Trauma Surgeon for trauma patients and the attending physician for non-trauma patients to terminate the MTP.
3. The physician or designee notifies the Blood Bank immediately when the MTP has been discontinued by completing the order in eSTAR (preferred) or calling the Blood Bank (downtime only).
ii. Premature discontinuation of MTP should be avoided to minimize catch-up reactive transfusions.

VIII. MTP Documentation
a. The following is required to be documented for each unit given:
i. Start time
ii. Stop time
iii. Volume
iv. Dual verification signatures
v. Acknowledgment of deferral of informed consent and patient education per emergent situation
vi. Expiration verification

vii. Vital signs (may indicate they are captured elsewhere, such as eSTAR or code sheet)
viii. If a transfusion reaction occurred (on the back of the TAR)

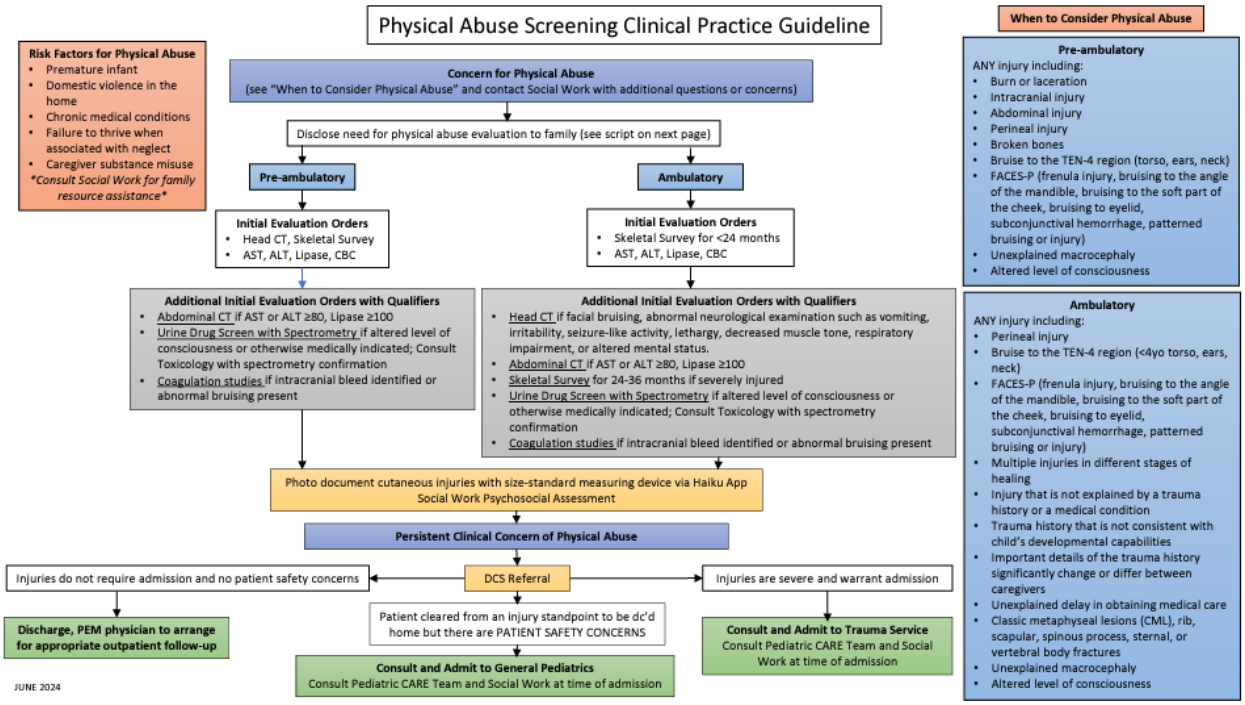
b. Where to document:
   i. Uncrossmatched “Trauma” units issued under the “Trauma, Two” name, that is, they do not have the patient’s name on them, are documented on the TAR. When complete, the TARs are uploaded into the EMR.
   ii. Units issued with the patient's name on the TAR can be documented in the EMR using the standard process when and where resources are available to do so at the time of transfusion as part of the dual verification process. Reference Blood Product Administration Procedures (SOP).

c. The total volume of each type of blood product is documented in the EMR. If using the TAR and vital signs are captured elsewhere, indicate “see EMR” or “see code sheet” in the vitals section of each TAR.

