

**EL PASO COUNTY HOSPITAL DISTRICT
TRAUMA DEPARTMENT MEDICAL STAFF**

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TRAUMA PROVIDER CREDENTIALS

POLICY PURPOSE:

Provide a description of authority and process for providers to participate in the care of the trauma population.

- Granting of privileges is a Clinical Chief Department (medical staff) function overseen by the Hospital District's Board of Managers.
- The Trauma Medical Director has authority to set the qualifications for the trauma service members that are routinely involved with the care of the trauma patient.
- Review includes evaluation of trauma specific Ongoing Professional Practice Evaluation (OPPE) and applicable Focused Professional Practice Evaluation (FPPE) to include practitioner's continuing education.

REFERENCE:

American College of Surgeons-Committee On Trauma (2014). *Resources for optimal care of the injured patient*. American College of Surgeons. Chicago: IL.

RESPONSIBLE:

Trauma Medical Director (TMD)
Associate Trauma Medical Director
Assistant Trauma Medical Director
Medical Staff Services
Medical Staff
Trauma Program Director (TPD)

I. PROCEDURE:

- A. Medical Staff Services will initiate documentation of adherence to the requirements using the "Medical Staff Trauma Credentials" form.
- B. The Trauma Medical Director (TMD) or designee will complete and return the "Medical Staff Trauma Credentials" form to the Medical Staff Office.
- C. Listed below are the preliminary requirements to participate and maintain trauma privileges. Services identified with a symbol (*) have additional requirements and/or clarification outlined.
- D. Preliminary requirements include:

TRAUMA PROVIDER CREDENTIALS

- a. Privileged and credentialed within applicable department service.
 - b. All participating physicians must be in good standing with the hospital and have active admitting/practicing privileges.
 - c. Current board certification, lifetime board certification or board eligible within five (5) years of successful completion of an approved residency program. (*Anesthesiology and **Alternate Pathway).
 - d. Successful completion of an Advanced Trauma Life Support (ATLS) course within one (1) year of beginning participation on the trauma call schedule, and maintain current ATLS provider status (**Emergency Medicine).
 - e. Satisfactory completion of trauma specific OPPE (refer to attachment B).
 - f. Must obtain an average of nine (9) hours of trauma related CME hours annually or 27 hours over a three (3) year period. At least half must be obtained outside of Paul L. Foster School of Medicine and/or University Medical Center of El Paso (****Trauma Surgery and **Alternate Pathway).
 - i. Outside credit may be obtained when outside speakers present on campus.
 - ii. Provider's required trauma-related CME hours are pro-rated according to their start date.
 - g. Physician liaison, designated alternate liaison and trauma surgeons must complete a physician liaison commitment resolution every three (3) years (refer to attachment A).
- E. It is expected that physicians participating on the trauma call schedule maintain current credentials and participate in the Trauma Performance Improvement and Patient Safety process.
- F. At the discretion of the TMD, criteria outlined may be waived under extraordinary circumstances.
- G. Participation on the trauma call schedule is a privilege extended to qualified physicians by the TMD and Clinical Chief of each department.
1. *Anesthesiology:

TRAUMA PROVIDER CREDENTIALS

- a. Board Certified or Board Eligible is only required for the liaison and designated alternate liaison.
 2. **Alternate Pathway:
 - a. 36 hours of external trauma-related CME over three (3) years.
 - b. Performance improvement assessment by TMD to ensure patient outcomes compare favorably to other members of the trauma call panel.
 3. ***Emergency Medicine (EM):
 - a. Successful completion of ATLS at least once and submit documentation to Trauma Services Department or Trauma Program Director (TPD).
 4. ****Trauma Surgery
 - a. Successful completion of PALS or equivalent course within one (1) year of beginning participation on the trauma call schedule.
 - b. Annual participation in the care of approximately 30 or more trauma patients with immediate life threatening or urgent injuries otherwise categorized by an Injury Severity Score (ISS) greater than 15.
 - c. Three (3) trauma-related CME hours annually or 9 hours over three (3) years of the total required trauma-related CME hours must focus on pediatric trauma.
 - d. The TMD must have:
 - i. 36 trauma-related CME hours over three (3) years. 9 hours of the 36 must focus on pediatric trauma.
 - ii. participation in the care of approximately 35 or more trauma patients with immediate life threatening or urgent injuries (ISS greater than 15).
- F. In regards to Allied Health Professionals (AHPs) in Trauma, Orthopedics, Neurosurgery and Anesthesiology Services the requirements are:
1. Current ATLS or acquire within the first year of employment. Anesthesiology Services meets requirement with Advanced Trauma Care Nurses (ATCN).

TRAUMA PROVIDER CREDENTIALS

2. 13.5 trauma-related CME hours over three (3) years.
3. Satisfactory completion of annual OPPE process.
4. No peer review issues via the TPIPS process.

ATTACHMENTS:

- Attachment A: Physician Liaison Commitment Resolution
Attachment B: OPPE Trauma Specific Indicators

TRAUMA PROVIDER CREDENTIALS

Trauma Program Director

Date

Trauma Medical Director

Date

Revised/Reviewed

02/2000
07/2004
05/2008
12/2010
03/2014
03/2017
05/2019
02/2020
12/2020

TRAUMA PROVIDER CREDENTIALS

ATTACHMENT A: PHYSICIAN LIASON COMMITMENT RESOLUTION

Resolved, that PHYSICIAN NAME, NAME OF SERVICE Trauma Liaison, acknowledge and commit to the criteria expectations for a Level I trauma center. This includes but is not limited to credentialing, certification, continuing education and adequate involvement in performance improvement. The multidisciplinary trauma performance improvement program has the authority to evaluate care across disciplines, identify opportunities for improvement and implement corrective actions.

Printed Physician Name
Discipline Department Name Trauma Liaison

Date

Alan. H. Tyroch, M.D., F.A.C.S., F.C.C.M.
Trauma Medical Director

Date

Sandra Gonzalez, RN, MSN, TCRN
Trauma Program Director

Date

TRAUMA PROVIDER CREDENTIALS

ATTACHMENT B: INDICATORS BY SERVICE

Service	Indicators
Trauma Surgery	<ul style="list-style-type: none"> • Surgeon’s bedside presence within 15 minutes of patient arrival for level I activations. • Annual attendance to Multidisciplinary Peer Review (MPR) committee meetings. • Annual attendance to Trauma Performance Improvement and Patient Safety (TPIPS) committee meetings. • Trauma registry hospital identified events based off the National Trauma Data Dictionary. • Mortality Review: <ul style="list-style-type: none"> ○ Mortality without opportunity for improvement ○ Mortality with opportunity for improvement ○ Unanticipated mortality with opportunity for improvement
Orthopedic Surgery	<ul style="list-style-type: none"> • Liaison or Designated Alternate Liaison annual attendance to MPR and TPIPS committee meetings.
Neurosurgery	
Emergency Medicine	<ul style="list-style-type: none"> • Trauma registry hospital identified events based off the National Trauma Data Dictionary.
Anesthesiologist	<ul style="list-style-type: none"> • Response to trauma performance improvement referrals.
AHPs	<ul style="list-style-type: none"> • Per Quality Management Dept. (Surgery, Neurosurgery and Orthopedics) <ul style="list-style-type: none"> ○ Consultation Notes ○ Discharge Documentation ○ Progress Notes ○ Pre, Intra and Post-Operative/Procedure Notes (Anesthesia Services)

TRAUMA PROGRAM PERFORMANCE IMPROVEMENT PLAN

POLICY PURPOSE:

- The Trauma Performance Improvement (PI) Plan outlines the trauma program's process evaluating patient care, outcomes and measures to reduce unplanned complications.
- Trauma PI is a continuous and systematic process that analyzes data objectively and identifies opportunities through phases of the patient's care.

RESPONSIBLE

Trauma Medical Director (TMD)
Associate Trauma Medical Director (ATMD)
Pediatric Trauma Medical Director and Assistant TMD
Physicians and Allied Health Professionals (AHPs)
Trauma Program Director (TPD)
Injury Prevention and Education Manager
Trauma Service Coordinators (TSC)
Trauma Registrars
Injury Prevention and Education Division

LITERATURE REFERENCES

Committee on Trauma American College of Surgeons. (2014). Resources for optimal care of the injured patient. American College of Surgeons. Chicago:IL.

Society of Trauma Nurses. (2020). Trauma Outcomes and Performance Improvement Course Manual. Society of Trauma Nurses. Lexington: KY.

PERFORMANCE IMPROVEMENT PROGRAMS

Adult and Pediatric Trauma Quality Improvement Program (TQIP)
National Trauma Data Bank (NTDB)
Texas State Trauma Registry
Texas TQIP Collaborative
New Mexico State Trauma Registry
New Mexico Trauma Performance Improvement Committee (TPIC)
Border Regional Advisory Council (RAC)
Border RAC Trauma Systems PI Committee
Border RAC Physician Advisory Group (PAG)
Southern New Mexico Regional Trauma Advisory Council (ReTrAC)

TRAUMA PROGRAM PERFORMANCE IMPROVEMENT PLAN

Hospital Committees:

- Sub-Trauma Performance Improvement and Patient Safety (subTPIPS)
- Pediatric subTPIPS
- Trauma Performance Improvement and Patient Safety (TPIPS)
 - Adult
 - Pediatric
- Trauma Multidisciplinary Peer Review (MPR)
- Medical Staff Performance Improvement (MSPI)
- Patient Safety Committee (PSC)
- Performance Improvement Committee (PIC)
- Medical Executive Committee (MEC)
- Board of Managers (BOM)
- Trauma Program Oversight Committee (TPOC)

I. PROCESS

- A. The Trauma Program has a formal internal PI process that allows for a multidisciplinary approach beginning with problem identification, data driven analysis to resolution.
- B. The TSCs review one hundred percent of trauma patient admissions, acute transfers in/out and mortalities. Cases with identified performance improvement triggers reviewed by the TSC are brought forth to the Trauma Medical Director (TMD) and Trauma Program Director for further review (refer to Attachment A for entire process flow).
- C. Corrective actions may include the following: focused education and monitoring, revision or development of guideline/policy, counseling, enhanced resources or methods of communication, external review or referral to peer review.

II. PRIMARY LEVEL OF REVIEW

- A. The TSC will complete the initial case review for:
 - 1. All trauma admissions;
 - 2. Transfer out(s) and transfer in(s);
 - 3. Mortalities including hospice discharges;
 - 4. Emergency resuscitative procedures performed in the Emergency Department (ED), Post Anesthesia Care Unit (PACU) and/or Intensive Critical Care Units (ICUs);
 - 5. Level I and II trauma activations discharged from the ED;
 - 6. Level III trauma transfers discharged from ED.

TRAUMA PROGRAM PERFORMANCE IMPROVEMENT PLAN

7. Trauma registry PI indicators/triggers (refer to Attachment B).
- B. Initial case review identifying opportunities include participating in:
1. Daily morning report with physicians and AHPs;
 2. Daily multi-disciplinary patient rounds;
 3. Trauma Performance Outcome Assessment Tool (TPOAT);
 4. Trauma registry indicator review: National Trauma Data Standards (NTDS), TQIP and State (Texas/New Mexico);
 5. Practice management guideline compliance review.
- C. If the primary level review is completed, validating clinical care is appropriate and no provider or systems issues are identified, the case does not require additional review excluding emergency resuscitative procedures performed in the ED, PACU and ICUs.
- D. If the primary level review as determined by the TSC affirms opportunities are identified a formal referral is sent to the involved department, physician service liaison or outside agency requesting their further investigation and review of opportunity identified.
- E. The TSC will also enter identified filters into the trauma registry.
- F. Outside agency system related referrals are also sent to Border RAC Executive Director.
- G. Trauma registry will send monthly audit filters identified to TSC for follow-up.
- H. Referrals sent with returned replies are reviewed during weekly sub-TPIPS meetings with TMD, ATMD or Pediatric TMD.
- I. Department leadership, resident and/or physician service liaison are invited to subTPIPS to review case together when TMD, ATMD or Pediatric TMD requests.
- J. Referrals are reviewed with TMD and TPD. Determination is made for any of the following by the TMD:
1. Case warrants additional investigation by department involved.
 2. Acceptance of action taken and/or
 - a) Additional monitoring (for a deemed amount of time or volume based) to ensure incident does not repeat.

TRAUMA PROGRAM PERFORMANCE IMPROVEMENT PLAN

- b) No additional monitoring, case is closed.
- 3. Implement additional action to send for secondary level of review.
- K. Regional trauma system opportunities referred to Border RAC executive director are determined for secondary level of review with Systems PI Chair.

III. SECONDARY LEVEL OF REVIEW

- A. A secondary level of review is required when:
 - 1. Issues in the clinical care or when provider and/or system issue is identified.
 - 2. Emergency resuscitative procedures are performed in the ED, PACU or ICUs.
- B. The TMD's expertise and judgment determines if case warrants a Trauma Quality Case Review (QCR).
 - 1. A QCR is coordinated by the trauma office inviting providers involved in case as soon as schedule permits (optimal 24 to 72 hours).
 - 2. QCR discussions will include decisions for immediate actions and further secondary level review.
 - 3. Standing members to Trauma QCRs are:
 - a) TMD, ATMD, Pediatric and Assistant TMD
 - b) TPD and TSCs
 - c) CMO and MSPI Chair
 - d) Hospital Patient Safety Coordinator and Quality Manager and Director Risk Management (UMC and Texas Tech University Health Sciences)
 - e) Involved department physician liaison(s)
 - f) Involved department(s) leadership
 - g) Involved individual(s)
- C. The TMD's expertise and judgement determines if case should require Trauma Morbidity and Mortality (M&M) or Multi-disciplinary M&M presentation by the resident involved for educational benefits.
- D. The TMD's expertise and judgement determines if case is referred to Multi-disciplinary Peer Review (MPR). If event is systems related, TMD and TPD will determine to refer case to Adult and/or Pediatric TPIPS and TPD will present to Hospital Patient Safety committee.

TRAUMA PROGRAM PERFORMANCE IMPROVEMENT PLAN

1. MPR's purpose is to evaluate the care of the trauma patient from a clinical and systems perspective to perform interdisciplinary implementation of improvement strategies.
2. Monthly MPR cases are referred to the service liaison(s) or trauma surgeon involved by the TMD for their review prior to meeting date.
 - a) MPR committee members include service trauma liaisons (or designated alternate), TMD, ATMD, Pediatric TMD, trauma surgeons, Chief Medical Officer, TPD, TSCs, Hospital Patient Safety Coordinator and Hospital Risk Manager.
 - b) Case(s) is reviewed and discussed for determination.
 - c) Recommendations and action plans with associated re-evaluation is made when areas needing improvement are determined such as:
 - i. Judgement:
 - a. Mortality without opportunity for improvement;
 - b. Mortality with opportunity for improvement;
 - c. Unanticipated mortality with opportunity for improvement.
 - ii. Referral to TPIPS or for tertiary review.
 - iii. Teaching opportunities identified for multidisciplinary M&M or Trauma Grand Rounds.
3. Monthly TPIPS committee members are department leaders and/or designee.
 - a) There are two TPIPS committees, Pediatric and Adult.
 - i. Members are Pediatric Department leaders or designee.
 - ii. Members are Adult Department leaders or designee.
 - b) Scheduled reports are presented by participating department representative.

TRAUMA PROGRAM PERFORMANCE IMPROVEMENT PLAN

- c) Opportunities for improvement are reviewed and discussed.
- d) Case/event is either:
 - i. Closed with no further follow-up;
 - ii. Closed with continued monitoring validating actions taken resolved from event repeating;
 - iii. Referred to Patient Safety Committee.

IV. TERTIARY LEVEL OF REVIEW

A. Tertiary level of review involves case summary presentation by either the TMD or TPD pending committee.

- 1. TPD presents to Hospital Patient Safety Committee.
 - a) Patient Safety Committee determines acceptance of action taken or refers to PIC.
 - b) PIC Chair reports to the BOM.
- 2. TMD presents to MSPI committee.
 - a) MSPI determines acceptance of action taken or refers to MEC.
 - b) MEC Chair reports to BOM.

B. Annually TMD and TPD present to the Trauma Program Oversight Committee demonstrating quality measures. Members include:

- 1. CEO, COO, CNO, CFO and CMO
- 2. Physician department liaisons
- 3. Injury Prevention and Trauma Education Manager

V. QUATERNARY LEVEL OF REVIEW

A. Quaternary level of review involves external committees. This level of review occurs at a rate much lower than the previous levels of review described above.

- 1.Border RAC System PI:

TRAUMA PROGRAM PERFORMANCE IMPROVEMENT PLAN

- a) Case is reviewed between Executive Director and System PI Chair to determine scheduling a formal review with committee.
- b) Committee members include:
 - i. Participating trauma center's TMD and Trauma Program (Coordinator, Manager, Director or Hospital System Director).
 - ii. Pre-hospital agency designee and Medical Director
 - iii. Any additional hospital and outside agency designee involved in trauma system.
- c) Presentations include:
 - i. Timeline of events;
 - ii. Actions taken
 - iii. Additional committee action recommendations.

2.Southern New Mexico ReTrAC:

- a) Case is identified and presented to participating trauma center Trauma Program (Coordinator, Manager or Director) and if applicable the pre-hospital agency coordinator.
- b) Collaboratively the case is requested for presentation at the next scheduled ReTrAC meeting.
- c) Committee members include all regional participating hospital and pre-hospital representatives.
- d) Presentations are brief and include the following:
 - i. PI reason for review identifying opportunities;
 - ii. Recommended actions or actions already implemented.

VI. CONFIDENTIALITY PROTECTION

- A. Data related to quality improvement and risk management activities, such as patient information is maintained in a confidential manner.
- B. Data and patient information utilized to reduce M&M shall not be subject to discovery, subpoena or other means of legal compulsion for release to any person or entity.

TRAUMA PROGRAM PERFORMANCE IMPROVEMENT PLAN

- C. Other trauma PI related documents are considered confidential and protected as defined by the Health Insurance Portability and Accountability Act of 1996 (HIPAA), protected by Texas Health & Safety Code 161.031; Texas Medical Practice Act, Texas Occupations Code 151.001 et. seq.; N.M. Laws 1979, ch. 169. Information is confidential and/or privileged.

VII. RESOLUTION (LOOP CLOSURE) AND RE-EVALUATION

- A. Any identified issue/event will be subject to a primary, secondary, tertiary or quaternary review that may result in the formation of an action plan.
- B. In order for loop closure to occur the outcome of the corrective action plan will:
 - 1. Be monitored for the expected change or
 - 2. Re-evaluation process will demonstrate a measure of performance or
 - 3. Change to an acceptable level
 - a) Determined by frequency tracking, benchmarking and variance analysis.
 - b) Acceptable level determined by TMD/TPD.
 - c) Acceptable level if PI process involved tertiary and/or quaternary review is determined by committee members.
 - 4. Integrate with Trauma Specific On-going Professional Practice Evaluation/Focused Professional Practice Evaluation (OPPE/FPPE).
- C. Loop closure determination is updated in either of the applicable following: trauma registry, TPIPS, MPR, Hospital Patient Safety Committee, MSPI, BorderRAC Systems PI and TPOC.

VIII. INTEGRATION INTO HOSPITAL PERFORMANCE IMPROVEMENT PROCESS

- A. The Trauma Program collaborates with multiple disciplines, departments and agencies to review the quality of patient care.
- B. The hospital's Risk Management associate participates in monthly PI program meetings such as Multi-disciplinary M&M, Trauma M&M, MPR and TPIPS.

TRAUMA PROGRAM PERFORMANCE IMPROVEMENT PLAN

- C. The hospital's Patient Safety Coordinator participates in Trauma Quality Case Reviews, MPR and TPIPS.
- D. The TPD or designee also respond to hospital's Quality Management Patient Related Occurrence (PRO) electronic system that tracks events entered by hospital associates requesting review.
 - 1. Each PRO is reviewed by the hospital Patient Safety Coordinator.
 - 2. The Patient Safety Coordinator refers events that involve trauma services to TPD.
 - 3. TPD or designee respond with trauma PI process.
 - 4. Patient Safety Coordinator reports to Quality Management Director who then reports to Chief Nursing Officer.
 - 5. The Patient Safety Coordinator presents PRO summary events during monthly PSC meetings.
- E. The Trauma PI Program is integrated with the Hospital MSPI, PIC and PSC.
- F. Attachment A illustrates PI process in a flowchart format.

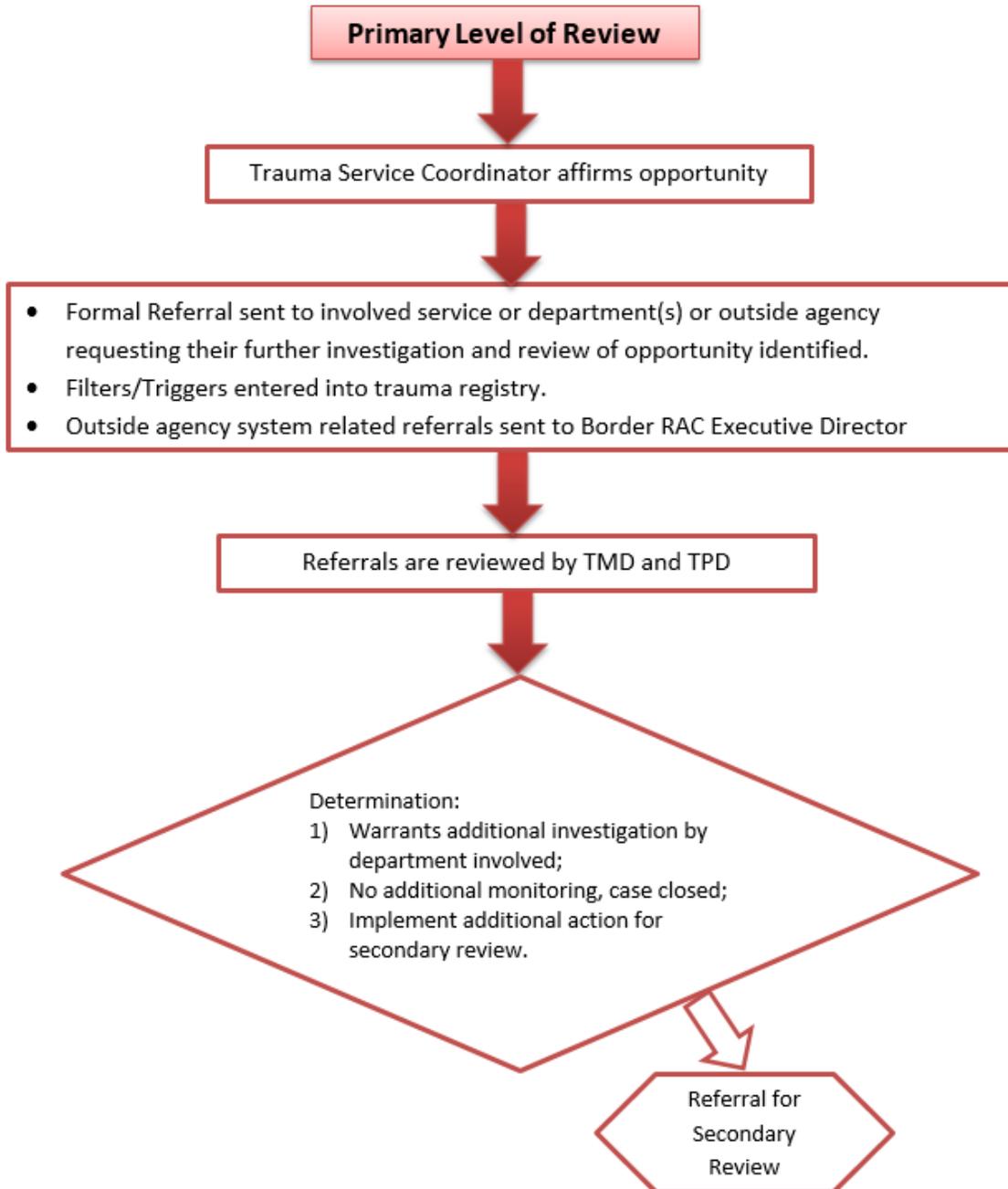
TRAUMA PROGRAM PERFORMANCE IMPROVEMENT PLAN

_____ Trauma Program Director	_____ Date
_____ Pediatric Trauma Medical Director Assistant Trauma Medical Director	_____ Date
_____ Associate Trauma Medical Director	_____ Date
_____ Trauma Medical Director	_____ Date

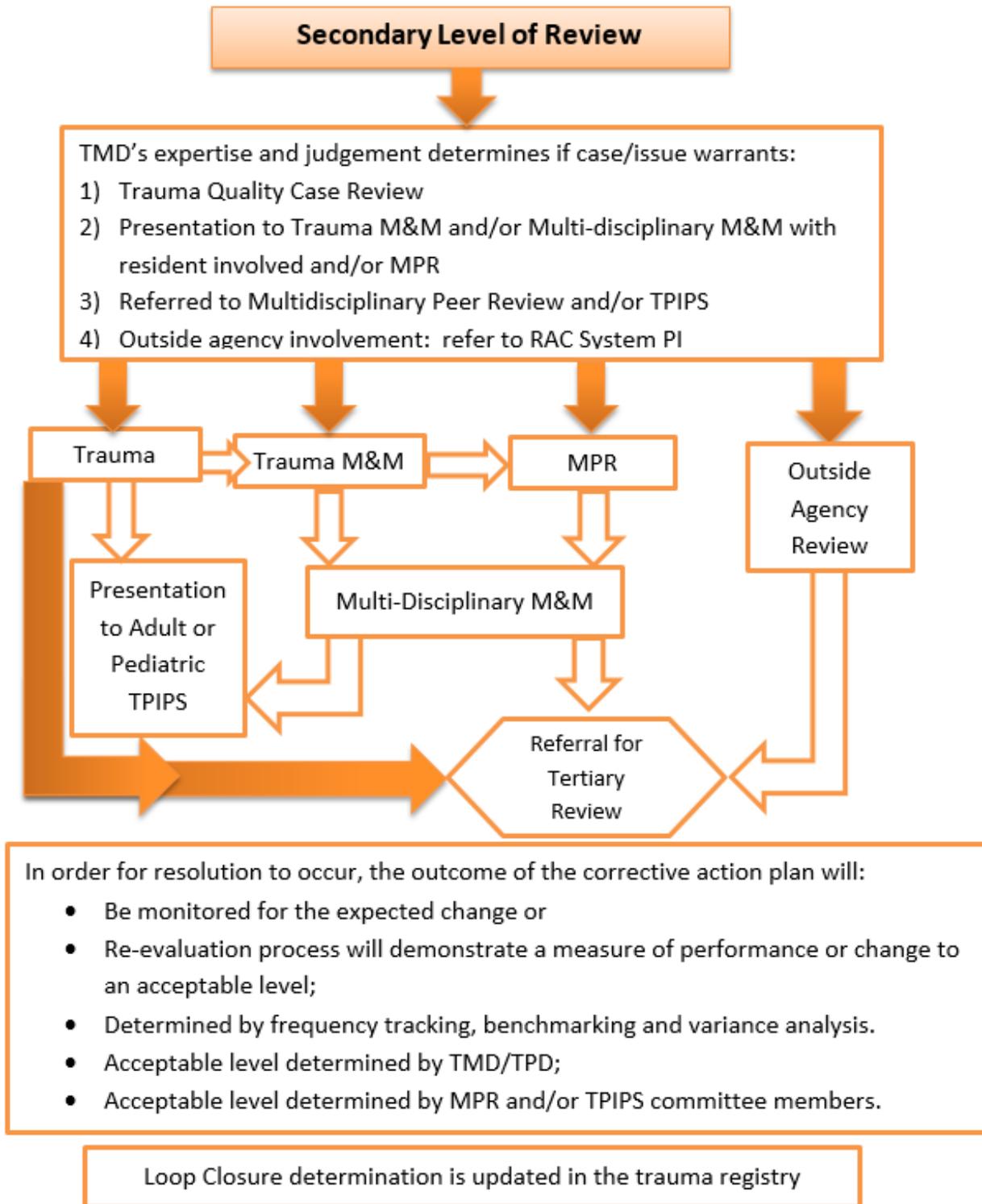
Reviewed/Revised
02/2017
02/2020
03/2021

TRAUMA PROGRAM PERFORMANCE IMPROVEMENT PLAN

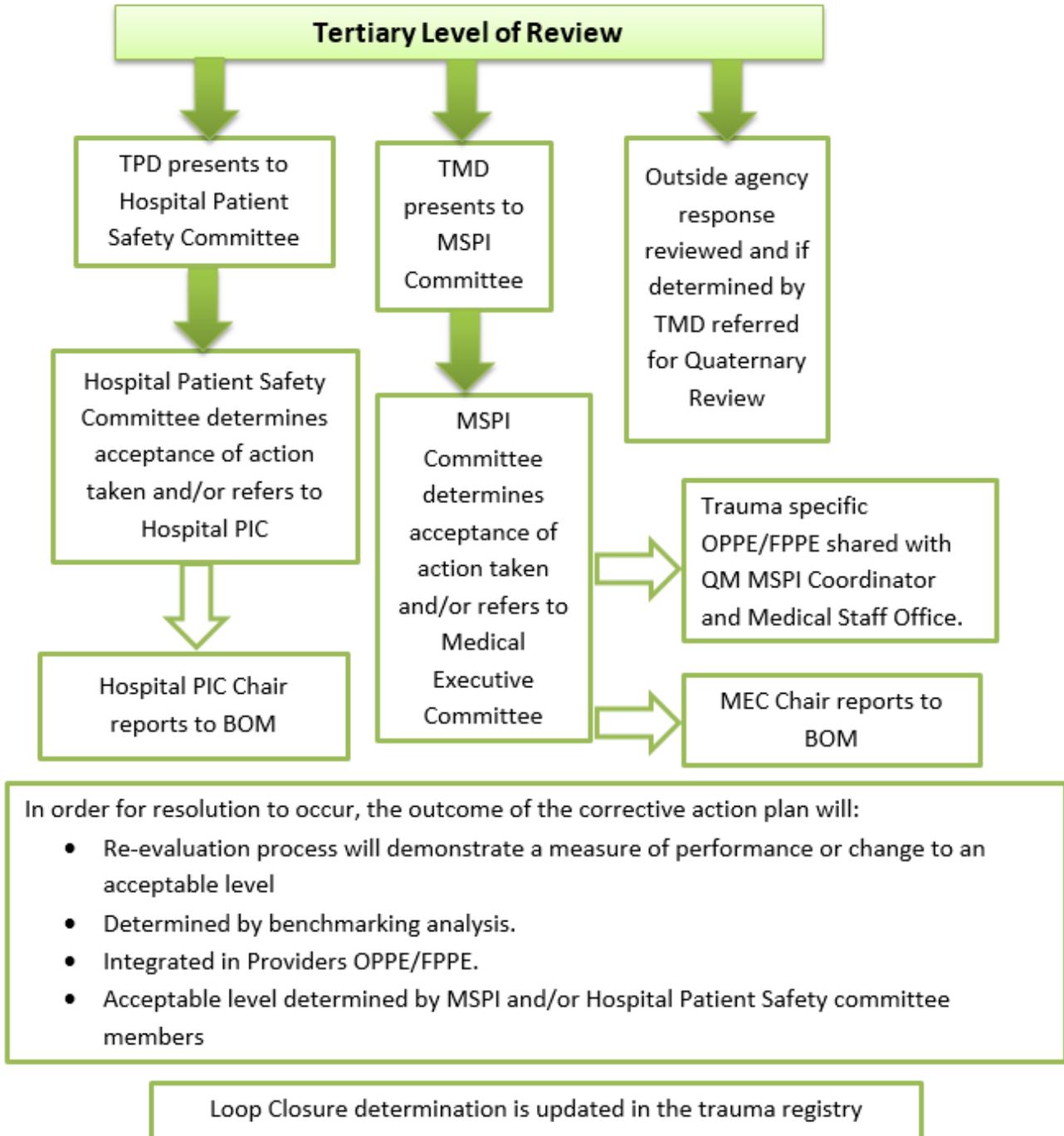
ATTACHMENT A:
TRAUMA SERVICES PI PROCESS AND REPORTING STRUCTURE



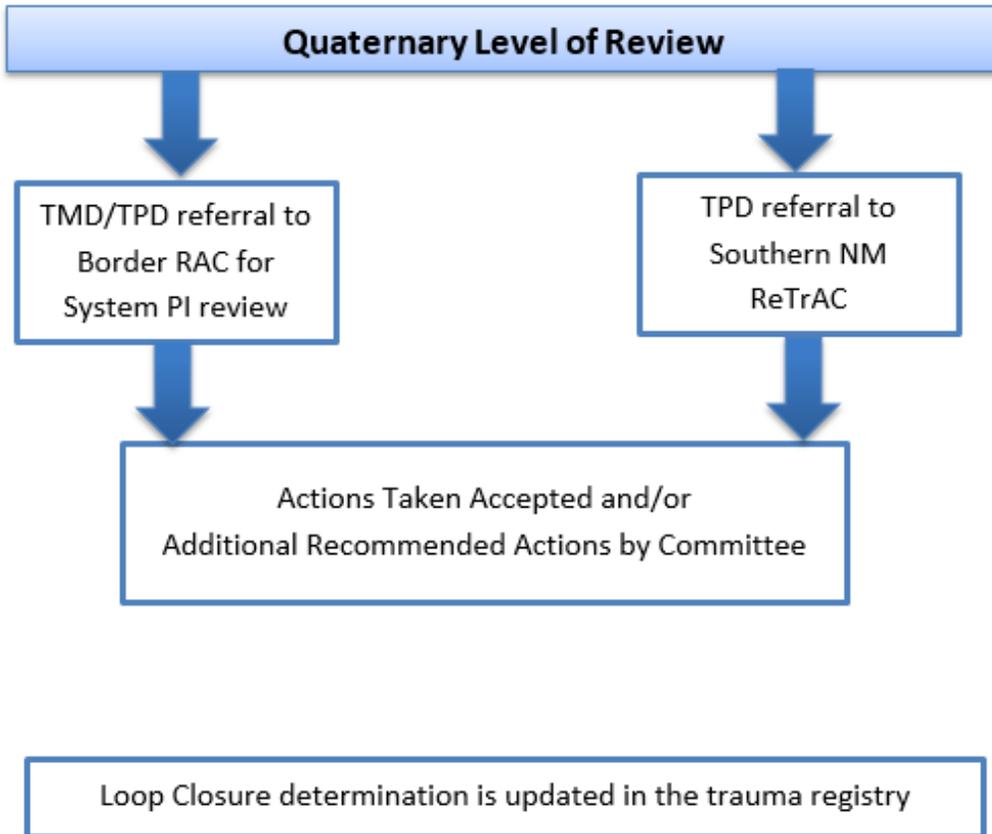
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TRAUMA PROGRAM PERFORMANCE IMPROVEMENT PLAN



TRAUMA PROGRAM PERFORMANCE IMPROVEMENT PLAN



TRAUMA PROGRAM PERFORMANCE IMPROVEMENT PLAN

**ATTACHMENT B:
TRAUMA REGISTRY PERFORMANCE IMPROVEMENT INDICATORS/TRIGGERS**

Filters

This is the favorites speed screen. Go to the menu to set your favorites/frequently used menu items.

<input type="checkbox"/> Scene Patient Without EMS Runsheet	<input type="checkbox"/> Referring hospital missing documentation	<input type="checkbox"/> Readmission to the Hospital within 30 days
<input type="checkbox"/> Trauma Admission to Non-Surgical Service	<input type="checkbox"/> Level 2 Trauma Consult > 30 mins. post ED arrival	<input type="checkbox"/> Delays in Identification of Injuries
<input type="checkbox"/> ED to Critical Care > 2hrs.	<input type="checkbox"/> Self Extubation	<input type="checkbox"/> Absence of Trauma Team Member(s) Response Times
<input type="checkbox"/> ED to Floor > 4hrs.	<input type="checkbox"/> Negative Ex- Lap Necessary	<input type="checkbox"/> In-House Consult Response > 10 Minutes
<input type="checkbox"/> Trauma Death	<input type="checkbox"/> Discharged from ED, Readmitted <= 72 Hours Later	
<input type="checkbox"/> LOS at Referring Facility > 2 hrs	<input type="checkbox"/> Failed Intubation	
<input type="checkbox"/> Other	<input type="checkbox"/> Trauma Code/Alert and Trauma Triage Decision Schem	

Select Additional Filters:

Date: [?] QA Tracking

OK Cancel

ACS Questions

Record Edit Navigate

<input type="checkbox"/> ?	<input type="checkbox"/> Absence of Hourly Vitals
<input type="checkbox"/> ?	<input type="checkbox"/> SDH/EDH with Craniotomy > 4 hrs after Arrival
<input type="checkbox"/> ?	<input type="checkbox"/> Comatose Patient Left ED before Definitive Airway Established
<input type="checkbox"/> ?	<input type="checkbox"/> Reintubation within 48 hrs of Extubation
<input type="checkbox"/> ?	<input type="checkbox"/> Abdominal Injuries and Hypotension without a Laparotomy within 1 hr of Arrival
<input type="checkbox"/> ?	<input type="checkbox"/> Laparotomy > 4 hrs after Arrival
<input type="checkbox"/> ?	<input type="checkbox"/> Nonfixation of Femoral Diaphyseal Fracture
<input type="checkbox"/> ?	<input type="checkbox"/> GSW to Abdomen Managed Non-operatively
<input type="checkbox"/> ?	<input type="checkbox"/> Initiation of Debridement of Open Tibial Fx > 8 hrs after Arrival
<input type="checkbox"/> ?	<input type="checkbox"/> Abdominal, Thoracic, Vascular, or Cranial Surgery > 24 hrs after Arrival
<input type="checkbox"/> ?	<input type="checkbox"/> HIV Positive

Date: [?] QA Tracking

TRAUMA PROGRAM PERFORMANCE IMPROVEMENT PLAN

NTDB

<input type="checkbox"/> Acute Kidney Injury (AKI)	<input type="checkbox"/> Severe Sepsis
<input type="checkbox"/> Acute Respiratory Distress Syndrome (ARDS)	<input type="checkbox"/> Other (Retired 2019)
<input type="checkbox"/> Cardiac Arrest with CPR	<input type="checkbox"/> Abdominal Compartment Syndrome (Retired 2011)
<input type="checkbox"/> Decubitus Ulcer (Retired 2017)	<input type="checkbox"/> Abdominal Fascia Left Open (Retired 2011)
<input type="checkbox"/> Deep Surgical Site Infection	<input type="checkbox"/> Base Deficit (Retired 2011)
<input type="checkbox"/> Drug or Alcohol Withdrawal Syndrome (Retired 2017)	<input type="checkbox"/> Bleeding (Retired 2011)
<input type="checkbox"/> Deep Vein Thrombosis	<input type="checkbox"/> Coagulopathy (Retired 2011)
<input type="checkbox"/> Extremity Compartment Syndrome	<input type="checkbox"/> Coma (Retired 2011)
<input type="checkbox"/> Graft/prosthesis/flap failure (Retired 2016)	<input type="checkbox"/> Intracranial Pressure (Retired 2011)
<input type="checkbox"/> Myocardial Infarction (MI)	<input type="checkbox"/> Systemic Sepsis (Retired 2011)
<input type="checkbox"/> Organ/Space Surgical Site Infection	<input type="checkbox"/> Wound Disruption (Retired 2011)
<input type="checkbox"/> Pneumonia (Retired 2016)	<input type="checkbox"/> Catheter-Associated Urinary Tract Infection (CAUTI)
<input type="checkbox"/> Pulmonary Embolism (PE)	<input type="checkbox"/> Central Line-Associated Blood Stream Infection (CLABSI)
<input type="checkbox"/> Stroke/CVA	<input type="checkbox"/> Ventilator-Associated Pneumonia (VAP)
<input type="checkbox"/> Superficial Surgical Site Infection (Retired 2017)	<input type="checkbox"/> Alcohol Withdrawal Syndrome
<input type="checkbox"/> Unplanned Intubation	<input type="checkbox"/> Pressure Ulcer
<input type="checkbox"/> Urinary Tract Infection (Retired 2016)	<input type="checkbox"/> Superficial Incisional Surgical Site Infection
<input type="checkbox"/> Catheter-Related Blood Stream Infection (Retired 2016)	<input type="checkbox"/> Delirium
<input type="checkbox"/> Osteomyelitis	<input type="checkbox"/> Unplanned Visit to the Operating Room
<input type="checkbox"/> Unplanned Return to the Operating Room (Retired 2020)	
<input type="checkbox"/> Unplanned Admission to ICU	

Date QA Tracking

NEURO TRAUMA CONTINGENCY PLAN

POLICY PURPOSE

Outline contingency plan in the event the primary and back up neurosurgeons are encumbered upon arrival of additional neuro trauma cases.

RESPONSIBLE

Trauma Medical Director
Trauma Faculty, Residents, and Advanced Healthcare Practitioners (AHPs)
Neurosurgery Faculty and Advanced Healthcare Practitioners
Emergency Medicine Physicians
Anesthesiologists and Certified Registered Nurse Anesthetists (CRNAs)
Trauma Program Director
Perioperative Services Director

PI TRIGGERS FOR REVIEW

- Craniotomy >4 hours after arrival, excluding invasive monitoring procedure (ICP)
- Treatment protocols not followed
- On-Call Consult Response >30 Minutes

PROCEDURE

- A. The neurosurgery service line practice manager (or designee) will release a published neurosurgery call schedule on a monthly basis. The call schedule will include the primary, back up neurosurgeon and scheduled nurse practitioner(s).
- B. Revision(s) to the call schedule will be released as soon as change(s) is made.
- C. When the primary neurosurgeon is encumbered with a patient, either the primary neurosurgeon, nurse practitioner or trauma attending will inform the backup neurosurgeon with an estimated timeframe the primary neurosurgeon will be encumbered.
- D. When the backup neurosurgeon and primary neurosurgeon are encumbered, the nurse practitioner or trauma attending will inform a 3rd full time neurosurgeon who is scheduled as primary neurosurgeon the next day.
 1. If necessary, the additional full time neurosurgeons will be notified of situation.
 2. In addition to notifying the additional neurosurgeons, the following are options to consider:

NEURO TRAUMA CONTINGENCY PLAN

- a. The neurosurgery medical director has credentialed trauma surgeons to provide initial assessment and management of the neuro trauma patients.
 - b. Neurosurgery nurse practitioners may facilitate patient evaluation, communication with plan of care and patient throughput. They are also:
 - i. Credentialed to insert ICP and external ventriculostomy monitoring catheters.
 - ii. Current with ATLS.
 - c. On campus outpatient clinic hours may need to be suspended or postponed.
 - d. Elective cases may be placed on hold or rescheduled for a later time.
 - e. Neurosurgeon on call for non-trauma services may be notified.
- E. If any of the above options are not sustainable, EMResources and BorderRAC executive director will be updated describing limited neurosurgical capability. Notification to the regional Level II trauma center will also be made by either the TMD or TPD.
- F. Patients may require transfer to next closest Level I trauma center in Lubbock or Albuquerque.
- G. The regional military based trauma center may also be considered if any of the neuro trauma patients are active military personnel.
- H. Contingency plan activation reaching to the point of three or more neurosurgeons at the same time will be reviewed following trauma PIPS process.
- I. PI triggers identified will be reviewed following trauma PIPS process with neurosurgery trauma liaison(s).

NEURO TRAUMA CONTINGENCY PLAN

Trauma Program Director

Date

Neurosurgery Medical Director

Date

Trauma Medical Director

Date

Reviewed/Revised
12/2019

TRAUMA REGISTRY GUIDELINE

POLICY PURPOSE:

Provide description of data abstraction and quality process to ensure accuracy.

Facilitate accurate trauma data reporting to regulatory agencies (Texas and New Mexico Department of Health and Trauma Quality Improvement Program (TQIP)).

To assist trauma services identify trends for opportunities for improvement.

RESPONSIBLE:

Trauma Medical Director (TMD)
Associate Trauma Medical Director (ATMD)
Assistant Trauma Medical Director and Pediatric Trauma Medical Director
Trauma Program Director (TPD)
Lead Trauma Registrar
Trauma Department Associates

PROCEDURE:

- A. Trauma Registrar Education:
1. Each trauma registrar within a year of hire will successfully complete the following educational courses:
 - a. Association for Advancement of Automotive Medicine-Abbreviated Injury Scale (AAAM-AIS).
 - b. Trauma Registry Course sponsored by the American Trauma Society (ATS).
 2. Subsequent education for all trauma registrars will be on a rotational basis based on availability:
 - a. TQIP annual conference and other sponsored education activities (ie. Quizzes, webinars).
 - b. Digital Innovations /ESO annual conference
 - c. ATS registry courses
 - d. ICD-10 trauma coding course
 - e. Regional and other national trauma registry or PI related conferences

TRAUMA REGISTRY GUIDELINE

- B. Trauma Registrar Orientation:
1. The Lead Trauma Registrar will facilitate orientation to new hires.
 - a. New registrar will:
 - i. Become familiar with EMR system and initiate trauma patient census list for distribution by 08:30 Monday through Friday.
 - ii. Collect, abstract and enter clinical data completing a minimum of five to seven charts per week with one to two day length of stays.
 - iii. Gradual increase in length of stays will be adjusted pending Inter Rater Reliability review (IRR) and progress. Refer to section F regarding registry audit process.
 - b. By 90 to 120 days, the trauma registrar is expected to:
 - i. Participate on-line or in person educational courses.
 - ii. Abstract three charts per day with length of stays between one to four days.
 - iii. By the end of year one, longer length of stays and routine report writer reports will be assigned.
- C. Trauma Registry Patient Entry Criteria follows the National Trauma Data Dictionary Inclusion Criteria.
- D. Data submissions:
1. End of month closing to quarterly reports:
 - a. BorderRAC
 - b. Texas and New Mexico state registries
 - c. TQIP
- E. Routine Reports:
1. Weekly data abstraction by registrar
 2. Demographic
 3. Comorbidities and complications (PI filters)
 4. Over and Under Triage
 5. Trauma Attending Response within 15 minutes

TRAUMA REGISTRY GUIDELINE

6. Non Surgical Admissions
 7. Others reports periodically requested by TPD or TMD.
- F. Trauma Registry Quality Verification Process (Audits):
1. Validation will occur at multiple points in data abstraction and reporting.
 2. Completion benchmark: 80% (minimum) of patient charts within 60 days of discharge.
 3. Assigned registrar will audit 5 to 10% of monthly charts. Findings will be reviewed with fellow registrars for education purposes and corrections made. An electronic abstraction audit spreadsheet is utilized and kept up to date.
 4. The abstraction audit tool is used to demonstration re-abstraction process and record errors.
 5. Lead Registrar will report summary findings to TPD.
 6. Data quality will be determined by:
 - a. $\geq 90\%$ accuracy (# elements agreed upon divided by # validated x 100)
 - b. Zero events with “significant error” rating
 7. TPD follow up with registrar trends and if necessary provide additional focus with education or counseling.
- G. Trauma Registry Data Request:
1. Requested and data release will be vetted by the lead trauma registrar, trauma program director and research compliance manager.
 2. Refer to Attachment B related to data request form.

TRAUMA REGISTRY GUIDELINE

Trauma Program Director

Date

Trauma Medical Director

Date

Revised/Reviewed

02/2021

TRAUMA TEAM ACTIVATION AND ADMISSION

POLICY PURPOSE

- Outline communication to key personnel of an impending trauma patient arrival.
- Outline the team activations for Level 1 and Level 2 trauma patients and define activity for Level 3 patients.

RESPONSIBLE

Trauma Medical Director
Associate Trauma Medical Director
Assistant Trauma Medical Director
Emergency Medicine, Orthopaedic Surgeons and Trauma Surgeons
Allied Health Professionals (AHPs)
Trauma Program Director
Administrator on Duty
Emergency Department Associates
Nursing Associates

LITERATURE REFERENCES

Centers for Disease Control and Prevention (CDC). (2011). *Guidelines for Field Triage of Injured Patients Recommendations of the National Expert Panel on Field Triage*. Retrieved from <http://www.cdc.gov/mmwr/preview/mmwrhtml/rr6101a1.htm#Box2>

Committee on Trauma American College of Surgeons. (2014). *Resources for Optimal Care of the Injured Patient*. American College of Surgeons. Chicago: IL.

Committee on Trauma American College of Surgeons. (2018). *Advanced Trauma Life Support. Student Course Manual. 10th Ed.* American College of Surgeons. Chicago: IL.

POLICY REFERENCES

NC-ED-36 Nursing care of the trauma patient in the ED
TR-P-5 Physician guideline for the care of the pregnant patient

TRAUMA TEAM ACTIVATION AND ADMISSION

PI TRIGGERS

- Trauma Code/Alert and Trauma Triage Decision Scheme
- Level 2 Trauma Consult > 30mins post ED arrival
- Absence of Trauma Team Member(s) Response Times
- Resuscitation Protocols not Followed
- In-house Consult Response > 10 Minutes
- Trauma Surgeon not Present at Time of Arrival

PROCEDURE

- A. Pre-hospital Emergency Medical Services (EMS), Emergency Medicine (EM) Physician, Emergency Department (ED) Registered Nurse (RN), ED Tech/Paramedic or Trauma Surgeon has the authority to activate team members based on the trauma activation criteria.
- B. Once the EM Faculty, Resident, ED RN or ED Tech/Paramedic receives notification from EMS or transferring facility of an incoming trauma patient, this individual will determine the appropriate trauma level activation (refer to TR-S-1 Attachment A).
- C. For Level 1 Activations the following will occur:
(Refer to Attachment A for activation criteria).
 1. ED Health Unit Coordinator (HUC) or designee will contact the hospital operator requesting Level 1 trauma team activation be initiated via group communication system and will institute an ED overhead announcement. The Maternal Response Team will require activation notification inclusion if the patient is ≥ 20 weeks pregnant.
 - a. The following information is provided: Level 1 trauma adult or pediatric, blunt or penetrating injury, by air or land, and estimated time of arrival to UMC. Notification will also include trauma bay location and if patient is pregnant.
 - b. Refer to TR-S-1 Attachment B related to roles and responsibilities.
 2. All team members are expected to be physically present upon the patient's arrival or within five minutes of a STAT (now) call (Refer to Attachment B related to roles and responder responsibilities inside and outside of Red Zone).

TRAUMA TEAM ACTIVATION AND ADMISSION

3. The Trauma Attending is expected to be physically present in the trauma bay within 15 minutes of patient arrival.
 4. The ED HUC assigned to the Level 1 trauma team activation will request additional pages to team members who are not present or to consultants as requested by Trauma Nurse Scribe as delegated by the Trauma Lead Surgeon such as:
 - a. Pediatric Intensivists and Pediatric Intensive Care Unit (PICU) RN.
 - b. Neurosurgeon.
- D. For Level 2 activation arriving from scene:
1. Prior to arrival, the ED HUC will announce overhead “Level 2 Trauma Team Activation” and provide estimated time of arrival (Refer to Attachment B related to roles and responder responsibilities).
 2. If patient pregnancy is known, the Maternal Response Team will also be activated.
 3. The RN will notify the ED faculty when Level 2 trauma patient arrives.
 4. The ED Faculty or Senior ED resident will complete the primary and secondary survey immediately upon arrival.
 5. The ED Faculty for the majority of the patients will determine appropriate patient disposition plans within 30 minutes of the evaluation (i.e. trauma consult for admission, extended observation or discharge).
 6. If it is determined that the patient requires a trauma consultation, the Trauma Faculty and the Trauma Resident or AHP will be paged notifying them of a Level 2 Trauma and patient location.
 7. The Trauma Services will physically respond to the trauma consult within 10 minutes from notification.
 - a. The Trauma Resident will inform the trauma attending within 10 minutes from performing a primary and secondary survey.

TRAUMA TEAM ACTIVATION AND ADMISSION

- b. It is the Trauma Attending's discretion when his/her bedside evaluation will take place.
- E. For Level 2 trauma transfers:
 1. The ED HUC or designee will announce overhead "Level 2 Trauma Transfer" and provide estimated time of arrival.
 2. Upon patient arrival, the HUC or designee will notify communications (operator) to page the Trauma Attending and the Trauma Senior notifying the providers of the Level 2 Trauma transfer arrival and patient location.
 3. The HUC or designee will notify communications (operator) to activate the Maternal Response Team of the Level 2 pregnant trauma transfer arrival and patient location.
 4. The Trauma Resident or AHP will physically respond within 10 minutes of notification.
 - a. The Trauma Resident or AHP will inform the trauma attending within 10 minutes from performing a primary and secondary survey.
 - b. It is the Trauma Attending's discretion when his/her bedside evaluation will take place.
 5. Refer to Attachment B: Roles and Responsibilities for Level 2 Trauma Team Members.
- F. Inter-facility (Satellite) transfers:
 1. Provider and/or designee will proceed with the following when patient arrives exceeding capability due to multiple high acuity injuries:
 - a. Stabilize patient as a triage area.
 - b. Coordinate transport to main campus using 911 dispatch for complex injured and critical patients. Transport arrangements for lower acuity patients are to be made using other appropriate modes.

TRAUMA TEAM ACTIVATION AND ADMISSION

- c. Satellite physician will telephone main ED EM Faculty and provide verbal report.
 - d. Satellite RN will telephone main ED Charge RN and provide verbal report. Documentation will be completed using the medical flow sheet.
 - e. The main ED RN will enter Patient Status Order (PSO) order via patients EMR.
 - f. Upon main ED receiving pre-hospital (ambulance) radio report, the appropriate trauma level team will be activated.
2. Satellite physician or AHP will proceed with the following for patients arriving with low impact and isolated injury:
- a. Triage and stabilize.
 - b. If the provider determines the patient requires admission, the provider will consult trauma services.
 - c. Trauma Attending will provide patient disposition recommendation by either accepting transfer or follow up in clinic.
 - d. If Trauma Services accepts patient admission, provider from trauma services will proceed with entering a Patient Status Order (PSO) via patient's EMR and the satellite RN will coordinate transport arrangements to main ED.
 - e. Satellite RN will telephone main ED Charge RN and provide verbal report. Documentation will be completed using the medical flow sheet or EMR.
 - f. Upon main ED receiving pre-hospital (ambulance) radio report, the appropriate trauma level team will be activated.
 - g. Upon patient arrival to main ED the RN page Trauma Services on call notifying provider of patient arrival with location.