IX. Quality Review and Improvement

a. Unused products are returned promptly to the Blood Bank with the cooler they were issued.
b. Regular review and performance monitoring is ongoing based on current recommended practices and guidelines, not limited to and subject to change:
   i. Utilization metrics
   ii. Waste of products
   iii. Time to prepare the first and second cycles
   iv. Time interval to crossmatch availability
   v. Compliance with the call to discontinue
   vi. Stewardship of products

Non-Accidental Trauma Recognition



DISCUSSING THE PHYSICAL ABUSE WORK-UP WITH THE FAMILY – EXAMPLE SCRIPT

"Any time a child of this age comes to the hospital with [this injury/these injuries], we evaluate for other injuries. Sometimes a child can have internal injuries, such as broken bones, head injury, or abdominal injury that we cannot see on the outside. Just like you, we want to make sure that your child is okay, so it is important that we do this testing. These tests include _____. As a part of this evaluation, we will also have our Social Worker come talk with you. By law, we are obligated to report any concern for abuse to Department of Children Services. This is a standard part of our evaluation. We are happy to answer any questions or concerns along the way."

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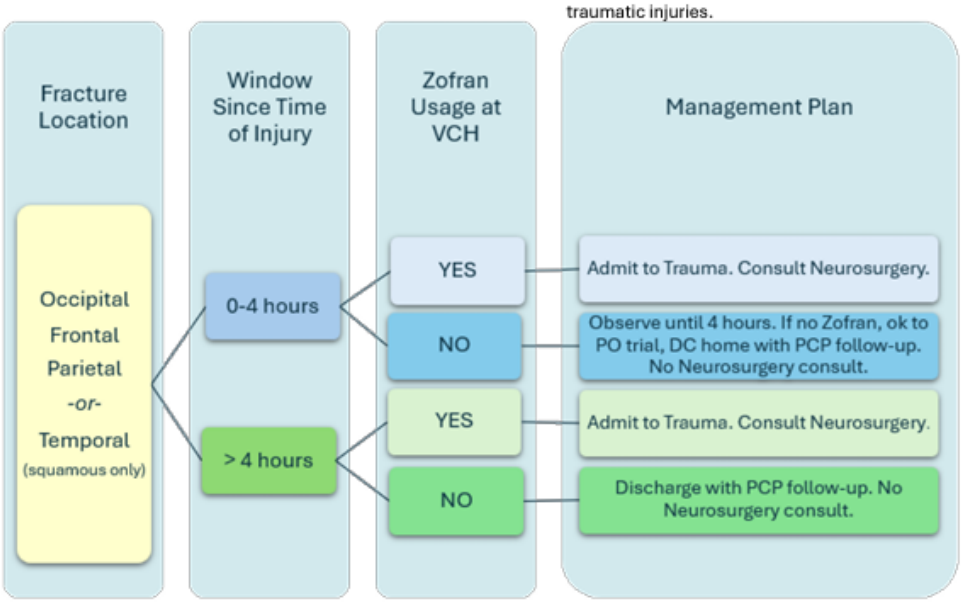
Isolated Linear Skull Fractures

Isolated Linear Skull Fractures

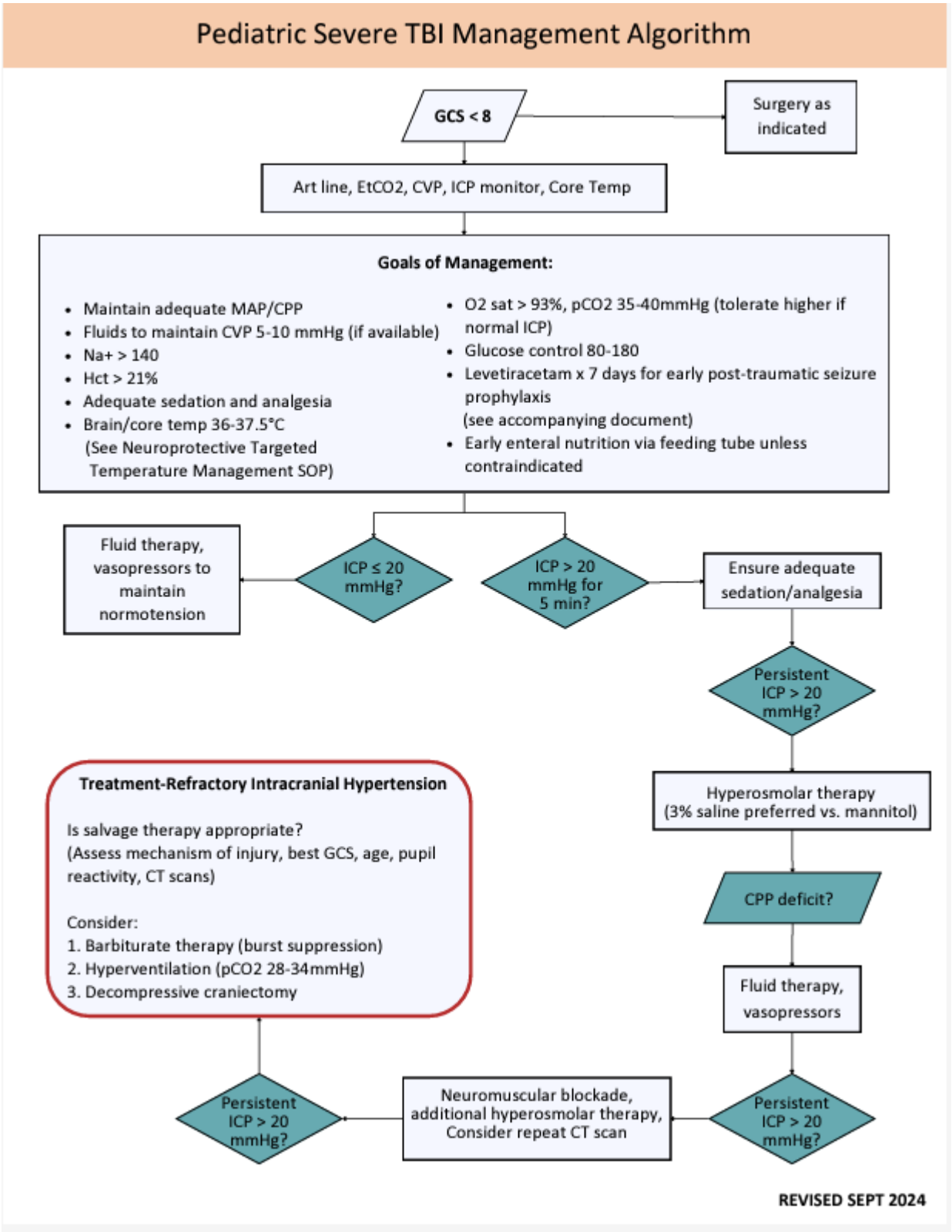
Isolated Linear Skull Fracture: defined as a non-depressed skull fracture without intracranial findings and no other traumatic injuries.