TRAUMA TEAM ACTIVATION AND ADMISSION

Trauma Program Director

Date

Trauma Medical Director

Date

Review/Revision History

07/1996
06/1998
07/1999
10/2000
02/2003
03/2005
04/2009
05/2010
08/2013
02/2014
09/2015
02/2017
09/2017
02/2018
02/2019
08/2019
07/2020
12/2020

TRAUMA 1-800 TRANSFER LINE NUMBER

POLICY PURPOSE:

- The purpose of this policy is to ensure injured patients within our trauma service area receive timely access to the appropriate level of trauma care.
- Trauma transfers excluding isolated hips are accepted by the Trauma Attending on call.
- The Orthopedic Surgeon on call is contacted for the isolated hip fracture patient transfer requests.

RESPONSIBLE:

Trauma Medical Director (TMD)
Associate Trauma Medical Director
Assistant Trauma Medical Director
Physicians
Allied Health Professionals (AHPs)
Trauma Program Director (TPD)
Emergency Department and AOD Administrative Director
Trauma Service Coordinators
Administrator of the Day (AOD)
Emergency Department Nursing Associates

DEFINITIONS:

Border RAC (Regional Advisory Council):

Is relied upon to unite regional medical providers and serve as a strategic partner for the Texas legislature, state and local agencies, and most importantly for the health and welfare of our region. BorderRAC is integral to helping hospitals and other healthcare organizations in emergency preparedness to respond to a wide-scale natural disaster or terrorism attack. It is also a healthcare coalition with a comprehensive interprofessional membership of hospitals, EMS, and other healthcare agencies and has expanded its role. It's committees work to reduce injury, illness and preventable deaths in the areas of trauma, stroke, heart disease, pediatrics, and neonates. BorderRAC is a 501 (c) (3) non-profit organization dedicated to helping residents of our region in the education and prevention of injury and disease and healthcare emergencies and disaster preparedness.

TRAUMA 1-800 TRANSFER LINE NUMBER

PI TRIGGERS FOR REVIEW

- Acute Trauma Transfers In and Out
- Trauma Transfer Denial
- Other: Lack of Communication
- Delay in Trauma Transfer Acceptance

PROCEDURE:

- A. The AOD is responsible for managing trauma related telephone calls received on the 1-800-4RETGH-0 (1-800-473-8440) or (915) 521-7200 transfer request line.
- B. Upon receipt of the telephone call, the AOD obtains pertinent information from the transferring facility/physician (see Attachment A) and a decision regarding the appropriate level of trauma care required is made.
- C. The AOD will proceed with communicating to the trauma surgeon on call regarding patient transfer request. If there is no response from trauma surgeon on call within five minutes, the AOD will proceed with accepting transfer and update the trauma surgeon as soon as possible (within the next 15 to 30 minutes).
- D. The transferring facility/physician requesting the transfer will be provided with a response within 15 minutes from initial request to AOD.
- E. If the patient has a specialty care issue (i.e. major to severe isolated burn), the patient will be stabilized and transferred to the nearest, appropriate, specialty center by the originating facility.
 - a. The AOD receiving the call will assist originating facility with the coordination of transfer by:
 - i. Provision of telephone numbers of burn centers in the region;
 - ii. Provision of guidance in transfer process.
- F. Transfer requests for patients requiring specialty care for trauma-related burns are called to the trauma surgeon on-call and the TMD will be notified of transfer request for acceptance or denial.
- G. If at any time there is a question regarding which trauma-related patient with

TRAUMA 1-800 TRANSFER LINE NUMBER

specialty care (other than burns) is requested to be transferred out from the Emergency Department, the TMD or TPD and/or designee must be notified before making any transfer out arrangements.

- H. The 1-800 transfer line number also serves as phone consultation service to assist outlying areas with initial trauma resuscitation/stabilization and transfer concerns/questions.
- I. If the transferring facility is requesting to speak to the trauma surgeon regarding transfer request, the AOD will connect the two physicians to speak to one another. It is the trauma surgeons discretion to request the AOD connect to the specialist directly should it be deemed appropriate (i.e.: microvascular hand surgeon).
- J. AOD transfer line conversations are recorded and monitored for quality assurance purposes.
- K. All transfer requests are entered into an electronic database to track trends and to initiate process performance improvement measures.
- L. The AOD will initiate the pre-arrival form in the patient's electronic medical record with the transferring facility patient information. The Emergency Department RN will complete the pre-arrival form after RN telephone report is received from transferring RN caring for patient.
- M. Trauma transfer declines are to be reported to TMD and/or TPD immediately by the AOD. Transfer declines are also reported by the AOD to Chief Nursing Officer, Chief Compliance Officer, and if necessary Chief Medical Officer for additional quality assurance review.

TRAUMA 1-800 TRANSFER LINE NUMBER

Emergency Department and AOD
Administrative Director

Date

Trauma Program Director

Date

Trauma Medical Director

Date

Review/Revision History
02/2000
02/2003
03/2005
04/2008
2/2010
03/2014
03/2017
03/2020

TRAUMA PATIENT ADMISSION

POLICY PURPOSE:

The below policy outlines the process of accommodating trauma patients to inpatient care service areas within the campus.

RESPONSIBLE

Trauma Medical Director
Physicians and Allied Health Professionals (AHPs)
Trauma Program Director
Administrator of Day (AOD)
Nursing Associates

POLICY REFERENCES

NC-B2-4 Admission of Patient
NC-NS-10 Overload to EMS
NC-CC-45 Admissions Process to Medical and Surgical ICU
P-5 Admission
TR-S-18 Optimizing Pediatric Operative Resources
TR-P-4 Physician Guideline for Trauma Patient Admission

PI TRIGGERS

- Trauma Admission to Non –Surgical Service
- Emergency Surgical Procedures Not Performed in Main OR
- Pediatric Admissions to UMC

PROCEDURE

A. Emergency Department

1. Six trauma bays are available for adult and pediatric resuscitations.
2. The availability of trauma bays are maintained with timely evaluation, triage, and movement of patients.
3. Trauma patients are prioritized for admission or final disposition. Refer to policy: NC-NS-10 “*Overload to EMS.*”

B. Perioperative Department

TRAUMA PATIENT ADMISSION

1. Perioperative services will hold a suite with each Level I trauma activation.
2. In the event the trauma surgeon released the suite and subsequent studies deem for surgical intervention, the trauma surgeon will notify the anesthesiologists of immediate need for suite.
3. Perioperative services will immediately provide the first suite available.
4. For a pediatric trauma patient, refer to policy: TR-S-18 "*Optimizing Pediatric Trauma Operative Resources*" for details.

C. Adult Critical Care and Intermediate Care (IMC) Areas

1. Reference policy: NC-CC-45 "*Admissions process to Medical and Surgical ICU.*"
2. Trauma patients are accommodated based on their acuity and with the collaboration of Post Anesthesia Care Unit (PACU), Neuroscience Intensive Care Unit and Cardiovascular Intensive Care Unit services during times of critical care bed capacity.

D. Adult Non-Critical Care Areas

1. Trauma patients are admitted to Surgical/Orthopedic/Trauma units based on the specialty of care required as ordered by the admitting trauma service.
2. Reference NC-B2-4 "*Admission of patient*", TR-P-4 "*Physician Guideline for Trauma Patient Admission*" and P-5 "*Admission.*"
3. During times of high census or extenuating circumstances, a trauma patient may be admitted as an overflow to another designated unit.

E. Pediatric Trauma admission is as follows:

1. The trauma surgeon will notify the listed individuals below of decision to admit patient:
 - a. AOD;
 - b. Pediatric Intensivists (if admitting to PICU);
 - c. Pediatric Hospitalists or Resident (if admitting to Pediatric Floor).

TRAUMA PATIENT ADMISSION

2. If admitting to PICU or Pediatric Floor, the AOD will request:
 - a. Transfer to PICU or Pediatric Floor;
 - b. A new Financial Institution Number (FIN);
 - c. Room assignment.
 3. Upon receipt of new FIN from AOD, the trauma surgeon will enter admission orders and complete history and physical.
 4. The Emergency Department Nursing Associates will initiate the Memorandum of Transfer (MOT). The AOD will review the MOT for completion and approve patient transfer to designated unit.
- F. When there are limited patient rooms available with multiple pending admissions, the Surgical ICU and/or PICU Medical Director or designee will round with the Critical Care Directors or designee and AODs to triage patients and accommodate admissions.

TRAUMA PATIENT ADMISSION

Trauma Program Director

Date

Trauma Medical Director

Date

Reviewed/Revised
10/02
03/05
03/10
12/13
12/16
02/2020

TRAUMA CASE MANAGEMENT SERVICES

POLICY PURPOSE:

Policy purpose is to describe the multidisciplinary coordinated plan of care for injured patients and their families through the full continuum of care.

RESPONSIBLE:

Trauma Medical Director (TMD)
Associate Trauma Medical Director
Assistant Trauma Medical Director
Trauma Program Director (TPD)
Trauma Service Coordinators (TSCs)
Trauma Registrars
Case Management Associates
Physicians
Advanced Healthcare Providers (AHPs)
Nursing Associates

PROCEDURE:

1. Trauma patient listing is verified using national and trauma program criteria by Trauma Services.
2. The Trauma Department releases the trauma patient listing electronically every business day.
3. Trauma patients are defined as patients who meet the National Trauma Data Standard criteria for trauma registry inclusion. Other patients who are also kept in the trauma registry include:
 - a. Subacute or chronic subdural hematomas;
 - b. Re-admissions for complications related to their original traumatic injury disease process within 30 days of discharge;
 - c. Transfers in and out;
 - d. Hangings;
 - e. Submersions;
 - f. Burns

If at any time there is a question regarding the status of a patient (i.e. trauma vs. non-trauma), the TSC or TPD should be contacted for clarification.

TRAUMA CASE MANAGEMENT SERVICES

4. Trauma patients are followed from admission through discharge by the assigned Case Manager (CM) and if consulted the Social Worker (SW) of the respective nursing department where the patient is admitted.
5. CM reviews all trauma admits and refers to the SW as deemed necessary.
6. Consults for the SW are entered using the electronic medical record order set as “Social Worker Consult” by the ordering physician.
 - a. SW will be paged for emergent consults.
 - b. After hours or holiday consults for SW will be placed via operator to the SW on-call.
7. The CM, SW, AHPs, TSCs and Unit Charge Nurses attend daily discharge rounds in the multi-purpose room in Thomason tower 3rd floor Monday through Friday at 09:00 a.m.
8. The primary nurse will communicate to the patient/family which physician providers they are to follow after hospital discharge.
 - a. The primary nurse will ensure the discharge orders and patient’s contact number are forwarded to the appropriate clinic(s).
 - b. Discharge orders must have the name of the admitting and discharging faculty physician, including the name of the faculty physician from another service. The discharging physician will be responsible for documenting the appropriate faculty physician(s) for follow-up.
 - c. Upon receipt for discharge orders, the discharging nurse will contact the respective clinic for patient follow up appointment. This information will be documented as part of the patient’s discharge instructions.
 - d. Upon the receipt of the discharge orders, the representative clinic will be contacted and provide the patients with appointment dates.
9. The CM/SW will be responsible for making the clinic follow-up appointment(s) for the following patients:
 - a. Patients who do not have a legal guardian or family contact;
 - b. Patients who are discharged to foster homes and/or shelters;

TRAUMA CASE MANAGEMENT SERVICES

- c. Other high risk patients.
10. The primary nurse and/or the CM/SW will document scheduled appointment(s).
 11. For Emergency Department patients:
 - a. Discharge process is completed in the electronic medical record depart process.
 - b. For downtime purposes, discharge orders are to reflect clinic referral and reason for referral.
 12. Insurance calls for medical necessity will be received by the Care Management Department associates. The utilization review representative will contact insurance carrier to provide required medical information.
 13. Admitted patients will be reviewed by the Case Management associates to determine admissions status for documentation and will complete any insurance reviews necessary within one business day.
 14. For Level 1 Trauma activations, or any other special case, where the patient receives an alias name for pre-registration purposes, the CM and/or SW assigned to the patient will collaborate with registration associate to identify the patient's identity.
 - a. The name change will take place until the critical phase is over, which may take up to 24 hours after patient's admission.
 - b. This name change will be done by registration associate and be reflected on the patient's medical record.

TRAUMA CASE MANAGEMENT SERVICES

Director of Case Management

Date

Trauma Program Director

Date

Trauma Medical Director

Date

Reviewed/Revised
02/21/00
03/2007
09/2009
08/2013
12/2016
02/2020

SAFETY SEAT PROGRAM

POLICY PURPOSE

University Medical Center of El Paso Trauma Injury Prevention Car Safety Seat Program's purpose is to reduce injuries and fatalities in the infant and child population within the El Paso County and surrounding trauma service area.

RESPONSIBLE

Trauma Medical Director
Trauma Program Director
Trauma Education, Injury Prevention, SANE Manager
Nursing Associates

LITERATURE REFERENCES

Centers for Disease Control and Prevention. (2019). "Child Passenger Safety: Get the Facts." http://www.cdc.gov/motorvehiclesafety/child_passenger_safety/cps-factsheet.html.

Safe Kids Worldwide. (2018). National Child Passenger Safety Certification Training Program. DOT HS 810 731. Washington: D.C. Retrieved from <http://www.cert.safekids.org>.

Texas Child Fatality Review Team Annual Report.(2015). Retrieved from <http://www.dshs.texas.gov/Legislative/Reports-2016.aspx?terms=texas%20child%20fatality%20review%20team%20annual%20report%202015>.

U. S. Department of Transportation National Highway Traffic Safety Administration (NHTSA), (2019). Traffic Safety Facts: 2017 Data. DOT HS 812 315. NHTSA's National Center for Statistics and Analysis. Washington: D.C.

DEFINITIONS

- **Car Safety Seat:** An approved device for the transportation of infants and children while secured in a motor vehicle.
- **Car Safety Seat Program:** A program sponsored by the Trauma Department to provide car seat resources to those persons in need of a safety seat.
- **Child Restraint Agreement:** A *Child Restraint Agreement and Release of Liability Form* must be submitted to participate in the Car Safety Seat Program.

SAFETY SEAT PROGRAM

PROCEDURE

A. Education

1. Associates who have completed a safety seat instructional course developed by Trauma Services and approved by the National Child Passenger Safety Technician Certification Program. (NCPSTP) will provide instruction on the proper use of safety seats.
2. All patients and community members are eligible to attend instruction on safety seats in addition to unrestrained child and seatbelt classes.

B. Eligibility

Individuals wishing to participate in the program will be screened for the need of a safety seat. Those individuals recommended for assistance will receive instruction on the Safety Seat Program and may participate in the program.

Note: Receipt of a safety seat is contingent upon the availability of safety seats and attendance at safety seat classes.

C. Participation

Individuals who request assistance and attend the instruction on the proper use of the safety seats may elect to participate in the program. In order to participate in the program, individuals must agree to comply with the terms of the program. This is evidenced by the completion of the required form. Attachment A: "required form"

D. Documentation and Record Keeping by Safety Technician:

1. Type of safety seat provided, based on appropriate age, height, weight, and developmental needs
2. Name of person who received the safety seat.

E. Inspections

1. Used safety seats and those that do not meet the qualifications of safety seats will be destroyed in accordance with (NCPSTCP) guidelines.
2. Program participants will be referred to safety seat inspection sessions based on availability. .

SAFETY SEAT PROGRAM

Trauma Education and Injury Prevention
Division Manager

Date

Trauma Program Director

Date

Trauma Medical Director

Date

Review/Revision History

02/2003
03/2005
06/2008
12/2010
01/2014
01/2017
01/2020

ALCOHOL SCREENING AND BRIEF INTERVENTION FOR TRAUMA PATIENTS

POLICY PURPOSE

This policy outlines screening process to identify trauma patient risk for: 1) alcohol use disorder; 2) substance use disorder and/or 3) suicide. Appropriate interventions will be initiated with each patient as determined by the screening outcomes. Options for treatment and educational material will be made available to each patient meeting criterion by the screening outcomes.

RESPONSIBLE

Trauma Medical Director (TMD)
Associate Trauma Medical Director
Assistant Trauma Medical Director
Physicians
Allied Health Professionals (AHPs)
Trauma Program Director (TPD)
Trauma Education and Injury Prevention, SANE Manager
Care Management Director
Screening and Brief Intervention Coordinator
Social Workers
Nursing Associates

BACKGROUND

Approximately one in eight visits to Emergency Departments (EDs) in the United States involves Mental and Substance Use Disorders (M/SUDs). These potentially preventable M/SUD-related ED visits also affect hospitals, because M/SUD-related ED visits are more than twice as likely to result in hospital admission compared with ED visits that do not involve M/SUDs. (Weiss, Barrett, Heslin, Stocks, 2016)

Addiction specialist frequently find themselves faced with suicidal behavior in their addictions patients. Although many addiction treatment programs will not accept clients with recent suicidal behavior, up to 40% of patients seeking treatment for substance dependence report a history of suicide attempts. (Yuodelis-Flores, Ries 2015). An unprecedented amount of research has validated the relevance and effectiveness of the questions used in the Columbia-Suicide Severity Rating Scale (C-SSRS) to assess suicide risk, making it the most evidence-based tool of its kind. (CSSRS.Columbia.edu, <http://cssrs.columbia.edu/the-columbia-scale-c-ssrs/evidence/> Accessed February 2, 2017)

CAGE-AID: Conjoint screening questions are defined as questions that inquire simultaneously and in aggregate about experiences with alcohol and other drugs. Conjoint questionnaires can allow patients who have problems related to multiple substances to more readily respond positively to a conjoint question than to separate

ALCOHOL SCREENING AND BRIEF INTERVENTION FOR TRAUMA PATIENTS

questions on individual substances, patients may be less likely to conceal affirmative answers to questions that inform clinicians about their use of illegal drugs, in addition, conjoint questions allow clinicians to screen for drug and alcohol issues as rapidly as they can screen for alcohol problems (Brown, et. al, 2001).

LITERATURE REFERENCES

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- American College of Surgeons Committee on Trauma. (2014). *Resources for Optimal Care of The Injured Patient*. (p.141). Chicago, IL.
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- Substance Abuse and Mental Health Service Administration. (2019). Enhancing Motivation for Change in Substance Use Disorder Treatment. Treatment Improvement Protocol (TIP) Series No. 35. SAMHSA Publication No. PEP19-02-01-003. Rockville, MD. Retrieved electronically on January 24, 2020 from: https://store.samhsa.gov/system/files/pep19-02-01-003_0.pdf
- The Lighthouse Project: Evidence. Proof Positive: The Evidence Supports Using the C-SSRS to Assess Risk. Retrieved electronically on February 2, 2020 from: <http://cssrs.columbia.edu/the-columbia-scale-c-ssrs/evidence/> (Validates the Columbia Suicide Severity Rating Scale tool utilized)
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- Weiss, A.J, Ph.D., Barrett, M.L, Heslin, K.C, and Stocks. C. (2016) Trends in Emergency Department Visits Involving Mental and Substance Use Disorders, 2006-2013. Retrieved electronically on February 2, 2020 from: https://www.hcup-us.ahrq.gov/reports/statbriefs/sb216-Mental-Substance-Use-Disorder-ED-Visit-Trends.jsp?utm_source=AHRO&utm_medium=EN-1&utm_term=&utm_content=1&utm_campaign=AHRO_EN1_10_2017
- Yuodelis-Flores, C., Ries, R.K., (2015). Addiction and suicide. *The American*

ALCOHOL SCREENING AND BRIEF INTERVENTION FOR TRAUMA PATIENTS

Journal of Addictions. (24)2 pp. 98-104. Retrieved electronically on January 20, 2020.

TOXICOLOGY

Laboratory Alcohol (ETOH) testing is done using serum. Most ranges are for whole blood alcohol. To convert serum ETOH to whole blood ETOH, the following formula is used: The result from the laboratory is divided by 1000 to calculate weight by volume percentage (w/v).

SCREENING AND BRIEF INTERVENTION

- A. Qualifying Trauma patients are screened by a master's prepared professional Screening and Brief Intervention (SBI) Coordinator (LMFT/LPC, or LCSW) Monday through Friday for at risk alcohol use disorder, substance use disorder, and suicide.
 1. Objective Assessment: Include toxicology results showing the presence of alcohol or noted smell of alcohol to breath on arrival to facility.
 2. Subjective Assessment: The Consumption Questions, CAGE-AID (Cut down, Annoyed, Guilty, Eye opener) - Adapted to Include Drugs, and the CRAFFT (Car, Relax, Alone, Forget, Family/Friends, Trouble) instrument tools will be utilized to conduct age appropriate brief screening.
 - a. The Consumption Questions plus CAGE-AID instrument questions will be completed for patients 21 years of age and above and the CRAFFT instrument questions will be completed for patients 12 to 20 years of age as they are under the legal age for drinking. Instrument questions will be available in the MIDAS system. A Word document for data gathering before computer system entry has been developed for bedside data collection.
 - b. One or more positive responses to the CAGE-AID conjoint questionnaire is a positive screen.
 - c. A positive CRAFFT screening is indicated by, refer to section H.
 - d. The Columbia Suicide Screening Questionnaire will be utilized to screen for suicidality among youth and adults, as recommended by age.
- B. The SBI Coordinator will oversee the administration of screening and brief intervention process.

ALCOHOL SCREENING AND BRIEF INTERVENTION FOR TRAUMA PATIENTS

- C. The SBI Coordinator reviews the daily trauma patient listing released by the trauma department. The SBI Coordinator will collaborate with the floor social workers and other trained SBI associates to ensure qualifying patients are screened.
- D. The SBI Coordinator initiates the screening process when the adult trauma patient has been stabilized as demonstrated by not having life threatening injuries or illness and who is mentally competent on floor status. Adult patients may decline screening for any personal reason or if the attending physician determines the individual is medical unstable, in extreme pain, or emotionally unable to participate in the brief screening process.
- E. After utilizing the Consumption Questions, the CAGE-AID instruments, a brief intervention for adult patients will be completed by the SBI Coordinator, the social worker, or other trained SBI associates.
 - 1. The brief intervention consists of Motivational Interviewing (MI), and a referral package is provided to the patient which provides information on treatment and/or recovery services.
 - 2. A referral will be made to the Region 10 OSAR (Outreach, Screening, Assessment and Referral) Office located at Emergence Health Network as the region's mental health authority.
 - 3. The Region 10 OSAR Office provides outpatient clients a comprehensive intake and detailed screening/assessment. If determined necessary post screening/assessment, referrals are made for in-patient and/or out-patient alcohol and drug treatment and/or mental health recovery support services.
- F. Screening and Brief Intervention can be completed once, every thirty days upon re-admission.
- G. For the pediatric trauma patients who are between the ages 12 to 20 years, the SBI Coordinator initiates the screening process when a request for consultation is received from the provider and the patient's legal guardian has consented for screening.
 - 1. Pediatric patient indicates alcohol and/or drug disorder use during the admission process.
 - 2. Pediatric patient has a positive toxicology report.
- H. The screening process will be initiated when the pediatric trauma patient has

ALCOHOL SCREENING AND BRIEF INTERVENTION FOR TRAUMA PATIENTS

been stabilized and moved from the critical care unit to the floor.

- I. Legal guardians of patients under the age of 18 may decline screening for any personal reason, or if the provider determines the individual is medical unstable; in extreme pain, or emotionally unable to participate in the brief screening process.
- J. Pediatric patients will be screened for alcohol and substance use utilizing only the CRAFFT instrument. If the CRAFFT screening is positive, indicated by answering “yes” to any of the questions, a brief intervention is provided for the pediatric patient and their legal guardian.
 - 1. The brief intervention for pediatric patients consists of Motivational Interviewing, the provision of age-appropriate referrals to treatment and recovery services.
 - 2. Patients who are 12 years and older in need of comprehensive intake, screening and assessment services will be referred to the Region 10 OSAR Office or other resources as identified for patient or legal guardian as necessary.
 - 3. Pediatric patients will be screened for suicide risk, utilizing the age appropriate Columbia-Suicide Severity Rating Scale, upon determination and request of attending physicians and medical care team, and with parental/guardian consent.
- K. The SBI Coordinator will enter the gathered data into the hospitals quality management electronic system (MIDAS).
 - 1. The SBI Coordinator will supply the social workers and other trained SBI associates with current literature (educational materials, readings) and information concerning this process.
 - 2. SBI Coordinator and Trauma Education and Injury Prevention associates will work with Human Resources Training and Development to provide training and continuing education modules for UMC associates.
- F. SBI reports will be provided at the Trauma Performance Improvement Patient Safety (TPIPS) committee on an annual basis or as requested by TMD or TPD.
- G. The Manager of the Trauma Education and Injury Prevention Division will be the primary licensed clinician responsible for program oversight.
 - 1. The Manager of Trauma Education, Injury Prevention and SANE services

ALCOHOL SCREENING AND BRIEF INTERVENTION FOR TRAUMA PATIENTS

will monitor and evaluate program activities.

2. Annual reports of patients at risk with positive BAC and/or re-admissions will be provided at the Trauma Performance Improvement Patient Safety committee.

FORMS:

Alcohol Screening and Brief Intervention (SBI) for Trauma Patients
Data Gathering Tool
Consumption Questions: CADE-AID, and CRAFFT Questions
The Columbia-Suicide Severity Rating Scale (C-SSRS)

ALCOHOL SCREENING AND BRIEF INTERVENTION FOR TRAUMA PATIENTS

Trauma Education, Injury Prevention and
SANE Manager

Date

Director Case Management

Date

Trauma Program Director

Date

Trauma Medical Director

Date

Reviewed/Revised
02/08
01/11
01/14
02/17
02/20

CARE OF THE PEDIATRIC TRAUMA PATIENT GUIDELINE

PURPOSE:

- To ensure the pediatric injured patient receives a timely and appropriate evaluation in an organized and coordinated manner to maximize the outcome for the pediatric patient. Refer to Attachment A and B: Key Points and Considerations.

RESPONSIBLE

Trauma Attending and Residents
Neurosurgeons
Emergency Medicine Attending and Residents
Allied Healthcare Practitioners (AHPs)
Pediatric Intensivists and Hospitalists
Registered Nurse
Pharmacist
Respiratory Therapist

POLICY REFERENCES

TR-P-1	Physician Protocol for the Assessment and Resuscitation of the Trauma Patient
TR-P-35	Acute Management of Severe Traumatic Brain Injury in Infants, Children, and Adolescents
TR-S-18	Optimizing Pediatric Trauma Operative Resources
TR-P-39	Pediatric Diagnostic Imaging Guideline
TR-P-40	Non Accidental Trauma Management Guideline
ED-16	Trauma Patient Presenting to the Emergency Department (EPCH)

PI TRIGGERS

- Trauma Code/Alert and Trauma Triage Decision Scheme
- Level 2 Trauma Consult > 30 mins Post ED Arrival
- In-house Consult Response > 10mins
- Treatment Protocols not Followed
- Pediatric Admission to UMC
- Trauma Admission to Non-Surgical Service
- Pediatric Patient <15yo without Pediatric Evaluation within 24hrs

CARE OF THE PEDIATRIC TRAUMA PATIENT GUIDELINE

LITERATURE REFERENCES

American College of Surgeons Committee on Trauma. (2018). *Advanced Trauma Life Support for Doctors Course Manual*. 10th ed. American College of Surgeons. Chicago: IL.