⇒ The temporal bone with 4 parts: squamous, petrous, tympanic, & mastoid.
⇒ **Only squamous temporal bone fractures apply** to this protocol.
⇒ **CARE team** to involve Neurosurgery as needed in cases of suspected **non-accidental trauma.**
⇒ Zofran use refers to IV or PO administration **at Vanderbilt.**
⇒ Patients with **multiple traumatic injuries** are **excluded** from this protocol and should receive Neurosurgery consult.
⇒ If a faculty member is concerned about a patient's exam or management according to the protocol, consult Neurosurgery.

SEP 2024

Severe Traumatic Brain Injury Management



Pediatric Severe TBI Management Algorithm

Check

- Patient position: head neutral, HOB 30°
- Cervical collar: appropriate size, fit
- Equipment functioning: good waveform
- No recent interventions
- Exclude seizure activity: EEG as indicated

CSF Drainage Options

- Not possible if ICP monitor used and not EVD
- EVD management per Peds NSGY

Fluid therapy, Vasopressors

- CPP should be maintained > 40 mmHg at all times, or above higher age-based targets while receiving ICP-targeted interventions
- Bolus with NS as needed to achieve euvolemia
- Once euvolemic, use inotropic/vasopressor support as indicated

Sedation/Analgesia/Sz Prophylaxis

- First 24 hours: remifentanil infusion
- After first 24 hours: fentanyl, hydromorphone, or morphine infusion titrated for exam. Add dexmedetomidine, ketamine, and/or midazolam infusion as needed
- Avoid hypotension
- Once sedation/analgesia is adequate, minimize boluses of fentanyl or midazolam
- Consider neuromuscular blockade for ICP > 20 mmHg refractory to other therapies

CPP Targets by Age

Age (yrs)	CPP (mmHg)
<1 year	45
1-4 years	50
5-7 years	55
>7 years	60

Hyperosmolar Therapy

- **3% Saline** 5-10 cc/kg bolus over 5-10 min.
- If needed, start 0.5 mEq/kg/hr (1 ml/kg/hr), titrate as needed for goal Na 150-160

- **23.4% Saline**, 0.5cc/kg bolus over 10 min.
- Must be infused through central line.

- **Mannitol** 0.25-0.5 g/kg for rescue therapy only when Na 150-160, serum osmolarity < 320, and ICP > 20 mmHg for 5 min

REVISED SEPT 2024

Seizure Prophylaxis in Pediatric Severe Traumatic Brain Injury

Division of Pediatric Critical Care Medicine
Department of Pediatric Surgery
Department of Neurological Surgery
Division of Pediatric Neurology

Rationale

Prophylactic anti-epileptic drugs are suggested in the 3rd Edition of the Guidelines for the Management of Pediatric Severe Traumatic Brain Injury (TBI) for the prevention of early posttraumatic seizures (PTS) within 7 days of injury[1]. This guideline is based on 2 retrospective studies. The first study from 1993 noted that children with severe TBI who were placed on prophylactic phenytoin had a 15% incidence of early PTS compared to 53% in children who received no seizure prophylaxis[2]. In 2011, a second retrospective study demonstrated that seizure prophylaxis administration in their cohort was associated with a significantly decreased odds ratio of developing early PTS[3]. Two subsequent studies have studied the use of levetiracetam for the prevention of early PTS[4,5]. Neither of these studies provided sufficient evidence to support a recommendation for a specific prophylactic agent. However, the effect of phenytoin on cognitive recovery following brain injury has been questioned. Levetiracetam does not appear to interfere with cognitive recovery, requires no therapeutic monitoring, and has a favorable side effect profile.

Practice Management Guideline

Indications

Pediatric patients with severe traumatic brain injury (post-resuscitation Glasgow Coma Score 3-8) should receive levetiracetam for early PTS prophylaxis.

- Therapy should not continue beyond 7 days unless documented seizure activity, Neurology has been consulted, or continuing home medications for a known seizure disorder.

Exception

- Hypersensitivity or previous adverse reaction to levetiracetam
- Pre-existing seizure disorder

If seizure prophylaxis is omitted based on an Exception, please document on the inpatient problem list and/or daily progress notes.

Prophylaxis dosing

- Levetiracetam 20mg/kg (max 1g) IV/enteral load → 10mg/kg (max 500mg) IV/enteral q12h x 7 days
- Levetiracetam can be converted to the enteral route at the same dose as the IV route
- Please consult Pharmacy for dosing recommendations in the setting of decreased renal function

Follow-up

- If seizure activity is documented at any point in the continuum of care, a Neurology consult should be placed to ensure long-term management.

Appendices

Glasgow Coma Scale

Eye Opening			Verbal Response			Motor Response		
> 2 yrs		≤ 2yrs	>2 yrs		≤2 yrs	>2 yrs		≤2 yrs
Spontaneous	4	Spontaneous	Oriented	5	Coos, Babbles	Obeys Commands	6	Normal, Spontaneous
To Voice	3	To Speech	Confused	4	Irritable, Cries	Localizes Pain	5	Withdraws to Touch
To Pain	2	To Pain	Inappropriate	3	Cries to Pain	Withdraws to Pain	4	Withdraws to Pain
None	1	None	Incomprehensible	2	Moans to Pain	Flexion to Pain	3	Abnormal Flexion
			None	1	None	Extension to Pain	2	Abnormal Extension
						None	1	None
Eye Opening =			Verbal =			Motor =		
TOTAL = /15								

The GCS can be used to monitor a child's level of consciousness during both the pre-hospital and hospital care. The score ranges from 3 to 15. A higher score represents a higher level of consciousness. It is preferable to document the score on each measure of response, rather than just giving the total score.

SBIRT

All trauma-related patient admissions 13 years and older will have a brief screening conducted and documented by either a trained Social Worker (SW) or Advance Practice Provider (APP). When indicated, a referral to treatment will be made.

Admission Process:

1. Admission orders for Trauma, Orthopedics, and PEDS PICU Trauma now include a hard stop for patients ages 13 years or older in the laboratory section.
    a. The ordering provider will be asked a question regarding whether the admission is related to an "injury" or a "medical" issue.
    b. If "injury" is selected, EPIC will then take into consideration the ED length of stay and order an ethanol level for ED length of stay (LOS) <5hrs and SW consult for SBIRT/CRAFFT screening for those with ED LOS ≥5hrs.

Screening Procedure:

1) Ethanol Testing:
    a. If an ethanol level is ordered, the lab is to be drawn immediately so that it may reflect an accurate level. This lab is a dark green top and should be drawn like all other lab work.
    b. If the caregiver asks what the lab is, it should be relayed that the lab is part of a national injury admission baseline screening. There is no associated cost.
2) CRAFFT: For patients meeting criteria, SW or an APP conduct an interview (preferably private) with the patient utilizing the CRAFFT Screening Tool.
    a. CRAFFT is a mnemonic acronym for first letters of keywords in the six screening questions. The questions were developed to screen adolescents for high-risk alcohol and other drug use disorders simultaneously, specifically looking at the past 12 months.
    b. Screening using the CRAFFT begins by asking the adolescent to "Please answer these next questions honestly".
    c. Telling him/her "Your answers will be kept confidential"; and then asking three opening questions.
    d. If the adolescent answers "No" to all three opening questions, the provider only needs to ask the adolescent the first question - the CAR question.
    e. If the adolescent answers "Yes" to any one or more of the three opening questions (Part A), the provider asks all six CRAFFT questions (Parts A and B). Questions should be asked using the exact wording provided. i. ii. iii.
        i. Part A: During the PAST 12 MONTHS, did you:
            1. Drink any alcohol (more than a few sips)?
            2. Smoke any marijuana or hashish?
            3. Use anything else to get high? ("Anything else" includes illegal drugs, over-the-counter and prescription drugs, and things that you sniff or "huff")

            * If the patient answers NO to ALL questions, answer only the first question in part B and select N/A for the remaining questions.
        ii. Part B
            1. Have you ever ridden in a CAR driven by someone (including yourself) who was "high" or had been using alcohol or drugs?
            2. Do you ever use alcohol or drugs to RELAX, feel better about yourself, or fit in?
            3. Do you ever use alcohol or drugs while you are by yourself, or ALONE?
            4. Do you ever FORGET things you did while using alcohol or drugs?