American Heart Association. (2020). *PALS: Pediatric Advanced Life Support*. American Academy of Pediatrics. American College of Emergency Physicians. Jones & Bartlett. Boston: MA.

Emergency Nurses Association (2020) *Trauma Nurse Core Course*. 8th ed. Emergency Nurses Association. Des Plaines: IL.

Emergency Nurses Association (2020). *Emergency Nursing Pediatric Course*. 5th ed. Chapter 6, p 48. Emergency Nurses Association. Jones & Bartlett Learning. Burlington: MA.

I. Pediatric Trauma Evaluation

- A. Level 1 Trauma Activation: Patient will be evaluated upon arrival to trauma bay.
- B. Level 2 and 3: Trauma Resident will evaluate patient within 10 minutes of receiving consult.
- C. Consultations from El Paso Children’s Hospital (EPCH) ED (Refer to EPCH ED-16).
 - 1. Level 1 Trauma Criteria: Upon identification, transfer immediately to UMC ED.
 - 2. Level 2 and 3 trauma consult: It is the Trauma Attending’s discretion to transfer patient to UMC after evaluation of resources needed to optimally care for the patient are considered.

II. Airway and Breathing Management

- A. Orotracheal intubation is the most reliable means of establishing an airway and ventilations. Refer to Attachment C: Pediatric Equipment Sizes.
 - 1. In general, uncuffed endotracheal tubes are used in infants because of the anatomic differences.

CARE OF THE PEDIATRIC TRAUMA PATIENT GUIDELINE

2. Cuffed endotracheal tubes are used in toddlers and small children.
3. Nasotracheal intubation should not be performed in children.
4. The following equations can be used to determine the size and depth of the endotracheal tube:
 - Internal diameter size= $(\text{Age} + 16) / 4$
 - Depth= Size of endotracheal tube x 3
5. Bag valve ventilations should be delivered at a rate as follows:
 - a) Infants= 30-40- breaths/minute
 - b) Older children= 15-20 breaths/ minute
6. Tidal volumes also vary with age. Visualizing good chest rise and fall is a proper assessment tool to assess proper delivery of oxygen.
 - a) For infants and children: volumes of 4 to 6 ml/kg should be sufficient.
 - b) Larger volumes of 10ml/kg may also be needed.
7. A surgical airway is rarely indicated for the infant or small child and a surgical cricothyroidotomy should only be performed on children greater than 12 years.

III. Fluid Resuscitation Management

- A. Obtaining vascular access. Refer to Attachment D: Central Venous Catheter Sizes.
 1. Peripheral access will be attempted initially, however if no access obtained within 2 attempts, proceed to other access means.
 2. Intraosseous lines should be obtained if no peripheral access is obtained after 2 attempts on an unstable patient.
 3. Central venous catheters are preferred in children with no peripheral access and in those who may require long-term IV access (refer to Attachment D for central venous catheter sizes).

CARE OF THE PEDIATRIC TRAUMA PATIENT GUIDELINE

- B. Initial bolus at 20ml/kg of Normal Saline
 - 1. Patient may require a total of 60ml/kg to achieve replacement (three boluses of 20ml/kg).
 - 2. Consider the use of packed red blood cells when 60ml/kg replacement is achieved (3:1).
 - 3. Blood product administration replaced at 10ml/kg.
- C. Monitor urine output to verify systemic perfusion. Refer to Attachment E: Pediatric Vital Sign Parameters.
 - 1. Infants and children should have a minimum of 1 to 2 cc/kg/hr.
 - 2. If output is less than 1cc/kg/hr communicate findings to physician.
 - 3. Monitor vital signs for trends by referring to Attachment E for vital sign parameters.

IV. Pediatric Head Trauma Management

- A. Consult Neurosurgery Services as soon as possible if a head injury is suspected.
- B. Measure head circumference at minimum of every four hours in children less than 3 years old.
- C. Monitor neurological status utilizing the pediatric Glasgow Coma Scale (GCS). Refer to Attachment F: Glasgow Coma Scale.
- D. Monitor medication administration levels appropriately.
- E. Monitor for signs of increased intracranial pressure (refer to TR-P-35).
 - 1. Persistent vomiting or vomiting that becomes more frequent is a concern and mandates CT of the head.
 - 2. All seizure activity requires investigation by CT of the head.

V. Pediatric Abdominal Trauma Management

CARE OF THE PEDIATRIC TRAUMA PATIENT GUIDELINE

- A. Gastric decompression should be completed during the resuscitation phase and maintained as needed.
- B. Monitor abdominal girths frequently in children less than 3 years of age to assess for increasing distention.
- C. Ensure proper diagnostic measures are completed. Refer to TR-P-39 Pediatric Diagnostic Imaging Guideline.

VI. Pediatric Thermoregulation Management

- A. Utilize heat lamps, warmers, warm blankets, and/or increase room temperature during the resuscitation phase.
- B. Utilize warm fluids and warm blood products during the resuscitation phase.
- C. Monitor electrolytes during the resuscitation phase and during hospitalization.

VII. Child Maltreatment Considerations: Refer to TR-P-40 Non Accidental Trauma Management Guideline.

ATTACHMENTS:

- A KEY POINTS
- B CONSIDERATIONS
- C PEDIATRIC EQUIPMENT SIZES
- D CENTRAL VENOUS CATHETER SIZES
- E PEDIATRIC VITAL SIGN PARAMETERS
- F PEDIATRIC GLASCOW COMA SCALE, AND G40

CARE OF THE PEDIATRIC TRAUMA PATIENT GUIDELINE

Trauma Program Director

Date

Assistant Trauma Medical Director

Date

Trauma Medical Director

Date

Review/Revision History

04/2008
09/2009
12/2010
03/2014
03/2017
04/2017
07/2020
11/2020

CARE OF THE PEDIATRIC TRAUMA PATIENT GUIDELINE

ATTACHMENT A: KEY POINTS

KEY POINTS:

- The pediatric trauma patient is defined as newborn to less than 18 years of age.
- Pediatric Advanced Life Support (PALS) guidelines are applied to those who weigh less than 40 kilograms (kg).
 - Attachment C describes age and weight appropriate equipment sizes.
 - Pharmacist calculates continuous and scheduled interval weight based medication drips and doses for patients who weigh less than 50kg.
- Pediatric intensivist is available to assist with pediatric level one activation resuscitations.
- Patients admitted to University Medical Center under the age of 18 and weigh greater than 40kgs are at the discretion of the trauma surgeon.
 - Pediatric admissions to UMC are reviewed as part of the trauma Performance Improvement (PI) process.
- Pediatric patient admissions to El Paso Children's Hospital:
 - Trauma is the primary admitting service with co-management from pediatric hospitalists for those younger than 15 years of age.
 - Pediatric floor patients under the age of 15 years old will have a pediatric consultation within 24 hours.
 - Patients 15 years of age and older will have a pediatric consultation at the discretion of the trauma surgeon.
 - All pediatric trauma patients admitted to the pediatric intensive care unit are co-managed with pediatric intensivists.
 - Trauma Services will complete the H&P using the El Paso Children's Hospital patient FIN.
 - Pediatric Services will complete a consult note.

CARE OF THE PEDIATRIC TRAUMA PATIENT GUIDELINE

- Communication:
 - Floor admissions: Trauma resident will contact the Pediatric resident for new admissions and consults.
 - PICU admissions: Trauma resident will contact the pediatric intensivist for new admissions and transfers.
 - Consult order will be entered by trauma services.
 - Trauma services will contact the pediatric floor hospitalist every morning to provide patient plan of care updates. Discharge orders have a target time by 12 noon.
 - The PICU intensivist will contact the Pediatric hospitalist for all trauma patients transferring from the PICU to the pediatric floor.
- Refer to TR-S-18 (Optimizing Pediatric Trauma Operative Resources) when evaluating a child for operative services.

CARE OF THE PEDIATRIC TRAUMA PATIENT GUIDELINE

ATTACHMENT B: CONSIDERATIONS

Airway

- The larynx and vocal cords are more anterior and cephalad.
- The cricoid is the narrowest portion of the airway versus the vocal cord in adults.
- The pediatric patient has a pliable chest wall which increases the risk of injury to the lung as well as the liver and spleen. Furthermore, the presence of rib fractures indicates great force exertion to torso.
- Children are more prone to develop a tension pneumothorax due to a mobile mediastinum.

Fluid Resuscitation

- Infant blood volume is estimated to be 80ml/kg.
- Child blood volume is estimated to be 70ml/kg.
- Tachycardia is the primary response to hypovolemia.
- Hypotension in a child is a late sign of compensatory mechanisms.
- A state of decompensated shock indicates severe blood loss of greater than 45% of the circulating blood volume.

Abdominal Trauma

- Abdominal muscles are thinner, weaker and less developed.
- The liver is more anterior and less protected by the ribs.
- The kidneys are more mobile and not protected by fat.

Thermoregulation

- Pediatric patients have increased metabolic rates, thin skin and lack substantial subcutaneous tissue which contribute to increase heat loss and calorie expenditure.
- Hypothermia can lead the child to prolonged coagulation times and negatively affect central nervous function

CARE OF THE PEDIATRIC TRAUMA PATIENT GUIDELINE

**ATTACHMENT C: PEDIATRIC EQUIPMENT SIZES
(UTILIZE BROSELOW PEDIATRIC EMERGENCY TAPE)**

AGE AND WEIGHT	Airway and Breathing						Circulation		Supplemental Equipment			
	O2 Mask	Oral Airway	Laryngo-scope	ETT	Stylet	Suction	BP Cuff	IV Catheter	OG/NG Tube	Chest Tube	Urinary Catheter	Cervical Collar
Premie 3kg	Premie, neonatal	Infant	0 Straight	2.5-3.0	6 Fr	6-8 Fr	Premie, Newborn	22-24g	8Fr	10-14 Fr	5 Fr feeding	
0-6 months 3-5kg	Neonatal/newborn	Infant Small	1 Straight	3.0-3.5	6 Fr	8 Fr	Newborn, Infant	22g	10 Fr	12-18 Fr	6 Fr or 5-8 Fr feeding	
6-12 months 7kg	Pedi	Small	1 Straight	3.5-4.0	6 Fr	8-10 Fr	Infant, Child	22g	12 Fr	14-20 Fr	8 Fr	Small
1-3 yrs 10-12kg	Pedi	Small	1 Straight	4.0-4.5	6 Fr	10 Fr	Child	20-22g	12 Fr	14-24 Fr	10 Fr	Small
4-7 yrs 16-18kg	Pedi	Medium	2 Straight or Curved	5.0-5.5	14 Fr	14 Fr	Child	20g	12 Fr	20-28 Fr	10-12 Fr	Small
8-10 yrs 24-30kg	Adult	Medium Large	2-3 Straight or Curved	5.5-6.5	14 Fr	14 Fr	Child, Adult	18-20g	14 Fr	28-38 Fr	12 Fr	Medium

CARE OF THE PEDIATRIC TRAUMA PATIENT GUIDELINE

ATTACHMENT D: CENTRAL VENOUS CATHETER SIZES

Weight (kg)	Age (years)	Size (French)
< 5	0 - 0.5	3 or 4
> 5	0.5 - 1.5	5 or 7
> 15	5 - adult	5 - 11

CARE OF THE PEDIATRIC TRAUMA PATIENT GUIDELINE

ATTACHMENT E: PEDIATRIC VITAL SIGN PARAMETERS

AGE GROUP	WEIGHT RANGE (kg)	HEART RATE (beats/min)		BLOODPRESSURE (mm hg)			RESPIRATORY RATE (breaths/min)	URINARY OUTPUT (ml/kg/hr)
		Awake	Sleeping	Systolic	Diastolic	MAP		
Neonate (term)	2.2 to 5	100 to 205	90 to 160	67 to 84	35 to 53	45 to 60	30 to 60	2.0
Infant 1-11 m	0-10	100 to 180	90 to 160	72 to 104	37 to 56	50 to 62	30 to 53	2.0
Toddler 1-2 years	10-14	98 to 140	80 to 120	86 to 106	42 to 63	49 to 62	22 to 37	1.5
Preschool 3-5 years	14-18	80 to 120	65 to 100	89 to 112	46 to 72	58 to 69	20 to 28	1.0
School Age & Pre-Adolescent 6-12 years	18-36	75 to 118	58 to 90	97 to 120	57 to 80	66 to 79	18 to 25	1.0
Adolescent >13 years	36-70	60 to 100	50 to 90	110 to 131	64 to 83	73 to 84	12 to 20	0.5

CARE OF THE PEDIATRIC TRAUMA PATIENT GUIDELINE

PEDIATRIC GLASGOW COMA SCALE & G40

Pediatric GCS	Child	4 to 1 years of age	Infant	Score
Eye Opening	Spontaneous			4
	To Speech			3
	To Pain Only			2
	No Response			1
Eye Opening Score (E =)				
Best Verbal Response	Oriented	Appropriate words or social smile, fixes and follows	Coos and babbles	5
	Confused	Cries, but consolable	Irritable cry	4
	Inappropriate Words	Persistently irritable	Cries to pain	3
	Incomprehensible Sounds	Restless, agitated	Moans to pain	2
	No Response	None	No response	1
Best Verbal Response Score (B =)				
Best Motor Response	Obeys Commands		Moves Spontaneously & Purposefully	6
	Localizes Painful Stimulus		Withdraws to Touch	5
	Withdraws in Response to Pain		Withdraws to Response to Pain	4
	Flexion in Response to Pain		Abnormal Flexion Posture to Pain	3
	Extension to Response to Pain		Abnormal Extension Posture to Pain	2
	No Response			1
Best Motor Response Score (M =)				

OPTIMIZING PEDIATRIC TRAUMA OPERATIVE RESOURCES

POLICY PURPOSE:

- Our goal is to maximize our campus resources and optimize pediatric patient care by means of a seamless process between University Medical Center of El Paso (UMC) and El Paso Children's Hospital (EPCH).
- A required component for a verified Level I Trauma Center by the American College of Surgeons (ACS) is having in-house anesthesia providers and immediate Operating Room (OR) availability.
- Attending Trauma Surgeon will collaborate with other surgical services and clinically decide declaration of emergency cases while optimizing resources.

RESPONSIBLE:

Trauma Medical Director
Trauma Program Director
Orthopaedic Faculty and Residents
Surgery Faculty and Residents
Emergency Medicine Faculty and Residents
Anesthesiologists
Allied Health Professionals (AHPs)
Perioperative Associates
Nursing Associates

PI TRIGGERS FOR REVIEW

- Emergent Pedi to EPCH OR >2hrs from arrival

REFERENCES:

Committee on Trauma American College of Surgeons. (2014). Resources for Optimal Care of the Injured Patient (pp. 76-77). Chicago, IL: American College of Surgeons.

PROCEDURE:

- A. UMC perioperative services maintains the capability of in-house anesthesia and prompt OR availability 24/365. The following are a listing of examples of surgical interventions to consider for emergent surgical intervention.
 1. Laparotomy with unstable vital signs within one hour.
 2. Laparotomy within two hours.

OPTIMIZING PEDIATRIC TRAUMA OPERATIVE RESOURCES

3. Emergent craniotomies within two hours.
 4. Risk of vision or limb loss/function within two hours.
- B. Consider the following for utilization of EPCH's perioperative services:
1. Maximizing available services.
 2. Surgeries that can wait two hours as determined by the surgeon.
 3. The surgeon will communicate with the EPCH Administrator On Duty (AOD) to activate the EPCH perioperative team.
 4. The EPCH AOD will contact perioperative services including anesthesiologist regarding request by surgeon.
 5. The EPCH AOD will communicate with the UMC AOD regarding the acceptance patient's need for utilization of resources.
 6. Process will follow as referenced in TR-S-4 Trauma Patient Admission, TR-S-17 Care of the Pediatric Patient, P-2 Screening and Treatment for Emergency Medical Conditions Including Active Labor (EMTALA), P-7 Patient Transfers.
- C. All emergent surgical cases performed at EPCH (See Section A) will be reviewed.

OPTIMIZING PEDIATRIC TRAUMA OPERATIVE RESOURCES

Trauma Program Director

Date

Trauma Medical Director

Date

Reviewed/Revised
06/2013
12/2016
02/2020

MASSIVE HEMORRHAGE GUIDELINE IN TRAUMA

POLICY PURPOSE

The purpose is to outline initiation and discontinuation criteria to massive blood product transfusions.

- Uncrossmatched (O Rh negative or O Rh positive pRBC) will be available immediately.
- Group O Rh negative pRBC will be reserved for women of childbearing age (younger than 50 years of age).
- Patients will receive crossmatched pRBC as soon as available.

RESPONSIBLE

Trauma Medical Director
Associate Trauma Medical Director
Assistant Trauma Medical Director
Surgery Faculty and Residents
Emergency Medicine Faculty and Residents
Anesthesiologists
Allied Health Professionals (AHPs)
Trauma Program Director
Nursing Associates
Trauma Service Coordinators

REFERENCES

Committee on Trauma (2014). Resources for Optimal Care of the Injured Patient (p. 85). Chicago, IL: American College of Surgeons.

Committee on Trauma (2014). ACS TQIP Massive Transfusion in Trauma: Guidelines. Chicago, IL: American College of Surgeons.

Giancarelli, A., Birrer, K. L., Alban, R. F., Hobbs, B. P., & Liu-DeRyke, X. (2016). Hypocalcemia in trauma patients receiving massive transfusion. *Journal of Surgical Research*, 202(1), 182-187. [dio.org/10.1016/j.jss.201.12.036](https://doi.org/10.1016/j.jss.201.12.036)

POLICY REFERENCES

PA-IH-048 Blood products for mass transfusion
P-33 Blood component administration
TR-P-26 Traumatic Coagulopathy Factor VIIa guidelines

MASSIVE HEMORRHAGE GUIDELINE IN TRAUMA

TR-P-33 Traumatic Hemorrhage: Antifibrinolytic Control Tranexamic acid (TXA)

PERFORMANCE IMPROVEMENT TRIGGERS:

- Treatment Protocols not Followed
- Trauma Death

DEFINITIONS

Assessment of Blood Consumption (ABC) score: Consists of 4 variables, each is assigned a point, which includes:

- Pulse 120 or greater
- Systolic blood pressure (SBP) 90 mmHg or less
- Positive Focused Assessment with Sonography for Trauma (+ FAST)
- Penetrating torso injury

Indications to trigger MTG include one or more of the following:

- ABC score of two or more points
- Persistent hemodynamic instability (estimated blood loss of \geq 1500ml)
- Active bleeding requiring operation or angioembolization
- Blood transfusion of greater than 3 pRBCs in the trauma bay
- Pre-admission blood loss of \geq of 1000ml
- Coagulopathic patient
- Attending discretion

Administer one (1) gram of calcium gluconate IV if:

- Patient was transfused two or more blood products prior to arrival (pre-hospital or at transferring facility).
- Patient was transfused two or more blood products in the ED.
- Ionized calcium level is less than ($<$) 1.18.

PROCEDURE

- A. The trauma attending or designee will activate massive blood transfusion based on the indications listed above.

MASSIVE HEMORRHAGE GUIDELINE IN TRAUMA

1. Transfuse universal pRBC (packed red blood cells) and plasma in a ratio between 1:1 and 1:2.
 2. Transfuse one single donor apheresis or random donor platelet pool for each four (4) units of pRBCs.
 3. Process for obtaining blood products to the originating patient care area will follow PA-IH-048.
 4. Refer to attachment A for blood product delivery and assignments.
 5. pRBCs are transfused using a warming rapid infuser. Platelets and cryoprecipitate are not administered through rapid infuser.
 6. pRBCs and plasma will be delivered and kept in temperature controlled coolers. Platelets and cryoprecipitate should not be placed in coolers.
 7. Upon termination of massive blood transfusion, all remaining blood products and coolers will be returned to blood bank within 15 minutes by unit designated staff. Refer to attachment A.
- B. Mass transfusion in the Intensive Care Unit (ICU)**
1. Upon arrival to ICU, obtain baseline laboratory and repeat the listed tests as needed:
 - International Normalized Ratio (INR)/Partial thromboplastin time (aPTT)
 - Fibrinogen level
 - Hemoglobin or hematocrit
 - Platelet count
 - Ionized Calcium
 - Blood gas including lactate
 - Point of Care Testing (POCT)/Rotational Thromboelastometry (ROTEM)
 2. Immediately correct patient's hypothermia, acidosis and hypocalcemia.
 3. Continue with mass transfusion adhering to 1:1 pRBC/Plasma ratio by using contents in mass transfusion box.
 4. Once laboratory results are available, direct goal based on findings and clinical evidence of ongoing bleeding.

MASSIVE HEMORRHAGE GUIDELINE IN TRAUMA

5. If massive bleeding persists despite normalized coagulation results, patient may require prompt return to the operating room.
- C. End points of transfusion
1. Discontinue goal-directed transfusion based on laboratory findings if surgical bleeding has been controlled by the surgeon in the operating room **OR** there is radiographic and physiologic evidence of bleeding control after angioembolization.
 2. Massive transfusion will also be discontinued when there is recognition that further resuscitation is futile.
- D. The following will be used as a guide to stop blood component transfusion in a patient who is not actively bleeding and still in the acute resuscitation phase:
- pRBCs transfusion for hemoglobin of 10 g/dl or greater
 - INR less than 1.5
 - Platelet transfusion for platelet count greater than 150×10^9
 - Cryoprecipitate or fibrinogen concentrate for fibrinogen level >180 g/L
 - Rotational Thromboelastography (ROTEM) levels:
 - Plasma for CT exTEM >100 seconds and/or CT inTEM >230 seconds
 - Cryoprecipitate (fibrinogen concentrate) and/or plasma for MCF fibTEM <8 mm
 - Platelets for MCF exTEM <45 mm and MCF fibTEM >10 mm
 - Anti-fibrinolytics for ML exTEM >15 percent
- E. Therapeutic adjuncts to Massive Transfusion Guideline (MTG)
1. Refer to policy TR-P-33 Traumatic Hemorrhage: Antifibrinolytic Control Tranexamic acid (TXA).
 2. Refer to Policy TR-P-26 Traumatic Coagulopathy Factor VIIa guidelines.
 3. Refer to hospital intranet application page link titled “Anticoagulation Management.”
 4. Refer to attachment B: Andexanet Alfa (Andexxa) administration guideline.
- F. Upon termination of massive transfusion, all remaining blood products and coolers/boxes will be returned to blood bank promptly.

MASSIVE HEMORRHAGE GUIDELINE IN TRAUMA

Trauma Program Director

Date

Dir. Pharmaceutical Clinical Services

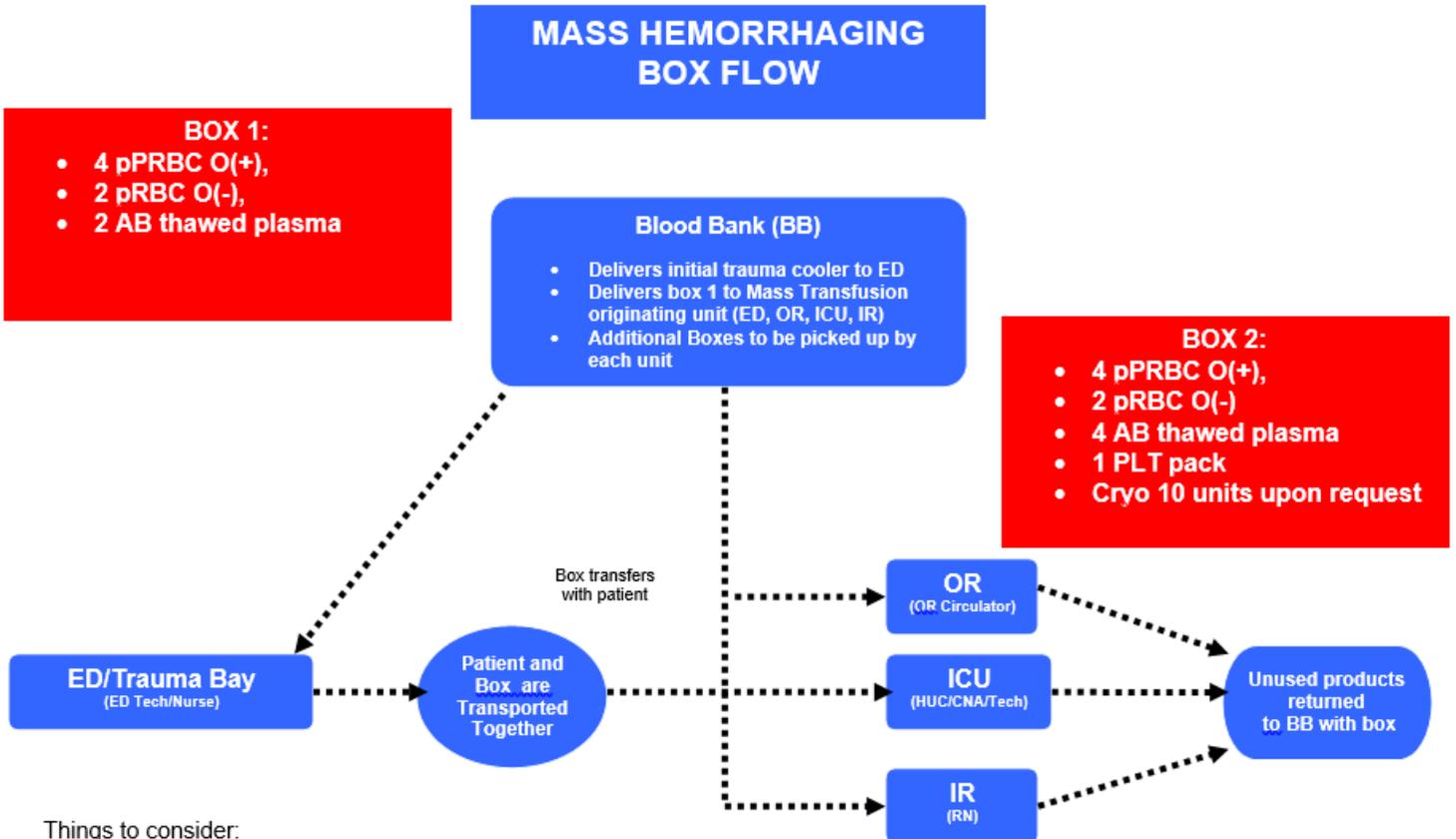
Date

Trauma Medical Director

Date

Reviewed/Revised
02/2014
11/2016
06/2018
10/2019
06/2020

**MASSIVE HEMORRHAGE GUIDELINE IN TRAUMA
ATTACHMENT A**



Things to consider:

- BB Staffing after hours (2)
- Responsible staff for box
- Keep cooler closed (products OK up to 4 hours)
- Attending Physician Initiates/Discontinues Mass Transfusion
- 20 minutes between boxes

MASSIVE HEMORRHAGE GUIDELINE IN TRAUMA

ATTACHMENT B: ANDEXANET ALFA (ANDEXXA) ADMINISTRATION GUIDELINE

Andexanet Alfa (Andexxa) administration order is restricted to only Trauma and Neurology attending physicians when intracranial bleeding is determined by CT or MRI.