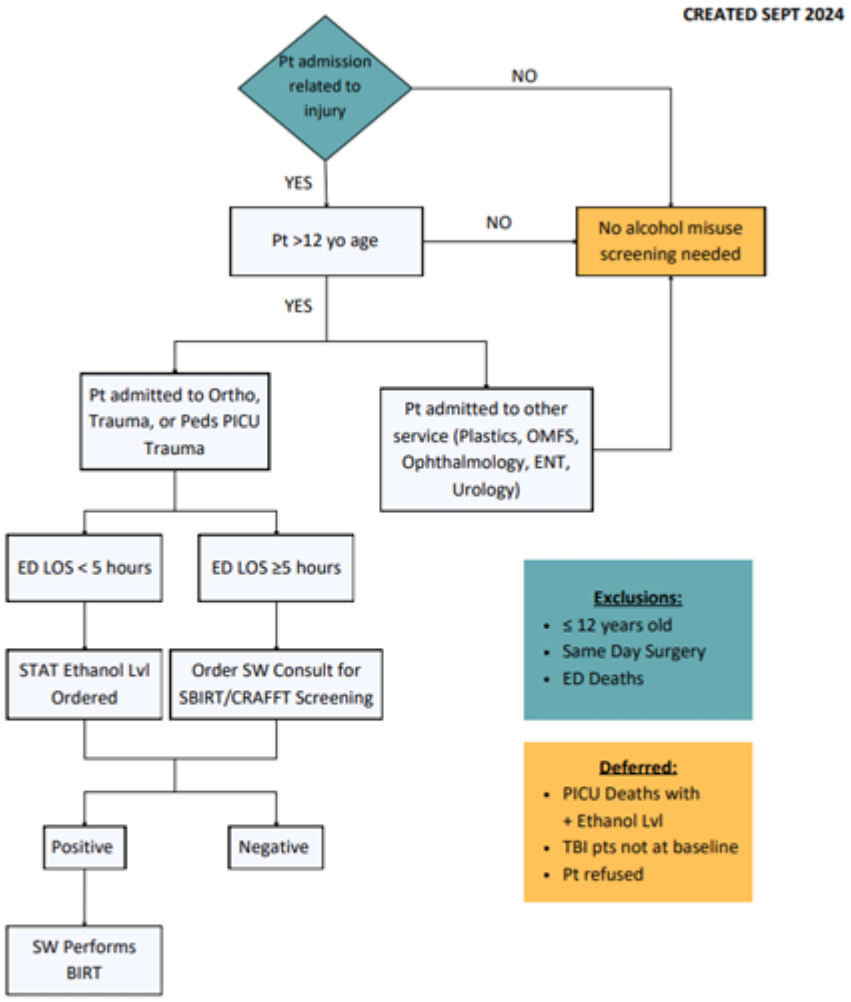
5. Do your FAMILY or FRIENDS ever tell you that you should cut down on your drinking or drug use?
6. Have you ever gotten into TROUBLE while you were using alcohol or drugs?

iii. If the patient answers “no” to the questions in Part A, then they are only asked question 1 in Part B.
iv. If the patient answers "yes” to any of the questions in Part A, then they are asked all the questions in Part B.
v. If the patient answers “yes” to less than one question, SW or APP provides the patient with positive reinforcement.
vi. If the patient answers “yes” to more than one question, SW is responsible for providing a brief intervention.
    1. Brief intervention talking points:
        a. Review – screening results
        b. Recommend – not to use
        c. Riding/driving – risk counseling d. Response – elicit self-motivational statements
        d. Reinforce – self-efficacy
    2. Results of the ethanol level or CRAFFT questionnaire are protected patient information and are not to be disclosed to caregivers or law enforcement.