Estimated dose cost: \$14,000 - \$37,000.

Dosing Andexanet Alfa (Andexxa)

Dose		Initial IV Bolus	Follow-On IV Infusion
LOW	Rivaroxaban ≤ 10mg	400mg-Target rate (30mg/minute)	480mg over 120 minute.
	Apixaban ≤ 5mg	400mg-Target rate (30mg/minute)	480mg over 120 minutes
	Dose Unknown	<i>Pill ingested 8 or more hours ago</i>	USE LOW DOSE
HIGH	Rivaroxaban > 10mg*	800mg-Target rate (30mg/minute)	960mg over 120 minutes
	Apixaban > 5mg*	800mg-Target rate (30mg/minute)	960mg over 120 minutes
	Dose unknown	<i>Pill ingested less than 8 hours ago</i>	USE HIGH DOSE
*NOTE: ANY dose taken over 8 hours ago USE LOW DOSE			
NO serious adverse events w/Andexxa		Reversal% 92% Apixaban	
Events that did occur DVT, Pulmonary Embolism		97% Rivaroxaban	
Use of Andexxa is for INTRACRANIAL BLEEDING patients: Restricted to Trauma/Neurology Attending			
Potentially life threatening symptoms of Hemodynamic compromise, i.e. Severe Hypotension, poor skin perfusion, mental confusion, low unexplained urine output; failure to reverse WILL result in death or permanent disability. Factor 10a reversal agent.			
INTRACRANIAL bleeding must have undergone a CT or MRI to determine new/expanding INTRACRANIAL bleeding FIRST.			
<i>85% of patients got low dose (Annexa-4 Study)</i>			
Restart antithrombotic therapy as soon as medically appropriate			

**PHYSICIAN GUIDELINE FOR THE TRAUMA PATIENT'S
INITIAL ASSESSMENT AND RESUSCITATION**

POLICY PURPOSE

This guideline describes a systematic approach for expeditious trauma care to the injured patient.

Systematic approach includes:

- Preparation,
- Triage,
- ABCDEs (primary survey),
- Immediate resuscitation with life-threatening injuries,
- Adjuncts to primary survey,
- Need to transfer considerations,
- Head to toe evaluation (secondary survey),
- Adjuncts to secondary survey,
- Post resuscitation monitoring,
- Reevaluation and definitive care.

RESPONSIBLE

Trauma Medical Director
Associate Trauma Medical Director
Assistant Trauma Medical Director
Trauma Faculty, Residents, and Advanced Healthcare Practitioners (AHPs)
Emergency Medicine Faculty, Residents and AHPs
Trauma Program Director
Trauma Service Coordinators
Nursing Associates

PI TRIGGERS

- Trauma Code/Alert and Trauma Triage Decision Scheme
- Level 2 Trauma Consult >30mins post ED arrival
- Absence of Trauma Team Member(s) Response Times
- Resuscitation Protocols not Followed
- In-house Consult Response >10 Minutes

LITERATURE REFERENCE

American College of Surgeons, Committee on Trauma. (2018). Advanced Trauma Life Support: Initial Assessment and Management, 10th ed. Chicago, IL. American College of Surgeons.

**PHYSICIAN GUIDELINE FOR THE TRAUMA PATIENT'S
INITIAL ASSESSMENT AND RESUSCITATION**

PROCEDURE

Follow Advanced Trauma Life Support (ATLS) (Primary and Secondary Survey) principles.

L. Primary Survey:

1. Airway
 - a. Patients are presumed to have cervical spine injury until proven otherwise (use techniques: jaw-thrust or chin-lift maneuver).
 - b. An adequate airway must be obtained and maintained.
 - c. Establish and secure a definitive airway for patients with a GCS less than or equal (\leq) to eight (8). Endotracheal oral intubation is preferred (unless contraindicated).
 - d. All patients are to receive supplemental oxygen.
2. Breathing
 - a. Assessment of adequacy and symmetry of respirations.
 - b. Visually inspect chest wall, Jugular Venous Distention (JVD) and position of trachea.
 - c. Intervene and correct any major abnormalities interfering with patient's breathing.
3. Circulation
 - a. Quickly control external hemorrhage (direct pressure and/or use of tourniquet).
 - b. Quickly assess for internal hemorrhage such as performing a Focused Assessment with Sonography for Trauma (FAST).
 - c. Apply pelvic and/or long-bone stabilizing devices if necessary.
 - d. Assess central pulses, heart sounds, Blood Pressure (BP), and capillary refill to nail beds or hypothenar eminence.

**PHYSICIAN GUIDELINE FOR THE TRAUMA PATIENT'S
INITIAL ASSESSMENT AND RESUSCITATION**

- e. Establish vascular access: two large-bore peripheral catheters or if unsuccessful, intraosseous or central venous access.
 - f. Initiate warm fluid therapy. One liter crystalloid, if no response proceed with blood products and consider coagulant agents such as Tranexamic Acid (TXA).
 - g. A rapid neurologic exam is performed to assess patient's level of consciousness.
4. Disability
- a. Perform a rapid neurologic evaluation to establish patient's level of consciousness and pupillary assessment, GCS.
 - b. Any changes in LOC indicates need to reassess patient's ABCs (oxygenation, ventilation and perfusion status).
 - c. Remember hypoglycemia, alcohol intoxication, narcotics or other drugs can alter patients LOC.
5. Exposure/Environmental Control
- a. Completely remove all patient worn garments to identify all injuries (including examination of the back).
 - b. Prevent hypothermia by administering warm fluids, application of warm blankets, increase room temperature and/or application of external warming device such as a bair hugger.

M. Adjuncts from Primary Survey may include the following:

- 1. Cardiac monitor;
- 2. Pulse Oximetry;
- 3. Carbon Dioxide (CO₂) monitoring;
- 4. Arterial Blood Gas (ABG) lactate included;
- 5. Gastric catheter to decompress gastric distention;
- 6. Chest and Pelvis plain films;
- 7. FAST.

N. Secondary Survey: History and head to toe examination to assess for further injuries.

**PHYSICIAN GUIDELINE FOR THE TRAUMA PATIENT'S
INITIAL ASSESSMENT AND RESUSCITATION**

1. History includes the AMPLE mnemonic:
 - a. Allergies
 - b. Medications
 - c. Past illnesses/Pregnancy
 - d. Last meal
 - e. Events/Environment related to injury. Mechanism of injury can lead to suspected injury patterns.
2. Examination of scalp to include inspection of open injuries.
3. Palpation for fracture of the head, face, jaw and neck.
4. Examination of the eyes for function, dilation of pupils, reaction to light, and examination of fundus. Include assessment of ocular mobility.
5. Examination of ears with particular attention to the tympanic membranes checking for blood behind the drums.
6. Examination of the oral cavity: teeth, maxilla, mandible and soft tissue.
7. Neck – Cervical spine injury is presumed until a complete cervical spine series is completed or after a reliable clinical exam can be performed. Neck examination includes inspection, palpation, and auscultation (Refer to TR-P-8 for cervical spine clearance guideline).
8. Chest
 - a. Reassess patients breathing adequacy.
 - b. Assess for blunt injuries that interfere materially with the airway.
 - c. Continuous ECG monitoring on all trauma patients.
9. Abdomen
 - a. Check for distention, abdominal sounds, external evidence of injuries.
 - b. Palpation for intra-abdominal masses and areas of tenderness.
10. Pelvis – pressure over the pelvic and pubic area to elicit tenderness to suggest fracture.

**PHYSICIAN GUIDELINE FOR THE TRAUMA PATIENT'S
INITIAL ASSESSMENT AND RESUSCITATION**

11. Rectal – examination to check for intactness of prostate, rule out bleeding, and check sphincter tone.
 12. Genitalia – assess for urethral blood. If prostate is intact, then may proceed with indwelling bladder catheter.
 13. Extremities – assess for intact neurovascular supply, obvious injuries, palpable fractures, and motor function.
 14. Neurologic:
 - a. Reassess LOC, GCS and pupillary size and response.
 - b. Include assessment of motor and sensory evaluation of extremities.
 - c. If suspected spinal cord injury, administer fluids judiciously and begin vasopressor infusion to manage hypotension from neurogenic shock.
- D. Adjuncts from Secondary Survey may include the following:
1. Labs (if serum samples not already drawn), for example type & cross, drug toxin screen and if applicable a pregnancy test for female of childbearing age.
 2. Chest, pelvic x-rays, and EKG, if not already performed. Cervical, thoracic, lumbar and/or extremity plain films if applicable.
 3. A naso/oral gastric (NG/OG) tube placements if not contraindicated or not already performed.
 4. CT scans and/or ultrasounds should be considered at this time.
 5. Decision to forgo diagnostic imaging is made by trauma surgeon with hemodynamically unstable patients needing immediate surgical intervention. Diagnostics are completed postoperatively in such cases.
- E. Consultation: Appropriate service consultation(s) is initiated according to the priorities of patient injuries.

**PHYSICIAN GUIDELINE FOR THE TRAUMA PATIENT'S
INITIAL ASSESSMENT AND RESUSCITATION**

Trauma Program Director

Date

Trauma Medical Director

Date

Review/Revision History:

Trauma Department
03/97
02/00
04/03
03/06
04/08
10/10
03/14
03/17
04/20

**PHYSICIAN PROTOCOL FOR EMERGENCY THORACOTOMY
POLICY:**

To provide guidelines for the appropriate use of resuscitative thoracotomy in the Emergency Department (ED) setting.

RESPONSIBLE:

Surgery Faculty and Residents
Emergency Medicine Faculty and Residents
Trauma Medical Director
Trauma Program Director

REFERENCE:

Seamon, M. J., Haut, E. R., Van Arendonk, K., Barbosa, R. R., Chiu, W. C., Dente, C. J., ... & Magnotti, L. J. (2015). An evidence-based approach to patient selection for emergency department thoracotomy: a practice management guideline from the Eastern Association for the Surgery of Trauma. *Journal of Trauma and Acute Care Surgery*, 79(1), 159-173.

OBJECTIVES:

- Improve selection of patients who undergo resuscitative thoracotomy to improve survival and neurologically intact survival
- Maintain coronary and cerebral perfusion by relieving cardiac tamponade or restoring efficient cardiac contractility via internal/open cardiac massage.
- Control hemorrhage by cardiorrhaphy and compression of bleeding intrathoracic vessels.
- Reduce intra-abdominal hemorrhage by exposure of the descending thoracic aorta for cross-clamping.

OVERVIEW:

The three most important prognosticators of survival after an ED Thoracotomy are the mode of injury, anatomic location of injury and the physiologic status of the patient on arrival to the Emergency Department. Utilizing level 3 evidence for patient selection for resuscitative thoracotomy vs. resuscitation without ED thoracotomy to improve survival and neurologically intact survival.

PHYSICIAN PROTOCOL FOR EMERGENCY THORACOTOMY

PROCEDURE:

Patients who present **PULSELESS** to the Emergency Department:

After Penetrating Thoracic Injury

- With signs of life- **Strongly recommend** resuscitative ED thoracotomy
- Without signs of life- **Conditionally recommend** resuscitative ED thoracotomy. Conditional recommendation based on pre-arrival CPR time less than 15 minutes

After Penetrating Extra-Thoracic Injury

- With signs of life- **Conditionally recommend** resuscitative ED thoracotomy
- Without signs of life- **Conditionally recommend** ED thoracotomy. Conditional recommendation based on pre-arrival CPR time less than 15 minutes and excluding isolated cranial injuries.

After Blunt Injury

- With signs of life- **Conditionally recommend** resuscitative ED thoracotomy. Conditional recommendation based on expected poor neurologically intact survival.
- Without signs of life- **Recommend against** resuscitative ED thoracotomy.

All ED Thoracotomies will be reviewed through the trauma performance improvement process

Note:

1. Signs of life are defined as follows: pupillary response, spontaneous ventilation, presence of carotid pulse, measureable or palpable blood pressure, extremity movement, or cardiac electrical activity.
2. Any decision outside these recommendations is under the discretion of the Trauma surgeon

PHYSICIAN PROTOCOL FOR EMERGENCY THORACOTOMY

Trauma Medical Director

Date

Trauma Program Director

Date

Reviewed/Revised History:

10/1997
02/2000
07/2003
05/2006
04/2008
10/2010
01/2013
01/2016
12/2018

CARE OF THE GERIATRIC TRAUMA PATIENT

POLICY PURPOSE

- Guideline outlines process when caring for injured patients 65 years and greater to receive timely and appropriate evaluations in an organized and coordinated manner.

RESPONSIBLE

Physicians, Residents & Allied Healthcare Professionals (AHPs)
Trauma Medical Director
Associate Trauma Medical Director
Assistant Trauma Medical Director
Trauma Program Director
Case Managers and Social Workers
Nursing Associates
Pharmacist
Respiratory Therapists
Rehabilitation Services (Physical, Occupational and Speech Language Pathology
Therapists, PT, OT, SLP)
Dieticians

LITERATURE REFERENCES

American College of Surgeons, Committee on Trauma. (2018). Advanced Trauma Life Support. 10th ed. Chicago, IL. American College of Surgeons.

American College of Surgeons Trauma Quality Improvement Program. Geriatric Trauma Management Guidelines (2012). Accessed May 4, 2020: https://www.facs.org/-/media/files/quality-programs/trauma/tqip/geriatric_guidelines.ashx

American College of Surgeons National Surgical Quality Improvement Program and American Geriatric Society. (2012). Best Practices: Optimal Perioperative Management of the Geriatric Patient. Accessed May 4, 2020: <https://www.facs.org/~media/files/quality%20programs/geriatric/acs%20nqip%20geriatric%202016%20guidelines.ashx>

American Geriatric Society. (2019). Updated AGS Beers Criteria for potentially inappropriate medication use in older adults. Journal of American Geriatric Society. 67 (4): 674-694. Accessed October 8, 2020 at <https://geriatrictoolkit.missouri.edu/drug/Beers-Criteria-AGS-2019.pdf>

CARE OF THE GERIATRIC TRAUMA PATIENT

I. Resuscitation/Initial Consult Phase

- A. Team members will follow Advanced Trauma Life Support (ATLS) primary and secondary survey principles.
- B. The secondary survey requires heightened awareness as patients have an increased vulnerability due to age, comorbidities and results of frailty. Consider the below during secondary survey. Refer to Attachment A: Background, Key Points and Considerations.
 - 1. Medication history.
 - 2. Non-traumatic existing conditions.
 - 3. Laboratory assessment and parameters.
 - 4. Diagnostic imaging with application of renal dose contrast guideline criteria.
 - 5. Evaluate anticoagulation and administer applicable reversal agents.
- C. Arterial or Venous Blood Gas, (ABG or VBG) and Electrocardiogram (EKG) will be obtained in the Emergency Department or upon arrival to admitting unit.
- D. Consider ICU admission for geriatric patients with any of the following:
 - 1. Base deficit equal or greater than negative four (- 4).
 - 2. Systolic blood pressure less than 110 mmHg.
 - 3. Any co-morbidity.
 - 4. High-risk mechanism of injury.
 - 5. Two or more rib fractures.
- E. For ICU admissions consider placing an arterial line and/or minimally invasive continuous cardiac output/stroke volume device particularly if patient is intubated (i.e. FloTrac).
 - 1. Monitoring will facilitate correcting hypovolemia or volume overload.
 - 2. Also monitor I&O's and daily weight.

CARE OF THE GERIATRIC TRAUMA PATIENT

- F. Continuous pulse oximetry monitoring will be ordered for Level 1 and 2 trauma patients going to units other than the critical care areas.
- G. It is important to gather information regarding the patient's preinjury chronic medical condition and functional status soon after admission during the tertiary survey.
 - 1. Pulmonary disease
 - 2. Chronic renal failure
 - 3. Chronic anemia
 - 4. Depression
 - 5. Baseline cognitive/functional impairment and nutritional status
 - 6. Thyroid dysfunction
 - 7. Glucose intolerance
 - 8. Decubitus pressure injury
- H. Consider Geriatrician service consult. Refer to Attachment B: Geriatric Trauma Consultation.
- I. Utilize the updated AGS Beers Criteria when evaluating patient's medication regimen. Access via <https://geriatrictoolkit.missouri.edu/drug/Beers-Criteria-AGS-2019.pdf>.
- J. Successful and effective patient pain management drives improvements for patients pulmonary function, optimizes mobility and mitigate delirium. Refer to Attachment C for overall geriatric trauma program goal and process.
- K. The patient's current condition and prognosis should be clearly communicated with the patient and their family or individual designated to make patient's medical decisions.
 - 1. Important decisions will need to be made regarding treatment.
 - 2. Treatment burden and potential functional outcome are to be considered and part of the decision making process.
- L. Providers are to document in the medical record discussions and decisions made between the healthcare team and patient/family members within 72 hours of admission.
 - 1. Treatment options.
 - 2. Risk of complications, mortality and temporary/permanent functional decline.
 - 3. Advanced directive.

CARE OF THE GERIATRIC TRAUMA PATIENT

4. Identification of surrogate decision maker.
5. Palliative care options.

II. In-patient management with early mobilization:

- A. Assess for fall risk and address with fall risk precautions.
- B. Ambulate patient within 12 hours of admission if not contraindicated.
- C. Institute aspiration precautions.
 1. Head of the bed elevation.
 2. Evaluate swallowing deficits. Patients have an increased risk for decreased cough reflex & mucociliary clearance.
 3. Sit patient upright for meals and for two (2) hours after completion of meal.
- D. Have respiratory therapist assist with chest physiotherapy treatment with use of incentive spirometer (IS). If patient cannot tolerate IS, use most appropriate acapella device (green or blue).
- E. Place on bowel regimen.
- F. Daily skin integrity assessments and documentation.
- G. Dietary Consultation.

III. Discharge Planning:

- A. Begin developing plan for transition soon after post injury and resuscitation period within 24 hours.
- B. Assess:
 1. Home environment, social support and possible medical equipment home health needs.
 2. Social services to assist with options for:
 - a) In-patient or out-patient rehabilitation services

CARE OF THE GERIATRIC TRAUMA PATIENT

- b) Nursing home placement or return
 - c) Skilled nursing facility placement or return
- C. Provide patient or caregiver with written discharge document that includes:
- 1. Discharge diagnosis
 - 2. Medication instructions
 - 3. Wound care
 - 4. Diet
 - 5. Need for PT/OT
 - 6. Contact with patients continuity physician/clinic
 - 7. Follow-up appointment instructions
 - 8. Pending laboratory or diagnostic studies

Attachment A: Background, Key Points and Considerations

Attachment B: Consultation Process

Attachment C: Overall Geriatric Trauma Program Objectives

CARE OF THE GERIATRIC TRAUMA PATIENT

Trauma Program Director

Date

Trauma Medical Director

Date

Review/Revision History:

04/2010
03/2014
05/2017
01/2021

CARE OF THE GERIATRIC TRAUMA PATIENT

ATTACHMENT A: BACKGROUND, KEY POINTS AND CONSIDERATIONS

BACKGROUND

- Geriatric trauma population is defined 65 years of age and greater.
- Trauma mortality increases with age and is higher than all other age group.
- Patients over the age of 85 years have five times higher mortality rate than those 65 to 74 years of age.
- Geriatric trauma patients with significant underlying physiologic abnormalities and/or presence of pre-existing conditions may adversely affect outcome and be at greatest risk for mortality.

KEY POINTS

- Level 1 activation criteria includes systolic blood pressure less than (<) 110 mmHg for patients 65 years of age and greater.
- Be aware of vital signs associated with aging, pre-existing disease, co-morbidities and current medication use (e.g., Clopidogrel, Aspirin, Warfarin and Beta Blockers).
- Maintain appropriate level of pain control with multi-modal analgesia, especially in patients with rib fractures, pelvic/long bone fractures or after a thoracotomy or laparotomy.
- Be cautious with sedatives.
- Physiologic changes with aging need to be considered as well. Resting organ function is often preserved but the ability to augment performance in response to stress is greatly compromised. Therefore the following are also important factors to consider:
 - Aggressive pulmonary toilet/early ambulation.
 - Adequate nutritional support.
 - Adequate thromboembolic prophylaxis.
 - Proper attention to skin integrity/bowel regimen/bladder catheter care.

Be cautious and consider geriatric abuse and or neglect.

Plan early for disposition needs: Inpatient rehabilitation, Long-Term Acute Care/Skilled Nursing Facility/Nursing Home.

CARE OF THE GERIATRIC TRAUMA PATIENT

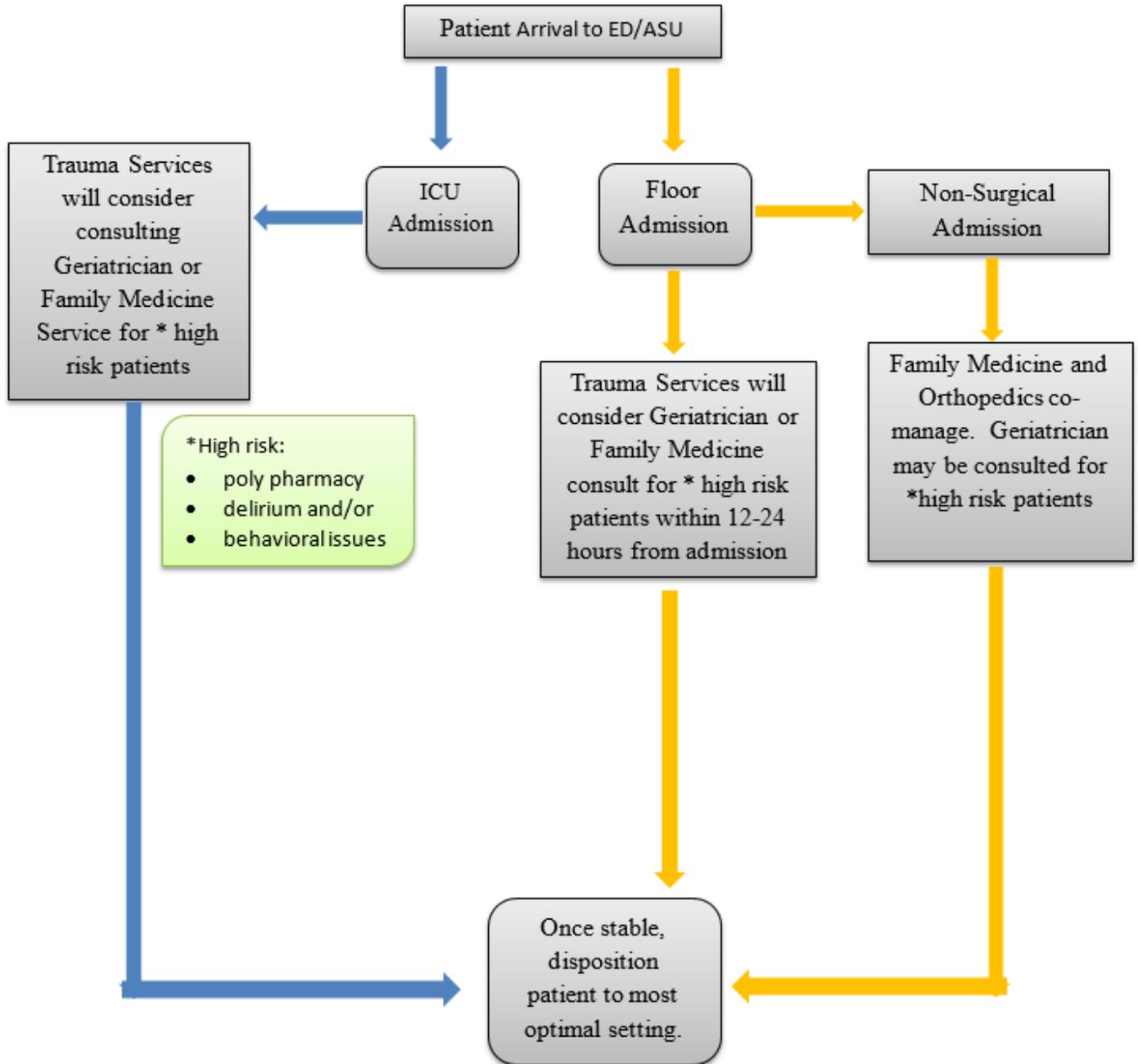
CONSIDERATIONS

The Secondary Survey awareness is heightened for the following:

- Medication history that may affect initial evaluation and care.
- Consider non-traumatic existing conditions that could impact patient's presentation:
 - Acute coronary syndrome
 - Hypovolemia/dehydration
 - Urinary tract infection
 - Pneumonia
 - Cerebrovascular event
 - Syncope
- Laboratory assessment and parameters facilitate providers with identifying patients who may benefit from aggressive resuscitation:
 - a) Base Deficit of greater than negative five (- 5)
 - b) Renal function (BUN, Cr, estimated GFR)
 - c) Blood alcohol level
 - d) Urine toxicology screen
 - e) Serum electrolytes
- M. Diagnostic imaging should include all CT scans needed to rule out injury in appropriate areas at risk. Renal dose contrast guideline is applied by diagnostic imaging department.
- N. Consider the following with relation to injuries:
 - a) For each rib fractured, risk of pneumonia increases by 27% and mortality by 19%.
 - b) A GCS less than (<) 8 is associated with a dismal prognosis. If substantial improvement in GCS is not realized within 72 hours of injury, consideration should be given to limiting further aggressive therapeutic interventions.
- Anticoagulation assessment and reversal considerations:
 - c) ROTEM
 - d) Platelet transfusion
 - e) Tranexamic acid (TXA)
 - f) Prothrombin Complex Concentrate (PCC)
 - g) Andexxa (Factor Xa)

CARE OF THE GERIATRIC TRAUMA PATIENT

ATTACHMENT B: GERIATRIC TRAUMA CONSULTATION



CARE OF THE GERIATRIC TRAUMA PATIENT

ATTACHMENT C: GERIATRIC TRAUMA PROGRAM OBJECTIVES

ED disposition to ICU for those with the following:

- Base deficit equal or greater than negative four (- 4)
- Systolic blood pressure less than 110 mmHg
- Uncontrolled glucose levels requiring insulin drip
- High risk mechanism
- Any co-morbidity
- ≥ 3 Rib fracture(s)

ED disposition to floor:

- Family Medicine will co-manage isolated hip fracture patients with Orthopedic Services. Refer to Code Hip Guideline.
- Consider Geriatrician (Geriatric Service) or Family Medicine consult for those categorized as high risk.

Treatments:

- Institute aspiration precautions.
- Institute use of incentive spirometer.
- Place on bowel regimen.
- Daily skin integrity assessment and documentation.
- Assess for fall risk and address with fall risk precautions.
- Expedite pre-procedure medical clearance for surgical intervention within 36 hours from presentation to emergency department (isolated hip fractures within 24 hours).
- Patient ambulation within 48 hours from admission if not contraindicated.

Providers are to document in the medical record discussions and decisions made between the healthcare team and patient/family members within 72 hours of admission.

Disposition and discharge within 5 days from arrival to emergency department for those with isolated injuries.