Screening Documentation:

1. SW or APP, using the specific SBIRT Template, enters the patient’s responses into the electronic medical record.
    a. Documentation includes: the date of screening, staff performing screening, answers to the CRAFFT questionnaire, and brief intervention notes and plan.

Alcohol Misuse Screening Algorithm



Revised: OCT 2024

Solid Organ Injury Scales

Spleen Injury Scale (adapted from the American Association for Surgery of Trauma)	
Grade	Descriptors
I	Sub-capsular hematoma (<10% surface area) Capsular laceration (<1 cm deep)
II	Sub-capsular hematoma (10-50% surface area) Laceration (1-3 cm deep)
III	Sub-capsular hematoma (>50%), ruptured Parenchymal hematoma (>5cm)
IV	Hilar or segmental vessel injury ± major (>25%) devascularization
V	Hilar injury + devascularization Shattered spleen

Liver Injury Scale (adapted from the American Association for Surgery of Trauma)	
Grade	Descriptors
I	Sub-capsular hematoma (<10% surface area) Capsular laceration (<1 cm deep)
II	Sub-capsular hematoma (10-50% surface area) Laceration (1-3 cm deep)
III	Sub-capsular hematoma (>50%), ruptured Parenchymal hematoma (>10cm) Laceration (>3 cm)
IV	Laceration - disruption of <75% of lobe or up to three segments
V	Laceration - disruption >75% of lobe, or more than three segments Juxta-venous injury (hepatic veins/inferior vena cava)
VI	Avulsed liver

Renal Injury Scale (adapted from the American Association for Surgery of Trauma)	
Grade	Descriptors
I	Contusion or non-expanding sub-capsular hematoma; no laceration
II	Non-expanding peri-renal hematoma; cortical laceration < 1 cm deep without extravasation
III	Cortical laceration > 1 cm without urinary extravasation
IV	Laceration: through corticomedullary junction into collecting system OR Vascular: segmental renal artery or vein injury with contained hematoma, or partial vessel laceration, or vessel thrombosis
V	Laceration: shattered kidney OR Vascular: renal pedicle or avulsion

Phone Numbers

Name	Pager	Phone Number
Trauma Service		
Melissa Danko	615-835-9017	615-936-1050
Joseph Fusco	615-835-5140	615-936-1050
Maggie Gallagher	615-835-7400	615-936-1050
Eunice Huang	615-835-0226	615-936-1050
Bo Lovvorn	615-835-0318	615-936-1050
Walter Morgan	615-835-7404	615-936-1050
Jamie Robinson	615-835-1960	615-936-1050
Jefferey Upperman	615-835-4143	615-936-1057
Irving Zamora	615-835-1412	615-936-1050
Trauma NP/PA	615-835-7663	615-480-9510
Surgery NP/PA	615-835-8625	615-497-7629
Miscellaneous		
Peds ED		615-936-7674
Admitting		615-936-4334
OR Scheduling		615-936-2318
OR Board		615-936-0027
OR Holding		615-936-4121
OR Recovery		615-936-4009
Inpatient Pharmacy		615-322-0708
PICU Fellow		615-524-8260
PICU		615-322-0881
ECMO		615-775-5861
Blood Bank		615-322-9443
Radiology Main		615-343-2617/ 615-322-0897
Radiology Reading Room		615-343-8816
CT		615-936-4920
Fluro		615-936-4956
Pathology		615-936-4089
Family Resources		615-936-2558
VCH Social Work		615-936-2113
Interpreter Services		615-322-7378
Spanish Interpreter	615-835-0507	
Surgery Scheduler		615-936-5379
Trauma Program Director	615-835-8098	615-936-7074