Trauma Performance Outcome Assessment Tool (TPOAT) data entry:

- ABG/EKG upon unit arrival
- Medical clearance within 2 to 36 hours
- Geriatrician consult when stable
- Speech evaluation for aspiration precautions
- Ambulate patient within 48 hours of admission
- Address end of life decisions within 24 to 48 hours

Trauma registry inclusion criteria: Primary diagnosis for an initial admission of an acute, identifiable injury, occurring within 14 days of arrival to the emergency department.

PHYSICIAN GUIDELINE FOR TRAUMA PATIENT ADMISSION

POLICY PURPOSE:

To ensure that the injured patient receives quality care in an organized and coordinated fashion to maximize patient outcomes.

RESPONSIBLE:

Physicians
Advanced Healthcare Practitioners (AHPs)
Administrator of the Day (AOD)
Nursing Associates

PI TRIGGERS FOR REVIEW

- Trauma Admission to Non-Surgical Service

PROCEDURE:

- O. All injured patients requiring admission are admitted to the trauma surgical service.
 1. If there are patients admitted to a non-surgical service, those patients will be reviewed and monitored through the trauma performance improvement process.
 2. Isolated hip fracture patients not requiring critical care services with orthopedic service consult are admitted to a non-surgical service (i.e. Family Medicine).
- B. After the first 24 hours of care and completion of tertiary assessment, a patient may be transferred to another service if the attending surgeon deems transfer of care to be in the best interest of the patient. (i.e., non-surgical interventions for isolated injury and patients have history of chronic renal failure requiring dialysis; cardiac co-morbidity; stable isolated hip injury; multiple co-morbidities).
- C. All pediatric trauma patients under the age of 15 require a pediatric Hospitalist consult and must be seen by Hospitalist within 24 hours of admission.
- D. All admitted pregnant trauma patients require an OB consult (Refer to policy TR-P-5 Physician Guideline for Care of Pregnant Trauma Patient).

PHYSICIAN GUIDELINE FOR TRAUMA PATIENT ADMISSION

Trauma Program Director

Date

Trauma Medical Director

Date

Reviewed/Revised
09/97
02/00
03/03
08/06
04/08
04/10
03/14
03/17
02/2020

CARE OF THE PREGNANT TRAUMA PATIENT

POLICY PURPOSE

Guideline to ensure that the pregnant injured patient receives a timely and appropriate evaluation in an organized and coordinated manner to maximize patient outcome.

RESPONSIBLE

Trauma Medical Director
Associate Trauma Medical Director
Assistant Trauma Medical Director
Acute Care/Trauma Surgeons
Emergency Medicine
OB-GYN
Neonatology Faculty & Residents
Allied Health Professionals (AHPs)
Trauma Team Activation Members
Trauma Program Director
Nursing Associates
Patient Access Associates
Maternal Response Team
Administrators of the Day (AODs)

LITERATURE REFERENCES

American College of Surgeons (2018). *American College of Surgeons Committee on Trauma: Advanced Trauma Life Support for Doctors: Student Course Manual*. 10th Ed. Chicago: IL.

Barraco, R.D., Chiu, W. C., Clancy, T. V., Como, J. J, Ebert, J.B., Hess, L.W., Hoff, W.S., Holevar, M.R., Quirk, J.G., Simon, B. J. and Weiss, P. M. (2010). Practice management guideline for the diagnosis and management of injury in the pregnant patient: The EAST practice management guideline work group. *The Journal of Trauma Injury, Infection and Critical Care*. 69 (1): pp 211-214.

PI TRIGGERS FOR REVIEW

- In-House consult response more than (>) 10 minutes
- Mass transfusion protocol activation
- Trauma code/alert and trauma triage decision scheme
- Laparotomy >1 hour with abdominal injury and SBP <90mmHg
- No trauma team activation for major trauma patient

CARE OF THE PREGNANT TRAUMA PATIENT

- Delays in identification of injuries

GUIDELINE

- P. Resuscitation of the pregnant patient will follow the Advanced Trauma Life Support (ATLS) guidelines to include Primary and Secondary assessment with its respective resuscitation measures (Refer to Attachment A: Physician Guiding Principles for Care of the Pregnant Trauma Patient).
- Q. Maternal Response Team are activated for a known Pregnant Trauma patient with an estimated pregnancy gestation of 20 or greater weeks. Upon patient arrival pregnancy term and gestational viability will be assessed.
- R. A Kleihauer Betke (KB) test is a recommended serum laboratory test quantitating fetal-maternal hemorrhage. The KB test is used to determine the presence of fetal blood in maternal circulation.

PROCEDURE

- 1) When a **known pregnant trauma patient with an estimated gestation of greater than 20 weeks** is pending arrival from the scene, or inter-facility transfer, the Maternal Response Team will be paged via operator (Refer to Attachment B and C and policy TR-S-1).
- 2) The Maternal Response Team include the OB-GYN faculty physician, the senior OB-GYN resident, Registered Charge Nurse from Labor and Delivery (L&D) department, Neonatologists, Neonatal Services AHP, Respiratory Therapist and Neonatal Intensive Care Registered Nurse (RN).
- 3) The Maternal Response Team will rapidly evaluate the maternal-fetal status: physical exam, bedside ultrasound examination, and electronic fetal monitoring. The Maternal Response Team will provide assistance and recommendations to the Trauma Team concerning the ongoing evaluation and management of the maternal-fetal status.
- 4) The primary admitting service is per Trauma Attending discretion for patients requiring trauma consults. Otherwise discretion between EM and OB Services.
- 5) ED nursing associates will be responsible to set up trauma bay with external fetal monitoring device and for possible emergency delivery. L&D charge nurse or designee as part of the Maternal Response Team will notify ED nurse if “C-section kit” is required (stocked in supply pyxis).

CARE OF THE PREGNANT TRAUMA PATIENT

- 6) In the event of labor delivery or emergency caesarean, neonatal services will provide care to the neonate in a separate trauma bay with the newborn warmer and neonatal resuscitation code cart.
- 7) A Patient Access Associate will register the neonate as a University Medical Center of El Paso patient. In the event the neonate requires intensive care therapy, a Memorandum of Transfer (MOT) will be completed and the neonatal services will transport neonate to the Neonatal Intensive Care Unit (NICU).
 - a. Initial patient (mother) will remain in the trauma bay and the second patient (neonate) in another trauma bay to allow providers ample space to work with their respective patient in separate bays.
 - b. Neonatal services will assess neonate and document findings.

ATTACHMENTS

- Attachment A: Physician Guiding Principles
- Attachment B: Team Roles and Responsibilities
- Attachment C: Maternal Response Team Members

CARE OF THE PREGNANT TRAUMA PATIENT

Trauma Program Director

Date

Trauma Medical Director

Date

Reviewed/Revised
09/1997
02/2000
06/2003
07/2006
04/2008
12/2010
03/2014
09/2015
01/2020
11/2020

CARE OF THE PREGNANT TRAUMA PATIENT

ATTACHMENT A: PHYSICIAN GUIDING PRINCIPLES

Cardiovascular

- After the 10th week of pregnancy, cardiac output can increase by 1.0 to 1.5L/min. As pregnancy progresses, supine position causes vena cava compression and can decrease cardiac output by 30% because of decreased venous return from the lower extremities.
- Pregnancy blood pressure results fall 5 to 15mmHg in systolic and diastolic pressures during the second trimester, then returns to normal levels at term. Hypertension may represent preeclampsia if accompanied by proteinuria.
- The resting heart rate increases 10-15 beats/min over baseline by the third trimester.
- Electrocardiograph may demonstrate with axis shift leftward by approximately 15 degrees. Flattened or inverted T waves in leads III and AVF may be normal. Ectopic beats increase during pregnancy.

Hematologic

- Healthy pregnant patients can lose 1,200 to 1,500 mL of blood before exhibiting signs and symptoms of hypovolemia. This amount of hemorrhage may be reflected by fetal distress as evidence by an abnormal fetal heart rate. At term, a Hematocrit of 31 to 35% is acceptable.
- The leukocyte count increases during pregnancy to 12,000/mm³ and as high as 25,000/mm³ during labor.
- The platelet count and bleeding time are not affected. Fibrinogen increases to 100 to 108 mm Hg.

Pulmonary

- The diaphragm is displaced upward 5cm near term, which results in decreased residual volume.
- Minute ventilation increases due to increase in tidal volume. Hypocapnia (PaCO₂ of 35 to 40mm Hg may indicate impending respiratory failure during pregnancy.
- Patients with advanced pregnancy requiring chest tube placement should have chest tube positioned higher to avoid intra-abdominal placement given the elevation of the diaphragm.

CARE OF THE PREGNANT TRAUMA PATIENT

- Administer supplemental oxygen to maintain a saturation of 95%.

Gastrointestinal

- Gastrointestinal motility and lower esophageal sphincter tone is diminished. This increases the risk of aspiration so early gastric tube decompression may be particularly important
- The small intestine is displaced upwards by the growing uterus
- Gallbladder stasis is common.
- The anterior parietal peritoneum is stretched and displaced from the viscera, thereby decreasing the sensitivity of the physical examination.

Endocrine

- The pituitary gland doubles in size. Shock may cause ischemia to the gland, resulting in pituitary insufficiency (Sheehan's Syndrome).
- Despite increased cortisol production, diurnal variation is maintained.
- Pancreatic lipase production is decreased, but amylase output is unaltered.
- In the late stages of pregnancy, prolactin may be very high.

Genitourinary

- A rising progesterone level reduces peristalsis of the ureters.
- As a result of uterine compression on the retro peritoneum, the renal pelvis and ureters dilate. This more pronounced on the right.
- The urinary bladder is displaced upward and becomes an intra-abdominal organ in the third trimester.
- Renal blood flow and glomerular filtration are increased.
- Glucosuria is common.

CARE OF THE PREGNANT TRAUMA PATIENT

Gynecologic

- At term the uterus not only increases in size, but also becomes highly vascular. The rate of blood flow through the organ increases from 60ml/min to 600ml/min. The patient's entire blood volume passes through the organ every ten minutes.

Musculoskeletal

- To facilitate delivery, the sacro-iliac ligaments and the pubic symphysis ligaments loosen.
- The width of the pubic symphysis widens to 4 to 8mm as compared to the non-gravid state.

Initial Assessment and Resuscitation

- In the initial evaluation and management of the pregnant trauma patient, priorities should remain the same as the non-pregnant patient. To ensure a good outcome for the fetus, prompt resuscitation of the mother is essential to the well-being of the fetus.
- As in all potentially injured patients, a systemic approach begins with the primary survey in which the airway, ventilation and circulation.
- Since the oxyhemoglobin disassociation curve for fetal blood differs from maternal blood, maternal hypoxia adversely affects fetal oxygen content. All patients, therefore, should receive supplemental oxygen until shock, maternal hypoxia and fetal distress have been ruled out.
- With the larger blood volume that is present during pregnancy, hemodynamic fluctuations are late findings in hemorrhagic shock. Pregnant women can lose 30 to 35% of her blood volume prior to developing tachycardia and hypotension. Furthermore, uterine blood flow is reduced up to 20% even prior to a change in maternal blood pressure. Blood flow is preferentially diverted to the mother at the expense of the fetus.
- Fluid resuscitation, as in all trauma patients, begins with crystalloid. If blood is required before the mother's blood type is known, O negative (-) is transfused to prevent Rh isoimmunization.
- After twenty weeks gestation, the patient is at risk of having uterine compression of their inferior vena cava. By placing the patient in the left lateral decubitus position, caval compression is alleviated. If a spinal injury is suspected, the same effect can be accomplished by inserting a wedge (roll of towels) under the right side of the long board or by simply manually displacing the uterus to the left.

CARE OF THE PREGNANT TRAUMA PATIENT

- A complete abdominal evaluation includes the perineum. Preferable, the obstetrician should perform the pelvic examination. Careful attention should be directed towards any vaginal discharge or bleeding. The presences of amniotic fluid in the vagina, evidenced by a pH of greater than 4.5, suggest ruptured chorioamniotic membranes.
- As with any major trauma patient, radiographs are mandatory. If films are indicated, radiographs should proceed as if in a non-pregnant trauma patient. To provide protection to the fetus, a lead apron is draped over the mother.
- CT scans are performed if there is a significant concern for intra-abdominal injury. An abdomen/pelvis CT scan radiation dose approaches 25 mGy, and fetal radiation doses less than 50 mGy are not associated with fetal anomalies or higher risk for fetal loss.
- In addition to the standard evaluation of the trauma patient, the fetus is evaluated for age, viability, fetal heart tones and uterine irritability. The fetus is evaluated only after the mother is stabilized. A gross estimate of fetal viability can be ascertained if the dome of the uterus can be palpated about the umbilicus.
 1. Fetal heart tones can be auscultated with Doppler ultrasound by 10 weeks of gestation.
 2. Perform continuous fetal monitoring with a tocodynamometer beyond 20 to 24 weeks of gestation.
 - i. Patients with no risk factors for fetal loss should have continuous monitoring for six (6) hours.
 - ii. Patients with risk factors for fetal loss or placental abruption should be monitoring for 24 hours.
- The Doppler ultrasound can detect fetal heart tones as early as 10 weeks, whereas a convention stethoscope is useful at approximately 20 weeks. Normal fetal heart rate is 120 to 160 beats per minute.
- For a patient with a pre-viable fetus, intermittent monitoring of the fetal heart tones suffices. On the other hand, a woman with a potentially viable fetus (>20weeks gestation) requires continuous noninvasive fetal monitoring
- As little as 0.01mL of Rh-positive blood will sensitize 70% of Rh-negative patients. All pregnant Rh-negative trauma patients should receive Rh immunoglobulin therapy unless the injury is remote from the uterus. Immunoglobulin therapy should be instituted within 72 hours of injury.
- Cesarean section is indicated when the risk of fetal distress exceed the risks of fetal prematurity. Specific indication include placental abruption, uterine rupture, the patient

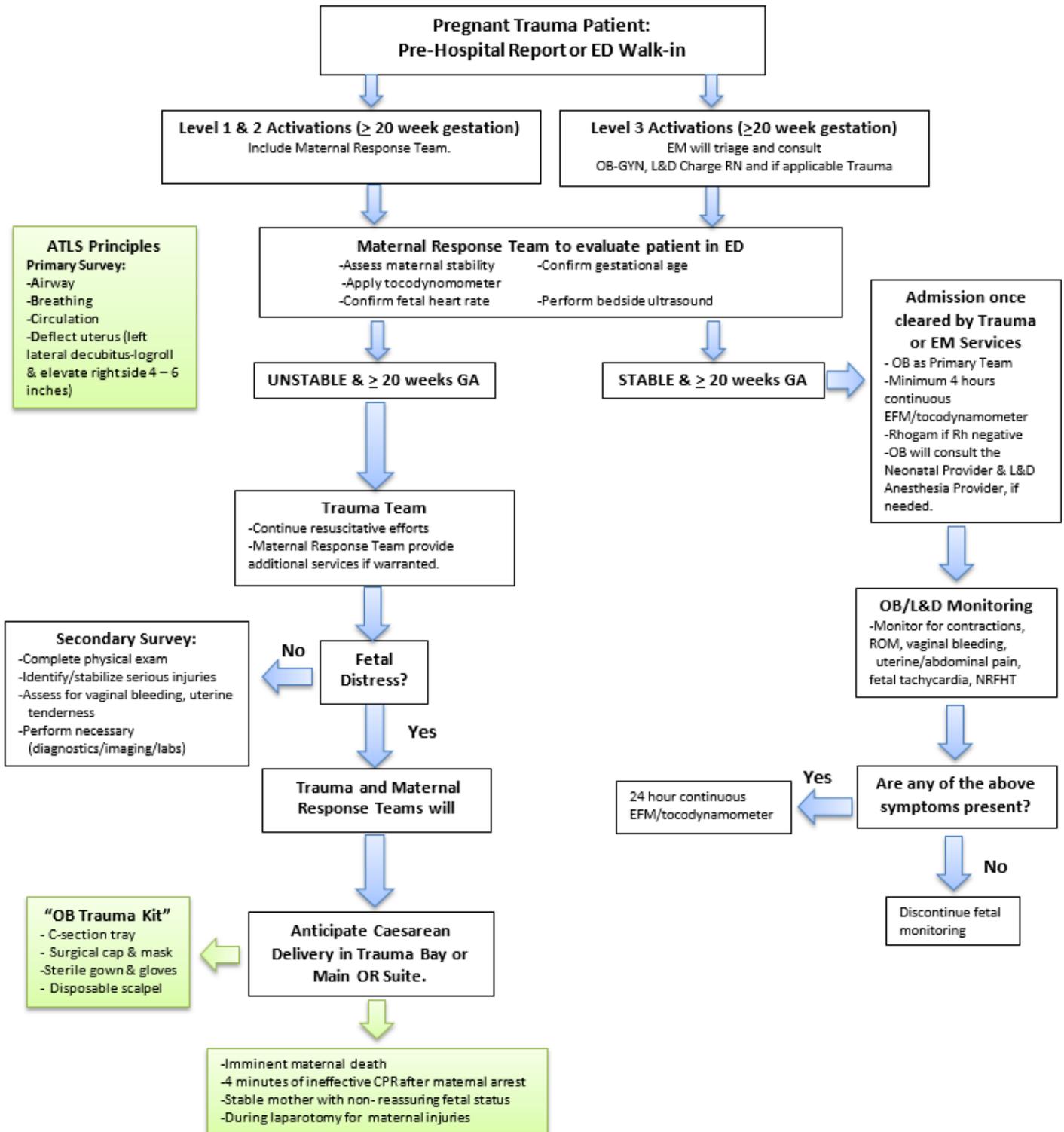
CARE OF THE PREGNANT TRAUMA PATIENT

with an unstable pelvic/lumbosacral fracture in labor, fetal malpresentation in labor or inadequate exposure at time of laparotomy for other intra-abdominal trauma.

- Because the fetus can be considered a bioassay for impending hemodynamic compromise to the mother, the trauma surgeon should be present for the cesarean section. The procedure provides an excellent opportunity for identification of any maternal intra-abdominal injuries.
- If a thoracotomy is performed, a left thoracotomy should be done with open cardiac massage and without cross clamping of the descending aorta.
- For cases of maternal cardiac arrest, perimortem cesarean section occasionally may be successful if performed within 4 to 5 minutes of the arrest.
- Perimortem cesarean delivery has limited data to support in pregnant trauma patients who experience hypovolemic cardiac arrest.

CARE OF THE PREGNANT TRAUMA PATIENT

ATTACHMENT B: TEAM ROLES & RESPONSIBILITIES



CARE OF THE PREGNANT TRAUMA PATIENT

ATTACHMENT C: MATERNAL RESPONSE TEAM MEMBERS

The hospital operator will contact the following team members via the IPCelerate (Dial Out) Application Communication System.

Maternal Response Team includes services for both pregnant patient ***and*** fetus/neonate.

IPCelerate Application	Team Members: OB/L&D & Neonatal High Risk	Extensions/Numbers
Maternal Response Team	High Risk Respiratory Therapist	43095
	NICU Faculty	43688
	NICU Jr. Resident	43696
	NICU Sr. Resident	43697
	Neonatal High Risk Nurse	43693
	Neonatal Nurse Practitioner	43695
	OB Faculty	44008
	OB Sr.	44011
	OB Boardrunner	44005
	L&D Charge RN	44017
	AOD UMC	479-3484
	AOD EPCH	996-8174

OB Trauma Group 2 will include services for pregnant patient consults only (non level ones and twos).

IPCelerate Application	Team Members: OB/L&D	Extensions/Numbers
OB Trauma Group 2	OB Faculty	44008
	OB Sr.	44011
	L&D Charge RN	44017

PHYSICIAN GUIDELINE FOR THORACIC TRAUMA MANAGEMENT

POLICY PURPOSE

To provide management guideline for patients who sustain blunt or penetrating injuries to the thorax region.

RESPONSIBLE

Trauma Medical Director
Associate Trauma Medical Director
Assistant Trauma Medical Director
Trauma Program Director
Surgery Faculty, Residents and Allied Health Professionals (AHPs)
Emergency Medicine Faculty, Residents and AHPs
Cardiothoracic Surgery Faculty

LITERATURE REFERENCE

American College of Surgeons Committee on Trauma (2018). *Advanced Trauma Life Support for Doctors Course Manual*. 10th ed. American College of Surgeons. Chicago, IL: American College of Surgeons.

POLICY REFERENCE

NC-B2-26 Chest tube management and autotransfusion.
TR-P-13 Guideline for blunt cardiac injury
TR-P-2 Physician guideline for emergency thoracotomy

PI TRIGGERS FOR REVIEW

- Delays of Identification of Injuries
- ED Thoracotomy
- Resuscitation Protocols not Followed
- Delay to Operating Room

GUIDING PRINCIPLES

- Follow Advanced Trauma Life Support (ATLS) guidelines for Airway, Breathing, and Circulation (ABC).
- Base decisions on degree of hemorrhage (Class I to IV).
- Unstable patients with a penetrating injury are to be managed surgically in the Operating Room (OR).

PHYSICIAN GUIDELINE FOR THORACIC TRAUMA MANAGEMENT

PROCEDURE:

S. Blunt chest trauma management for the following findings:

1. Widened mediastinum on chest plain film diagnostic (CXR):
 1. Obtain Computed Tomography (CT) of thorax.
 1. If there is a mediastinal hematoma, contact Interventional Radiologist (IR) for consideration of aortogram, aortic stent, or surgical intervention.
 2. If concerning for aortic injury:
 1. STAT IR consult
 2. STAT cardiothoracic surgery consult
2. Pneumothorax (PTX):
 - a. For significant PTX, therapy is based on clinical findings (i.e. do **not** wait for CXR results in patients with respiratory distress).
 - b. Tension pneumothorax is relieved by performing a thoracostomy:
 - 1) Perform thoracostomy with insertion of trocar into the fourth or fifth intercostal space in the mid axillary line and connect distal end of trocar to chest tube drainage system.
 - 2) Secure proximal placement to patient and assess for air leaks/drainage.
3. Small, isolated PTX or occult PTX detected on CT scan:
 - a. Admit patient under trauma services.
 - b. Repeat CXR six hours from initial diagnostic film and assess for pneumothorax expansion and need for thoracostomy.
 - c. If pneumothorax expansion is determined and/or patient develops respiratory distress, perform thoracostomy.
 - d. Thoracostomy with chest tube placement should be considered for:

PHYSICIAN GUIDELINE FOR THORACIC TRAUMA MANAGEMENT

- 1) Positive pressure ventilation.
 - 2) Pre-hospital performed needle chest decompression.
4. Hemothorax:
- a. Perform thoracostomy with a large (36 or 40 French) trocar (chest tube) insertion.
 - b. Operative management is indicated for:
 - 1) Initial chest drainage greater than (>) 1,000 to 1,500 ml.
 - 2) Drainage greater than (>) 200 ml/hr for three (3) consecutive hours.
 - c. Consider auto transfusion, if capability available, for output is greater than 300 ml. Reference policy NC-B2-26 Chest tube management and autotransfusion.
5. Cardiac tamponade:
- a. Obtain echocardiogram.
 - b. Focused Assessment Sonography in Trauma (FAST).
 - c. Consider pericardiocentesis or resuscitative thoracotomy if hemodynamically compromised.
 - d. Consider pericardial window for unstable patients.
 - e. STAT cardiothoracic surgery consult.
 - f. Perform life-saving procedure at patient's bedside and transport STAT to the OR.
6. Flail chest:
- a. Anticipate admission to Intensive Care Unit (ICU) or Intermediate Care (IMC).
 - b. Closely monitor respiratory status with intubation and reserve mechanical ventilation for impending respiratory failure.

PHYSICIAN GUIDELINE FOR THORACIC TRAUMA MANAGEMENT

- c. Order appropriate analgesia monitoring patient's pain control. Consider the following:
 - 1. Patient Controlled Analgesic (PCA)-pump;
 - 2. Anesthesiology consult for analgesia;
 - 3. Rib plating;
 - 4. Continuous intercostal nerve block catheter insertion.

- 7. Sternal fracture:
 - a. Obtain Electrocardiogram (EKG)
 - 2. Anticipate admission to ICU or IMC if arrhythmias are present.
 - 3. Consult cardiothoracic surgery for significantly displaced fractures.

- 8. Blunt cardiac injury:

(Refer to TR-P-13: Guideline for Blunt Cardiac Injury)

 - a. Urgent cardiology consult for patients with cardiac dysrhythmias and/or significant EKG changes.
 - b. Obtain cardiac sonogram.
 - c. Anticipate admission to the ICU or IMC.

- T. Order aggressive pulmonary toilet.

- U. Order appropriate patient pain management such as PCA.

- 9. Sentinel injuries should maintain a high index of suspicion and are frequent indicators of significant and/or potentially life threatening injuries. Evaluate accordingly for any of the following:
 - i. First rib;
 - ii. Scapular;
 - iii. Sternal;
 - iv. Bilateral rib and,
 - v. Lower rib fractures

- 10. Tracheal injuries

PHYSICIAN GUIDELINE FOR THORACIC TRAUMA MANAGEMENT

- a. Secure airway.
- b. Perform bronchoscopy for blunt injury.

B. Penetrating Chest Trauma

- 1. Neck wounds in Zone I:
 - 1. Do not probe or explore penetrating wounds of the neck or thorax.
 - 2. Consider Neck CT Angiogram if hemodynamically stable.
- 2. Pneumo and/or Hemothorax:
 - a. Positive pressure ventilation may worsen a pneumothorax, therefore, pleural cavity decompression assumes priority.
 - b. Perform thoracostomy.
 - c. Anticipate admission to ICU or IMC for at least 24 hour observation for gunshot wounds (GSW's).
- 3. Massive air leak:
 - a. Secure the airway (Consider use of double lumen endotracheal tube (ETT)).
 - b. ETT intubation with positive pressure ventilation may worsen a major tracheobronchial injury. Consider emergent cricothyroidotomy, tracheostomy or thoracotomy to secure the airway.
 - c. Consider bronchoscopy.
 - d. Consider thoracotomy.
- 4. Transmediastinal injuries:
 - a. Consider thoracic CT scan if patient is stable.
 - b. Consider an aortogram, Gastrograffin Swallow, and Bronchoscopy.

PHYSICIAN GUIDELINE FOR THORACIC TRAUMA MANAGEMENT

- c. Low threshold for performing a thoracotomy.
- d. Management based on injuries identified.
- 5. Chest penetrations below the nipple-areola line anteriorly and tip of scapula posteriorly:
 - a. Presume thoracoabdominal injury, including diaphragmatic lesions. Must objectively evaluate the abdomen.
 - b. Evaluate and manage accordingly.
- 6. Cardiac tamponade:
 - a. Consider pericardiocentesis/pericardial window/thorocotomy if hemodynamically compromised.
 - b. Perform life-saving procedure at patient bedside and/or transport to OR STAT.
 - c. STAT cardiothoracic surgery consult.
- 7. Open pneumothorax:
 - a. Temporary closure of defect on chest wall with a semi-occlusive dressing.
 - b. Immediate thoracostomy with placement of chest tube.
 - c. Surgical closure of the defect is frequently required.
- 8. Pulseless patients with penetrating injury over the pericardium require emergency thoracotomy. (Refer to TR-P-2 Physician Guideline for Emergency Thoracotomy).
 - a. Avoid injury to phrenic nerves.
 - b. Evacuate tamponade.
 - c. Control cardiac hemorrhage.
 - d. Perform cardiac massage.
 - e. Cross clamp aorta.

PHYSICIAN GUIDELINE FOR THORACIC TRAUMA MANAGEMENT

- f. Continue until cardiac chambers are filled.
- g. Avoid this procedure in blunt trauma.

PHYSICIAN GUIDELINE FOR THORACIC TRAUMA MANAGEMENT

Trauma Program Director

Date

Trauma Medical Director

Date

Reviewed/Revised
09/1997
02/2000
06/2004
04/2008
10/2010
03/2014
03/2017
03/2020

HEAD INJURY MANAGEMENT GUIDELINE

POLICY PURPOSE

To provide emergency triage management for head injury patients and establish criteria for neurosurgical service consultation. The patient's clinical situation may introduce additional factors in the decision-making process thus altering management schemes.

RESPONSIBLE

Trauma Medical Director
Associate Trauma Medical Director
Assistant Trauma Medical Director
Trauma Program Director
Trauma Service Coordinators
Neurosurgeons
Surgery Faculty and Residents
Emergency Medicine Faculty and Residents
Allied Health Professionals (AHPs)
Nursing Associates

LITERATURE REFERENCES

American College of Surgeons (2017). *American College of Surgeons Committee on Trauma: Advanced Trauma Life Support for Doctors: Student Course Manual*. 10th Ed. Chicago:IL.

Barbosa, R., Jawa, R., Watters, J., Knight, J., Kerwin, A., Winston, E., Barraco, R., & Tucker, B. (2012). Mild traumatic brain injury, management and evaluation of. *Journal of Trauma*, 73(5), S307-S314. Retrieved from http://journals.lww.com/jtrauma/Abstract/2012/11004/Evaluation_and_management_of_mild_traumatic_brain.6.aspx

Also refer to Attachments A and B related to Background/Key Points and Consulting Criteria.

PI TRIGGERS:

- On-Call Consult Response (Delay)
- Trauma Death
- Treatment Protocols not Followed

PROCEDURE:

A. Determine mechanism of injury.

HEAD INJURY MANAGEMENT GUIDELINE

- B. Calculate GCS and perform a pupillary and neurological examination to determine focal neurologic deficit.
1. If the GCS is **less than** or equal to eight (8), and there is a focal neurologic deficit assume a mass lesion and perform the following interventions:
 - a. Intubate and maintain partial arterial oxygenation (PaO₂) greater than 95 mm of Hg and a value of partial arterial carbon dioxide (PaCO₂) 35 to 45 mm of Hg.
 - b. STAT CT when hemodynamically stable.
 - c. Consider Mannitol 0.5 to 1.0 grams/kg IV over 20 minutes (blown pupil, focal neurologic deficit finding).
 - d. Notify OR of a likely neurosurgical case.
 - e. Prompt (STAT) Neurosurgery consult.
 2. If the GCS is **less than** or equal to eight (8) and there is **no** focal neurologic deficit assume diffuse injury and perform the following interventions:
 - a. Intubate and maintain partial arterial oxygenation (PaO₂) greater than 95 mm of Hg and a value of partial arterial carbon dioxide (PaCO₂) 35 to 45 mm of Hg.
 - b. STAT CT of head when hemodynamically stable.
 - c. Prompt (STAT) Neurosurgery consult.
 - d. Admit to ICU with neuro checks every hour.
 - e. If neurological deterioration (loss of 2 or more points on the GCS, development of hemiparesis or new pupillary asymmetry), obtain a STAT repeat CT scan of the head and notify Neurosurgeon with any changes.
 3. If the GCS is **greater than** or equal to eight (8) and there is a focal neurologic deficit, assume an expanding mass and possibility of rapid deterioration.

HEAD INJURY MANAGEMENT GUIDELINE

- a. Intubate and maintain partial arterial oxygenation (PaO₂) greater than 95 mm of Hg and a value of partial arterial carbon dioxide (PaCO₂) 35 to 45 mm of Hg.
 - b. Prompt (STAT) neurosurgery consult.
 - c. STAT CT.
 - d. Consider Bolus with Mannitol 0.5- 1.0 grams/kg IV over 20 minutes.
 - e. Notify OR of a likely neurosurgical case.
4. If GCS is **greater than** or equal to 8 and there is **no** focal neurologic deficit, assume small contusion, hemorrhage, fracture, etc.
- a. If there is a possibility of basilar skull fracture, penetrating injury, or a suspicion of contusion, obtain STAT CT scan of head and consider a neurosurgical consultation.
 - b. If possibility of concussion or skull fracture, with/without LOC; and neurologically normal, obtain a CT scan of the head. Neurosurgical consultation is at the discretion of the examiner. (Urgent/Non-urgent).
- C. Determine and perform baseline head injury screen.
1. Cognitive function:
 - a. orientation
 - b. mentation
 - c. speech
 - d. follow simple commands
 2. Cranial nerve function:
 - a. visual fields
 - b. extra ocular movements. Oculocephalics if c-spine is cleared or calorics.
 - c. if unable to rotate head
 - d. corneal reflex
 - e. pupillary function
 - f. facial motor function
 - g. tongue protrusion in midline
 - h. spontaneous ventilation
 - i. cough/gag reflex

HEAD INJURY MANAGEMENT GUIDELINE

3. Motor function: symmetric strength in extremities.

HEAD INJURY MANAGEMENT GUIDELINE

Trauma Program Director

Date

Neurosurgery Medical Director

Date

Trauma Medical Director

Date

Reviewed/Revised
07/95
10/96
02/00
06/00
08/07
04/08
12/2010
03/2014
03/2017
03/2020

HEAD INJURY MANAGEMENT GUIDELINE

ATTACHMENT A: BACKGROUND AND KEY POINTS

BACKGROUND:

The primary goal of head injury management in the Emergency Department (ED) is rapid and complete resuscitation. Patients are managed according to Advanced Trauma Life Support (ATLS) standards.

It is important to maintain a high index of suspicion for surgically correctable intracranial lesions, including associated systemic injuries. Always anticipate the need for an early computed tomography (CT) scan during the patient's evaluation or even prior to the patient's arrival.

The brain has a very limited tolerance to decreases in oxygen or substrate delivery. Injury further compounds this limitation of the brain by altering cerebral autoregulation. A dysfunctional cerebral vascular autoregulation makes the brain prone to ischemia with decreases in cerebral perfusion pressure (CPP).

Secondary brain injuries are another factor to consider. The goal is to provide an optimal environment for the brain to recover and minimize any factors, such as hypoxia, hypercapnea, hyponatremia, or fever that may aggravate intracranial hypertension.

Management may include tracheal intubation to protect the airway; ventilator support to prevent hypoxia and/or hypercapnea; sedation and analgesia administration; prevention of hyperthermia; maintenance fluids to provide normal intravascular volume and electrolytes; nutritional support; prophylaxis for stress ulcer and thromboembolism.

Coagulopathy and thrombocytopenia are other conditions that complicate the care of the traumatic brain injury (TBI) patient. Correcting coagulopathy and thrombocytopenia promptly is recommended by administration of fresh frozen plasma, platelets, cryoprecipitate, vitamin K.

Also refer to the following policies for additional management guidelines related to head injury patients:

- TR-P-22 Adult Severe Traumatic Brain Injury Management Guideline
- TR-P-35 Infant, Pediatric and Adolescent Guideline for Severe Traumatic Brain Injury

KEY POINTS:

- All head injury patients should receive Glasgow Coma Score (GCS) evaluations.
- An initial neurologic exam should be documented in all head injury patients.
- Consider mechanism of injury and loss of consciousness duration.

HEAD INJURY MANAGEMENT GUIDELINE

- A CT of the head is indicated if there is a questionable neurologic exam for any of the following:
 - Positive history of Loss of Consciousness (LOC).
 - Inability to adequately assess neurologic status secondary to intoxication.
 - GCS < 15.
 - Abnormal cranial nerve, motor or sensory functions.
- The trauma attending surgeon is in house 24/7 to begin appropriate neurosurgical diagnosis and medical treatment of head injury patients.
- All head injury patients are admitted to the trauma service for at least 24 hours to rule out concomitant injuries.

HEAD INJURY MANAGEMENT GUIDELINE

ATTACHMENT B: CONSULTING CRITERIA

CONSULTING CRITERIA:

A Neurosurgical consult is defined in three categories. They are as follows:

Non urgent: Consultation request with an anticipated response within 12 to 24 hours of neurosurgery consult.

Urgent: Consultation request with an anticipated response within 30 minutes. Neurosurgeons evaluation/recommendations may be made via telephone and review of PAC's system (if applicable). (Dictation note may be noted should patient's condition/prognosis warrant). Bedside evaluation by Neurosurgeon is within 6-12 hours of consultation, unless patient's neurologic condition deteriorates which should be reported immediately for further evaluation/recommendation/action.

Prompt (STAT): Consultation request with an anticipated bedside evaluation within 30 minutes. (Patients with signs of neurological deterioration: GCS <9; pupil asymmetry; abnormal flexion/extension; and initial GCS decreased by 2 or more points).

- Description of a **non-urgent** Neurosurgery consultation (12 to 24 hours):

Patients with a minor head injury and at least two of the following criteria require a **non-urgent** Neurosurgery consultation:

1. Loss of consciousness
2. Failure of head injury screen (refer to section C in guideline).
3. Glasgow Coma Scale (GCS) 9-13 with negative CT
4. Minor head injury patients may need admission for observation if GCS is persistently less than 14, or there is persistent failure of head injury screen in repeated exam.
5. Non-depressed linear skull fracture.

Intoxicated patients with normal neurologic exam and head CT scan, including a GCS greater than or equal to 14 may be observed in the ED electively.

HEAD INJURY MANAGEMENT GUIDELINE

- Description of **urgent** Neurosurgical consultation (30 minutes response via telephone with view of diagnostic images and recommendations. Bedside evaluation by neurosurgery services within 6 to 12 hours):

Patients that require an **urgent** Neurosurgical consultation include the below:

1. Lateralized focal neurologic deficit.
 2. Basilar skull fracture.
- Description of **prompt (STAT)** Neurosurgical consultation (bedside evaluation within 30 minutes unless injury is nonsurvivable. Neurosurgeon will provide consultation note with findings and recommendations):

Patients that require **prompt (STAT)** Neurosurgical consultation include the following criteria:

1. Abnormal CT scan as discussed above with potential surgical traumatic lesion and patient with signs of neurological deterioration. (Signs and symptoms of brain herniation).
2. Significant finding on CT scan such as:
 - a. Acute Epidural Hematoma (EDH) greater than or equal to 5mm in thickness.
 - b. Acute Subdural Hematoma (SDH) greater than or equal to 5mm in thickness.
 - c. Midline Shift (MLS) greater than or equal to 5mm with compression of ventricle.
3. Depressed skull fracture (greater than 1cm).
4. GCS less than or equal to 8 (unless altered mental status due to intoxicants).
5. In cases as described above, follow Management Guidelines for Severe Traumatic Brain Injury as applicable pending patient's age. Refer to Policy TR-P-22 or TR-P-35.

SPINAL TRAUMA EVALUATION & MANAGEMENT GUIDELINE

POLICY PURPOSE

- To detect and stabilize any spinal column injury as soon as possible to prevent spinal cord lesions or to relieve spinal cord compression that may be causing an irreversible neurologic deficit.
- To ensure immediate implementation of the treatment and education upon diagnosis of Spinal Cord Injury (SCI).

RESPONSIBLE

Trauma Medical Director
Surgery Faculty and Residents
Emergency Medicine Faculty and Residents
Neurosurgery Faculty
Allied Health Professionals (AHPs)
Nursing Associates
Trauma Program Director
Trauma Service Coordinators
Case Management
Rehabilitation Services
Respiratory Therapy Services

PI TRIGGERS FOR REVIEW

- Delays in Identification of Injuries
- Missed Initial Diagnosis of Cervical Spine Injury
- Treatment Protocols not Followed

LITERATURE REFERENCES

American College of Surgeons (2018). *American College of Surgeons Committee on Trauma: Advanced Trauma Life Support for Doctors: Student Course Manual*. 10th Ed. Chicago: IL.

Paralyzed Veterans of America (2014). *An Introduction to Spinal Cord Injury: Understanding the Changes*. 4th Ed. Washington: DC.

National Institute on Disability and Rehabilitation Research (2015). *Understanding Spinal Cord Injury: Part 1—The Body Before and After Injury*. Retrieved: March 1, 2019 from <http://www.msctc.org/sci/model-system-centers>

POLICY REFERENCE

SPINAL TRAUMA EVALUATION & MANAGEMENT GUIDELINE

Policy TR-P-18 Prevention and/or Treatment of Venous Thromboembolic (VTE) Event in Trauma Patients Guideline.

KEY POINTS:

- Presume vertebral column injury in penetrating injuries that are in the vicinity of the spine and in all blunt trauma patients.
- The cervical region is the most vulnerable part of the spine to injury. Most patients who survive and arrive to the hospital with injuries to C2 are neurologically intact. One-third of patients with upper cervical spine and cord injuries die at the scene from apnea caused from loss of central innervation of the phrenic nerves.

PROCEDURE:

- A. A complete motor & sensory baseline exam will be documented on all patients with suspected spine injuries (Refer to Attachment A: *Spinal Trauma Evaluation*).
- B. Continuous complete spinal immobilization and placement of a semi-rigid cervical collar, such as an Aspen will be maintained until a vertebral column injury is ruled out by clinical examination and/or diagnostic images (Refer to Attachment A: *Spinal Trauma Evaluation*).
- C. After the patient's cervical spine is palpated and immobilized with a rigid-soft collar, proceed with four person logroll.
 1. One person at the patient's head to control the head and cervical spine.
 2. Second and third person on the same side to control the body and extremities.
 3. Fourth person removes the backboard and examines the patient's back.
 4. Fifth person is required to secure airway if patient is intubated.

Note: Neither the slider or backboard provide spine protection. The boards only assist in patient transfers. Every effort is made to remove the rigid spine boards as early as possible to reduce the risk of pressure injury formation. Removal of either board does not indicate the patient's spine is cleared.

- D. Unresponsive patients should have complete Computed Tomography (CT) films of the cervical, thoracic and lumbosacral spine prior to transferring to another level of care from the emergency department.

SPINAL TRAUMA EVALUATION & MANAGEMENT GUIDELINE

1. Exceptions are patients with life-threatening injuries who require emergent Procedures or unstable patients requiring ongoing resuscitation in the critical care unit.
 2. Diagnostic images are completed after life-threatening conditions are stabilized.
- E. If a blunt cerebrovascular injury is suspected, then order a CT cervical arteriography, MRA or arteriography of the carotid and vertebral arteries. Patients at risk for cerebrovascular injury include those with the following:
1. Seat belt contusion across anterior neck/upper chest
 2. Swelling or soft tissue injury of anterior neck.
 3. Fracture in proximity to carotid canal or vertebral artery foramen.
 4. Severe maxillofacial injury.
 5. Neurologic deficit not consistent with Closed Head Injury (CHI).
 6. Violent neck hyperflexion/hyperextension.
- F. CT scan of the cervical spine with sagittal and coronal reconstructions from the occiput to the top of T1 will be performed on intubated patients.
- G. Patients undergoing a CT scan of the thorax, abdomen and/or pelvis, provider should consider performing a CT scan of the thoracolumbar spine with sagittal and coronal reconstructions in lieu of plain films of the T/L spine. It should be recognized that not all patients need radiographic films of the T/L spine (e.g., awake, alert, sober, neurologically normal, no back pain or tenderness, no back contusion, and no distracting injury).
- H. Patients with a spine fracture or spinal cord injury are to be repositioned by following strict four person logroll every two hours, unless contraindicated by neurosurgery.
- I. A normal CT scan of the C-spine in an awake patient with no signs of neurological deficits will suffice for clearance and removal of cervical collar.
- J. In an unconscious patient, an MRI of the cervical spine is only considered if reconstructed CT scan demonstrates an abnormal finding(s). If no abnormalities are detected, this will suffice for clearance and removal of cervical collar.
- K. Cervical spine clearance will be documented in the Electronic Medical Record (EMR) as an order to remove the collar. An activity level order will also be updated.

SPINAL TRAUMA EVALUATION & MANAGEMENT GUIDELINE

- L. If the patient's cervical, thoracic & lumbar spines are radiographically normal, but the patient cannot be clinically cleared, clarify patient activity level with surgeon during rounds. Activity order will be entered in the EMR by physician or AHP.
- M. If there is a vertebral spine fracture or spinal cord injury, strong consideration will be given to placing the patient on an advanced kinetic therapy rotating bed to prevent and treat pulmonary complications in immobile patients.
 - 1. This will be done after consultation with Neurosurgery Services.
 - 2. Mobility status will be documented by neurosurgery services on daily progress notes.
 - 3. If patient requires an orthotic brace such as a Thoracolumbosacral Orthosis (TLSO), order will be placed in the EMR by the neurosurgical service.
 - 4. Bedside RN will place orthotic brace on patient as per neurosurgical recommendations.
 - 5. Any requested diagnostic films will be ordered by the neurosurgical service.
- N. The neurosurgery service is consulted for all patients with a neurologic deficit(s), cervical/thoracic/lumbar spine pain, or abnormal/suspicious spine diagnostic images.
- O. Patients with confirmed unstable vertebral spine fractures or neurologic deficits will be admitted to the critical care unit for monitoring. Stable vertebral spine fractures with no other critical injuries will be admitted to a non-critical care unit.
- P. All patients with potentially unstable vertebral spine fractures or neurologic deficits will receive mechanical or chemical thromboembolic prophylaxis. Consult neurosurgery services prior to medication administration. (Refer to Policy TR-P-18).
- Q. RN will ensure appropriate multidisciplinary consultation is initiated within 24 to 48 hours of admission for SCI patients.
 - 1. Multi-disciplines (nursing, respiratory therapy, physical therapy and case management) will initiate education within 24 to 48 hours from receipt of consultation as per multi-disciplinary patient care plans otherwise known as iPOC (Refer to Attachment B: *Patient Education Documentation form: "Spinal Cord Injury"* during EMR downtime events).
 - 2. RN caring for patient will provide patient/family with the education material within 24 to 48 hours from admission (Trauma Service Coordinator will provide the education material supplied by the Trauma Department).

SPINAL TRAUMA EVALUATION & MANAGEMENT GUIDELINE

ATTACHMENTS:

Attachment A: Spinal Trauma Evaluation

Attachment B: Patient Education Documentation Form: Spinal Cord Injury
602-016m14-01 (rev. 03/19)

SPINAL TRAUMA EVALUATION & MANAGEMENT GUIDELINE

Trauma Program Director

Date

Neurosurgery Medical Director

Date

Trauma Medical Director

Date

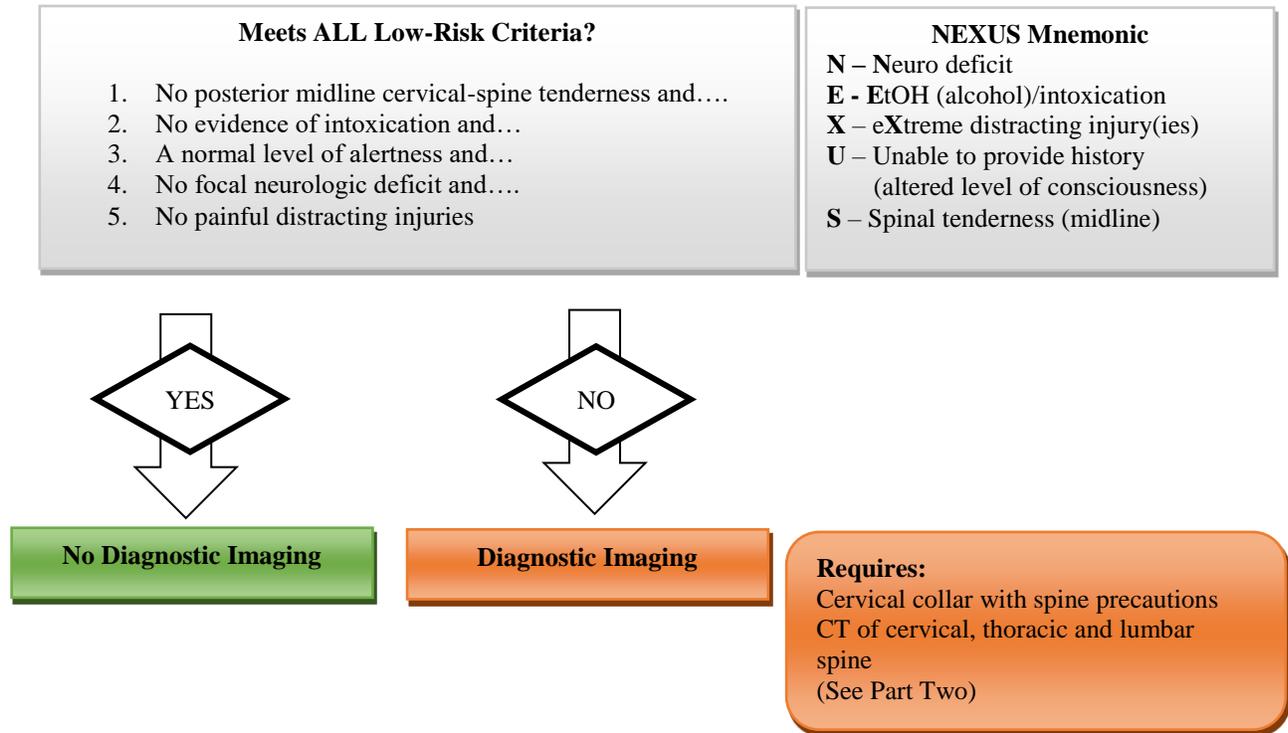
Reviewed/Revised

06/2000
02/2003
08/2004
04/2008
12/2010
04/2014
03/2017
03/2019
04/2021

SPINAL TRAUMA EVALUATION & MANAGEMENT GUIDELINE

ATTACHMENT A: SPINAL TRAUMA EVALUATION

**Part One: National Emergency X-Radiography Utilization Study
(NEXUS) Criteria**



Part Two: After Diagnostic Imaging

Altered Mental Status

If diagnostic images (Plain films/CT Cervical Spine Reconstruction) are normal and there is no pain on physical exam:
 Clinically clear cervical spine precaution and discontinue cervical collar.

- Consult Neurosurgery for any of the following:**
- Neurologic Deficit
 - Abnormal/Suspicious CT
 - Pain on Physical Exam

Coma

MRI of cervical, thoracic or lumbar spine if other diagnostic images demonstrate injury per neurosurgery service recommendations.

**SPINAL TRAUMA EVALUATION & MANAGEMENT GUIDELINE
ATTACHMENT B: PATIENT EDUCATION DOCUMENTATION FORM**

Patient Population: Spinal Cord Injury								
Problem/Content Area	Intervention		Learner		Evaluation			
LEARNING OBJECTIVES At conclusion of teaching, patient, family member, and/or significant other should be able to:	Needs Education	Dates/Initials	Teaching Codes	Patient	Significant Other	Verbalizes Understanding	Demonstrates Understanding	Comments
<p>*These are suggested educational interventions and may be modified to meet individual patient needs. (Chapter references refer to the book <u>Yes, You Can!</u>.)</p> <ol style="list-style-type: none"> Identify/demonstrate knowledge R/T spinal cord functioning & effects trauma has on how the body works (see chapter 1). Identify/demonstrate safety measures R/T: <ul style="list-style-type: none"> Decreased sensation Motor deficits <ul style="list-style-type: none"> Orthostatic hypotension (see chapter 3). Demonstrate performance of BP reading. Explain Autonomic Dysreflexia, its symptoms, preventive measures, & interventions (see chapter 11). Perform ADLs to include: <ul style="list-style-type: none"> Bathing Grooming Turning Feeding <ul style="list-style-type: none"> Other self-care activities (consult with O.T.) Demonstrate/verbalize knowledge R/T (see chapter 2): <ul style="list-style-type: none"> Maintenance of healthy skin Pressure ulcers & prevention Identify/demonstrate knowledge R/T bladder management (see chapter 6): <ul style="list-style-type: none"> S/S UTI Intermittent urinary catheterization Indwelling foley care 								<p>Preferences for learning: <input type="checkbox"/> Verbal <input type="checkbox"/> Written <input type="checkbox"/> Visual <input type="checkbox"/> Other _____ Demo desire and motivation to learn: <input type="checkbox"/> Yes <input type="checkbox"/> No Barriers towards learning: <input type="checkbox"/> None <input type="checkbox"/> Religion <input type="checkbox"/> Emotion/Anxiety <input type="checkbox"/> Cognitive <input type="checkbox"/> Values/Beliefs <input type="checkbox"/> Support Syst/Home Environ. <input type="checkbox"/> Physical <input type="checkbox"/> Communication <input type="checkbox"/> Language <input type="checkbox"/> Literacy <input type="checkbox"/> Cultural <input type="checkbox"/> Financial <input type="checkbox"/> Developmental Stages</p>
SIGNATURE/TITLE	INIT	SIGNATURE/TITLE		INIT	SIGNATURE/TITLE		INIT	

INSTRUCTIONS: 1-Indicate educational needs with a check 2-Date, initial each entry 3- If category not applicable, enter N/A in appropriate column.
 Teaching Methods: A-Audio Visual D-Demonstration E-Explanation H-Handout P-Poster Learner: M-Mother F-Father D-Daughter O-Significant Other Sn-Snouse



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**Patient Education Documentation Form
Spinal Cord Injury**

602-016m14-01(rev 03/19)(b/w,8.5x11,#20w,5hpt)

Patient Information Sticker

SPINAL TRAUMA EVALUATION & MANAGEMENT GUIDELINE

Patient Population: Spinal Cord Injury								
Problem/Content Area	Intervention		Learner		Evaluation			
LEARNING OBJECTIVES At conclusion of teaching, patient, family member, and/or significant other should be able to:	Needs Education	Dates/Initials	Teaching Codes	Patient	Significant Other	Verbalizes Understanding	Demonstrates Understanding	Comments
<p>*These are suggested educational interventions and may be modified to meet individual patient needs. (Chapter references refer to the book Yes, You Can).</p> <p>7. Identify/demonstrate knowledge R/T bowel management (see chapter 7):</p> <ul style="list-style-type: none"> ▪ Administration of suppositories ▪ Digital stimulation ▪ Use of stool softeners/bulk products <p>8. Identify/verbalize knowledge R/T: (Nutritional Services) – (see chapter 41)</p> <ul style="list-style-type: none"> ▪ Nutrition/fluid intake/Ca++ ▪ Management of constipation/diarrhea (see chapter 41) ▪ Weight management ▪ Adequate protein <p>9. Perform/demonstrate care of:</p> <ul style="list-style-type: none"> ▪ PEG (see electronic medical record) <p>10. Perform/demonstrate (Rehab Services) – (see chapter 5):</p> <ul style="list-style-type: none"> ▪ ROM exercises ▪ Positioning ▪ Prevention of foot drop ▪ Transfer techniques ▪ Splinting ▪ Adaptive equipment ▪ Swallowing techniques ▪ Techniques to facilitate phonation through manipulation of trach, i.e. finger occlusion/speaking valve 								
SIGNATURE/TITLE	INIT	SIGNATURE/TITLE		INIT	SIGNATURE/TITLE		INIT	

INSTRUCTIONS: 1-Indicate educational needs with a check 2-Date, initial each entry 3- If category not applicable, enter N/A in appropriate column.

1-Teaching Methods: A-Audio Visual, D-Demonstration, E-Explanation, H-Handout, P-Poster, S-Speaking Valve
2-Learner: M-Mother, F-Father, D-Daughter, O-Significant Other, S-Spouse

Patient Information Sticker



**Patient Education Documentation Form
Spinal Cord Injury**

SPINAL TRAUMA EVALUATION & MANAGEMENT GUIDELINE

Patient Population: Spinal Cord Injury							
Problem/Content Area	Needs Education	Intervention		Learner		Evaluation	
LEARNING OBJECTIVES At conclusion of teaching, patient, family member, and/or significant other should be able to:		Dates/Initials	Teaching Codes	Patient	Significant Other	Verbalizes Understanding	Demonstrates Understanding
<p>*These are suggested educational interventions and may be modified to meet individual patient needs. (Chapter references refer to the book <u>Yes, You Can</u>).</p> <ol style="list-style-type: none"> Identify/demonstrate knowledge R/T spinal cord functioning & effects trauma has on how the body works (see chapter 1). Identify/demonstrate safety measures R/T: <ul style="list-style-type: none"> Decreased sensation Motor deficits <ul style="list-style-type: none"> Orthostatic hypotension (see chapter 3). Demonstrate performance of BP reading. Explain Autonomic Dysreflexia, its symptoms, preventive measures, & interventions (see chapter 11). Perform ADLs to include: <ul style="list-style-type: none"> Bathing Grooming Turning Feeding <ul style="list-style-type: none"> Other self-care activities (consult with O.T.) Demonstrate/verbalize knowledge R/T (see chapter 2): <ul style="list-style-type: none"> Maintenance of healthy skin Pressure ulcers & prevention Identify/demonstrate knowledge R/T bladder management (see chapter 6): <ul style="list-style-type: none"> S/S UTI Intermittent urinary catheterization Indwelling foley care 							<p>Preferences for learning: <input type="checkbox"/> Verbal <input type="checkbox"/> Written <input type="checkbox"/> Visual <input type="checkbox"/> Other _____ Demo desire and motivation to learn: <input type="checkbox"/> Yes <input type="checkbox"/> No Barriers towards learning: <input type="checkbox"/> None <input type="checkbox"/> Religion <input type="checkbox"/> Emotion/Anxiety <input type="checkbox"/> Cognitive <input type="checkbox"/> Values/Beliefs <input type="checkbox"/> Support Syst/Home Environ. <input type="checkbox"/> Physical <input type="checkbox"/> Communication <input type="checkbox"/> Language <input type="checkbox"/> Literacy <input type="checkbox"/> Cultural <input type="checkbox"/> Financial <input type="checkbox"/> Developmental Stages</p>
SIGNATURE/TITLE	INIT	SIGNATURE/TITLE		INIT	SIGNATURE/TITLE		INIT
<p>INSTRUCTIONS: 1-Indicate educational needs with a check 2-Date, initial each entry 3- If category not applicable, enter N/A in appropriate column.</p>							

1- Teaching Methods: A-Audie Visual, D-Demonstration, E-Explanation, H-Handout, P-Poster, 2- Learner: M-Mother, F-Father, D-Daughter, O-Significant Other, S-Son/.....



**UNIVERSITY MEDICAL CENTER
OF EL PASO**

**Patient Education Documentation Form
Spinal Cord Injury**

602-016m14-01(rev 03/19)(blw,8.5x11,#20w,5hpt)

Patient Information Sticker

SPINAL TRAUMA EVALUATION & MANAGEMENT GUIDELINE

Patient Population: Spinal Cord Injury							
Problem/Content Area	Intervention		Learner			Evaluation	
LEARNING OBJECTIVES At conclusion of teaching, patient, family member, and/or significant other should be able to:	Needs Education	Dates/ Initials	Teaching Codes	Patient	Significant Other	Verbalizes Understanding	Demonstrates Understanding
<p>*These are suggested educational interventions and may be modified to meet individual patient needs. (Chapter references refer to the book Yes, You Can!).</p> <p>7. Identify/demonstrate knowledge R/T bowel management (see chapter 7):</p> <ul style="list-style-type: none"> ▪ Administration of suppositories ▪ Digital stimulation ▪ Use of stool softeners/bulk products <p>8. Identify/verbalize knowledge R/T: (Nutritional Services) – (see chapter</p> <ul style="list-style-type: none"> ▪ Nutrition/fluid intake/Ca++ ▪ Management of constipation/diarrhea (see chapter 41) ▪ Weight management ▪ Adequate protein <p>9. Perform/demonstrate care of:</p> <ul style="list-style-type: none"> ▪ PEG (see electronic medical record) <p>10. Perform/demonstrate (Rehab Services) – (see chapter 5):</p> <ul style="list-style-type: none"> ▪ ROM exercises ▪ Positioning ▪ Prevention of foot drop ▪ Transfer techniques ▪ Splinting ▪ Adaptive equipment ▪ Swallowing techniques ▪ Techniques to facilitate phonation through manipulation of trach, i.e. finger occlusion/speaking valve 							
SIGNATURE/TITLE	INIT	SIGNATURE/TITLE		INIT	SIGNATURE/TITLE		INIT
<p>INSTRUCTIONS: 1-Indicate educational needs with a check 2-Date, initial each entry 3- If category not applicable, enter N/A in appropriate column.</p>							

1- Teaching Methods: A-Audio Visual, D-Demonstration, E-Explanation, H-Handout, P-Poster, 1- Learner: M-Mother, F-Father, D-Daughter, O-Significant Other, S-Spouse

 <p>UNIVERSITY MEDICAL CENTER OF EL PASO</p> <p>Patient Education Documentation Form Spinal Cord Injury</p> <p>602-016m14-01 (rev 03/19)(b/w,8.5x11,#20w,5hpt)</p>	<p>Patient Information Sticker</p>
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SPINAL TRAUMA EVALUATION & MANAGEMENT GUIDELINE

Patient Population: Spinal Cord Injury							
Problem/Content Area	Intervention			Learner		Evaluation	
LEARNING OBJECTIVES At conclusion of teaching, patient, family member, and/or significant other should be able to:	Needs Education	Dates/ Initials	Teaching Codes	Patient	Significant Other	Verbalizes Understanding	Demonstrates Understanding
*These are suggested educational interventions and may be modified to meet individual patient needs. 15. Identify/utilize appropriate community resources: <ul style="list-style-type: none"> ▪ VOLAR (591-0800) – (Consult at onset of admission) ▪ Home Health Agency ▪ Rehab facilities ▪ Community support groups ▪ Vocational rehab agency (TRC) ▪ Extended care agencies ▪ UMC Trauma Department ▪ Financial Assistance for Social Security Disability 16. Participate in Family Discharge Planning Meetings: <ul style="list-style-type: none"> ▪ Date: _____ _____ _____ _____ 							Comments
EDUCATIONAL MATERIAL							
Circle Materials Given to Patient: Yes, You Can! A Guide to Self-Care for Persons with Spinal Cord Injury/SI, Usted Puede! (Obtain from Trauma Department) An Introduction to Spinal Cord Injury/ Introducción a la Lesión de Espina Dorsal (Obtain from Trauma Department) Autonomic Dysreflexia: What You Should Know Depression: What You Should Know Neurogenic Bowel: What You Should Know Constipation and Spinal Cord Injury, A Guide to Symptoms and Treatment						Date Given to Patient or Patient Representative	Init.
_____ _____ _____ _____ _____							
INSTRUCTIONS: 1-Indicate educational needs with a check 2-Date, initial each entry 3- If category not applicable, enter N/A in appropriate column.							

1- Teaching Methods: A-Audio Visual, D-Demonstration, E-Explanation, H-Handout, P-Poster, _____, L-Lecture, M-Mother, F-Father, D-Daughter, O-Significant Other, S-Spouse, _____

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 <p>UNIVERSITY MEDICAL CENTER OF EL PASO</p> <p>Patient Education Documentation Form Spinal Cord Injury</p> <p>802-016m14-01 (rev 03/19) b/w, 8.5x11, #20w, 5hpt</p>	<p>Patient Information Sticker</p>
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**PHYSICIAN GUIDELINES FOR CONCUSSION MANAGEMENT FOR
ADULTS**

POLICY PURPOSE:

- Guideline outlines concussion management to maximize patient outcomes.

RESPONSIBLE

Trauma Medical Director
Associate Trauma Medical Director
Assistant Trauma Medical Director
Pediatric Trauma Medical Director
Trauma Program Director
Trauma Service Coordinators
Neurosurgeons
Surgery Faculty and Residents
Emergency Medicine Faculty and Residents
Allied Health Professionals (AHPs)
Nursing Associates

LITERATURE REFERENCES

American College of Surgeons Committee on Trauma (2018). *Advanced Trauma Life Support for Doctors Course Manual*. 10th ed. American College of Surgeons. Chicago, IL: American College of Surgeons.

Giza, C.C., Kutcher, J.S., Ashwal, S., et al. (2013). Summary of evidence-based guideline update: Evaluation and management of concussion in sports: Report of the Guideline Development Subcommittee of the American Academy of Neurology. *Neurology* 80: 2250-2257.

HEADS UP to Health Care Providers. (2020, April 8). Retrieved April 20, 2020, from <https://www.cdc.gov/headsup/providers/index.html>

Scorza, K. and Cole, W. (2019). Current concepts in concussion: Initial evaluation and management. *American Family Physician*. April, 99:(7) pages 426-434 and 434A-434D.

User Manual: Ahead 300 device to BrainScope.

PI TRIGGERS:

- On-Call Consult Response (Delay)
- Treatment Protocols not Followed

**PHYSICIAN GUIDELINES FOR CONCUSSION MANAGEMENT FOR
ADULTS**

DEFINITION:

A concussion is an injury to the brain resulting from a force or jolt applied directly or indirectly to the head. The injury may produce a range of possible symptoms and may or may not, involve a Loss of Consciousness (LOC). Disturbance of brain function is related to neurometabolic dysfunction, rather than structural injury and is typically associated with normal structural neuroimaging findings (i.e., computed tomography (CT) scan or magnetic resonance imaging (MRI)). Concussion results in a constellation of cognitive, somatic, emotional and sleep-related symptoms. Duration of symptoms are variable and may last for as short as several minutes and last as long as several days, weeks, months or even longer in some cases.

PROCEDURE:

- D. Determine mechanism of injury.
 - 1. Rule out severe traumatic brain injury. (Refer to TR-P-7 Head Injury Guideline).
 - 2. Assess length of LOC (less than (<) 30 minutes, < one hour, < six hours, < 24 hours or greater than (>) 24 hours for possible diffuse axonal injury).

- E. Determine need for imaging.
 - 1. Consider use of Ahead 300, BrainScope application as an adjunct to evaluate patients who are considered for a head CT if:
 - a. Between the age of 18 to 85 years of age.
 - b. Glasgow Coma Scale (GCS) between 13 and 15.
 - c. Head injury was sustained within 72 hours.
 - 2. Use validated clinical decision rules predicting risk for more severe injury to determine need for CT.
 - 3. A noncontrast head CT is indicated in head trauma patients with positive LOC or post-traumatic amnesia only if one or more of the following is present:
 - a. Headache
 - b. Vomiting

**PHYSICIAN GUIDELINES FOR CONCUSSION MANAGEMENT FOR
ADULTS**

- c. Age > 60 years of age
 - d. Drug or alcohol intoxication
 - e. Deficits in short-term memory
 - f. Physical evidence of trauma above the clavicle
 - g. Post-traumatic seizure
 - h. GCS < 15 with focal neurologic deficit
 - i. Coagulopathy or use of anticoagulation therapy
- F. Determine need for admission
- 1. Consider admission if patient has one or more of the following symptoms:
 - a. Moderate to severe prolonged headache
 - b. Persistent nausea or vomiting
 - c. Vertigo
 - d. Ataxia
 - e. Lethargy or somnolence
 - f. Confusion
 - g. Memory loss
 - h. Ringing ears
 - i. Difficulty concentrating
 - j. Sensitivity to light
 - k. Loss of smell or taste
 - 2. Patients requiring admission will be admitted to the trauma surgical service with non-urgent neurosurgical consultation unless the findings on CT scan dictates otherwise.

MANAGEMENT:

- A: Provide patient with information regarding concussion:
- 1. Warning signs and symptoms that injury may be more serious.
 - 2. Recovery course.
 - 3. How to prevent further injury.
 - 4. Gradual re-introduction of activity that does not worsen symptoms.
 - 5. The need for social and emotional support.

**PHYSICIAN GUIDELINES FOR CONCUSSION MANAGEMENT FOR
ADULTS**

- B:** Provide clear instructions on return to activity including work, school and/or sport activities that are customized to the patient's symptoms.
1. Indicate to patient and caregiver specifics related to contact sport activities.
 2. For example: No return to contact sports activity (soccer) until symptom-free without the use of analgesics with exertion.
- C:** Provided patient with concussion education material as part of hospital depart process.

DISCHARGE FOLLOW UP REFERRAL:

- A:** Patients with concussion and minor head injury discharged from the hospital should follow-up with their primary care physician, neurosurgery and/or trauma clinic.
- B:** Follow-up referrals incorporating neurology, psychiatry, cognitive therapy, and/or psychological counseling will be ordered if indicated.
1. Consider neuroimaging for acutely worsening symptoms.
 2. Multi-disciplinary evaluation for chronic headache non-opioid analgesia use (monitor for overuse).
 3. Vestibular rehabilitation for vestibulo-ocular symptoms.
 4. Referral to sleep specialist for worsening sleep problem or need for sleep hygiene.
 5. Neuropsychological evaluation for cognitive impairment treatment directed at etiology.
 6. Psychological evaluation for emotional dysfunction and psychotherapeutic evaluation and treatment.

**PHYSICIAN GUIDELINES FOR CONCUSSION MANAGEMENT FOR
ADULTS**

Trauma Program Director

Date

Medical Director, Neurosurgery Division

Date

Associate Trauma Medical Director

Date

Trauma Medical Director

Date

Reviewed/Revised
02/2000
07/2004
01/2006
04/2008
12/2010
03/2014
3/2017
2/2021

**EMERGENCY ROOM MANAGEMENT OF
MAXILLOFACIAL TRAUMA**

POLICY:

Maxillofacial trauma not associated with airway obstruction or life-threatening hemorrhage, should be treated after the patient is completely stabilized. Adequate treatment can be initiated within 7-10 days of injury although earlier treatment may be instituted as the patient's condition permits.

RESPONSIBLE:

Trauma Medical Director
Oral and Maxillofacial Surgery Staff
Surgery, Emergency Medicine Faculty and Residents
Trauma Program Director
Nursing Associates
Trauma Service Coordinators

PI TRIGGERS FOR REVIEW

- Failed intubation

PRIMARY EVALUATION

- A. **Airway Management.** Objectives are to ensure an intact airway, protect the airway in jeopardy or to provide an airway when none is available.
1. Obstruction of the nasal and oral airways may result from the following factors:
 - a. Blood clots, vomitus, saliva, bone, teeth and dentures. Consider aspiration of above materials. Suction and debride.
 - b. Obstruction of both the nasopharynx and oropharynx by retroposition of the tongue and its attachments in bilateral mandibular body fractures (flail mandible) particularly in children and the obtunded. Airway watch should be instituted and consideration of elective intubation or temporary stabilization may be indicated.
 - c. Edema and hematomas of the upper airway should be expected following gunshot wounds that cross the midline and significant facial perioral facial burns. Close airway watch is indicated and elective intubation should be considered early in these patients.
 2. Placement of nasopharyngeal airways or dis-impaction of the maxilla should be considered when obstruction of the oral pharynx due to retroposition of the

EMERGENCY ROOM MANAGEMENT OF MAXILLOFACIAL TRAUMA

fractured maxilla is present. If attempts to stabilize the airway are unsuccessful and/or anticipation of edema or hematoma which may obstruct the airway, consider the following:

- a. Nasal or oral intubation
- b. Surgical airway if intubation is unsuccessful.
- c. If cervical spine injury is suspected, use in-line traction during head manipulation.

B. Hemorrhage Management

1. Soft Tissue. Direct pressure will control most facial hemorrhage. Wet to dry dressings or temporary closure is indicated to prevent desiccation of tissue when patient condition and time allows. Consider location of and possible involvement of vital structures such as the lacrimal, submandibular and parotid ducts and facial nerve.
2. Bony Trauma. Consider temporary stabilization of the fractures in order to control hemorrhage. If this is unsuccessful interventional radiology should be considered. Nasal hemorrhage can normally be controlled with anterior and posterior nasal packs.

SECONDARY MANAGEMENT

- A. A complete head and neck examination with appropriate x-ray examination is necessary to diagnose maxillofacial injury. All maxillofacial traumas should include a complete head, ears, eyes, nose and throat (HEENT) exam. The condition of the patient may preclude a complete examination.
 1. Head exam should include evaluation of facial and scalp lacerations and their proximity to vital structure.
 - a. All facial bones should be manually palpated to detect deformity.
 - b. A cranial nerve exam should be performed and dysfunction documented if patient level of consciousness allows.
 2. Eye exam should include pupils equal, round, react to light, and accommodation (PERLLA), extra ocular movements (EOMs), visual acuity, presence or absence of diplopia, periorbital edema and ecchymosis, subconjunctival hemorrhage, ptosis, foreign bodies, or direct ocular injuries such as hyphema or corneal abrasion.

**EMERGENCY ROOM MANAGEMENT OF
MAXILLOFACIAL TRAUMA**

3. Ear exam: Gross hearing exam should be done. Evaluation of canal to rule out tears, any discharge should be noted. Tympanic membranes should be examined for perforation if possible. The external ear should be evaluated for lacerations or hematomas. The post auricular area should be examined for battle's sign.
4. Nose exam: Evaluation for deformity, crepitus, septal disruption, septal hematoma, patency, and discharge.
5. Throat exam: Area should be palpated with notation of any irregularities; tenderness, ecchymosis or edema.
6. Oral Examination: All soft tissues of the oral cavity and oropharynx should be evaluated for hematomas, lacerations, tooth mobility, fractures of teeth, and any malocclusion. Evaluation for the elevation of the tongue due to edema or hematoma which may threaten the airway should be noted, and mandibular range of motion should be evaluated to include integrity of bilateral temporomandibular joints. The parotid and submandibular ducts should be evaluated for patency if lacerations are present in the area.
7. Radiographic imaging including plain films, Panorex, or a CT scan should be performed as indicated. Radiographic studies should be performed to rule out a cervical spine injury.

**EMERGENCY ROOM MANAGEMENT OF
MAXILLOFACIAL TRAUMA**

Trauma Program Director

Date

Trauma Medical Director

Date

Reviewed/Revised
10/1997
02/2000
05/2003
04/2006
04/2008
04/2010
02/2013
10/2016
12/2019

DENTO-ALVEOLAR INJURY PROTOCOL

POLICY:

Patients presenting to the emergency department with dento-alveolar injuries are treated after the patient is stabilized and when no other life-threatening injuries are present. Patient examination proceeds to rule out any additional maxillofacial trauma.

RESPONSIBLE:

Trauma Medical Director
Oral and Maxillofacial Surgery Staff
Surgery, Emergency Medicine Faculty and Residents
Trauma Program Director
Nursing Associates
Trauma Service Coordinators

PI TRIGGERS FOR REVIEW

- Delays in Identification of Injuries

PROCEDURE:

- A. The examination is dictated by the suspected injuries and the mechanism of injury. The exam is essentially the same as outlined for maxillofacial injuries and should include the following:
1. A head, ears, eyes, nose and throat (HEENT) exam highlighting the areas of suspected injuries. All facial bones should be palpated with particular attention to mandible, maxilla, orbits, nose, and zygomas.
 2. Intraoral examination should be performed as outlined on the section on maxillofacial injuries.
- B. Treatment for Dento-Alveolar Injuries
1. Avulsion Injuries:
 - a. Avulsed adult teeth should be replaced and stabilized immediately.
 - b. The estimated time out of the mouth should be noted on the record.
 - c. Gently rinse the root surface in sterile saline and reposition in the socket (Do not scrub the root surface).
 - d. Primary teeth are not re-implanted.

DENTO-ALVEOLAR INJURY PROTOCOL

- e. Referral should be made to patient's general dentist (for adults), or to a pediatric dentist (for children) as soon as possible.
2. Displaced Teeth and Alveolar fractures:
 - a. Teeth should be repositioned and stabilized.
 - b. Stabilization of the bony segment is necessary when the alveolar process is fractured. Consult an oral and maxillofacial surgeon if indicated.
 3. Fractured Tooth/Teeth:
 - a. The tooth should be anesthetized with a long acting local anesthetic such as bupivacaine (Marcaine).
 - b. The tooth should be evaluated for exposure of the dentin and pulp, and those areas of the tooth covered if possible.
 - c. The patient should be medicated for pain. Antibiotics are not usually indicated for isolated tooth fracture. The patient should be seen by a general dentist or an endodontist in order to treat this within 24 hours.
 4. Radiographic Imaging Evaluation:
 - a. A Panorex or CT scan of the face is dictated by the injury and mechanism of injury.
 - b. CT scan of the head may be reconstructed to avoid repeat patient radiographic exposure.

DENTO-ALVEOLAR INJURY PROTOCOL

Trauma Program Director

Date

Trauma Medical Director

Date

Reviewed/Revised
10/1997
02/2000
05/2003
04/2006
04/2008
04/2010
02/2013
10/2016
01/2020

GUIDELNES FOR BLUNT CARDIAC INJURY

POLICY PURPOSE:

To provide guidelines for the evaluation of patients sustaining blunt chest trauma and potential myocardial contusion.

RESPONSIBLE

Surgery Faculty, Residents and Allied Health Professionals
Emergency Medicine Faculty, Residents
Trauma Medical Director
Associate Trauma Medical Director
Assistant Trauma Medical Director
Trauma Program Director
Trauma Service Coordinators

REFERENCES

American College of Surgeons Committee on Trauma (2018). *Advanced Trauma Life Support for Doctors Course Manual*. 10th ed. American College of Surgeons. Chicago, IL: American College of Surgeons.

Clancey, K., Velopulos, C., Bilaniuk, J., Collier, B., Crowley, W., Kurek, S., Lui, F., & Nayduch, D. (2012). Screening for blunt cardiac injury: An eastern association for the surgery of trauma practice management guideline. *73(5): 4, S301-306*. The American Association for Surgery of Trauma. Retrieved from: <https://www.east.org/.../practicemanagementguidelines/cardiac-blunt-injury-screening>.

PI TRIGGERS FOR REVIEW

- Delays of Identification of Injuries
- Standards of Care not Followed
- Arrhythmia
- Cardiogenic Shock

Refer to Attachment A: Background and Findings for Blunt Cardiac Injury

PROCEDURE: Evaluation and Management

- A. Follow Advanced Trauma Life Support (ATLS) primary and secondary survey.
- B. Obtain a12 lead ECG and cardiac troponin levels on admission for suspected Blunt Cardiac Injury (BCI).

GUIDELNES FOR BLUNT CARDIAC INJURY

- C. If the admission ECG is abnormal (i.e. arrhythmia, ST changes, ischemia, heart block), the patient should be admitted with continuous ECG monitoring for 24 to 48 hours.
 - 1. A repeat ECG should be ordered after 24 hours.
 - 2. Patients with normal ECG results but elevated troponin I level should also be admitted to a monitoring unit.
- D. For patients with pre-existing abnormalities, comparison should be made to a previous ECG, if available to determine need for monitoring.
- E. BCI is ruled out when:
 - 1. ECG is normal,
 - 2. Cardiac troponin levels are normal and
 - 3. Patient is hemodynamically stable.
- F. If the patient is hemodynamically unstable and/or has arrhythmias:
 - 1. Obtain an echocardiogram (Refer to TR-P-21 Echocardiogram).
 - 2. If a transthoracic echocardiogram cannot be performed, proceed with a transesophageal echocardiogram.
- G. Consider a cardiology consult and an echocardiogram if the ECG remains abnormal at 24 hours or if there are persistent arrhythmias on the monitor.
- H. Consider non-invasive hemodynamic monitoring in patients with a significant cardiac dysfunction on echocardiogram.

GUIDELNES FOR BLUNT CARDIAC INJURY

Trauma Program Director

Date

Trauma Medical Director

Date

Reviewed/Revised
10/1997
02/2000
04/2004
10/2007
04/2008
12/2010
03/2014
03/2017
3/2020

GUIDELNES FOR BLUNT CARDIAC INJURY

**ATTACHMENT A:
BACKGROUND AND FINDINGS FOR BLUNT CARDIAC INJURY**

Fifty percent (50%) of Blunt Cardiac Injury (BCI) are related to Motor Vehicle Collisions (MVCs) followed by pedestrians struck by vehicles. Another mechanism of injury related to BCI are falls from heights greater than twenty (20) feet.

BCI can result in:

- Myocardial Muscle Contusion
- Cardiac Chamber Rupture—presents Cardiac Tamponade recognized in Primary Survey. Early use of FAST facilitates diagnosis.
- Coronary Artery Dissection and/or Thrombosis
- Valvular Disruption

Clinical sequelae are:

- Hypotension
- Dysrhythmias
- Wall-motion abnormality on two-dimensional echocardiography.

Most common ECG findings:

- Multiple premature ventricular contractions
- Unexplained sinus tachycardia
- Atrial fibrillation
- Bundle-branch block (usually right)
- ST segment changes

Note: Neither CPK with isoenzyme analysis nor measurement of circulating troponin T are useful in predicting which patients have or will have complications related to BCI.

ORTHOPAEDIC TRAUMA MANAGEMENT

POLICY PURPOSE:

To ensure injured patient receives quality orthopedic care in an organized, timely and coordinated manner to maximize patient outcomes.

RESPONSIBLE:

Trauma Medical Director
Associate Trauma Medical Director
Assistant Trauma Medical Director
Trauma Program Director
Orthopedic Faculty, Residents and Allied Health Professionals (AHPs)
Surgery Faculty, Residents and AHPs
Emergency Medicine Faculty and Residents
Trauma Service Coordinators

POLICY REFERENCES:

- TR-P-20: Physician protocol for the acute treatment of pelvic injuries in hemodynamically unstable patients.
- TR-P-19: Post-operative orders for patients undergoing orthopedic procedures.
- TR-P-34: Open Fracture Management

REFERENCES:

- American College of Surgeons. (2015). TQIP Best Practices in the Management of Orthopedic Trauma. American College of Surgeons Committee on Trauma.
- Committee on Trauma American College of Surgeons. (2014). *Resources for Optimal Care of the Injured Patient*. Chicago, IL: American College of Surgeons.
- Gustilo, R.B., Anderson, J.T. (1976). Prevention of infection in the treatment of one thousand and twenty-five open fractures of long bones: retrospective and prospective analyses. *The Bone and Joint Journal*. (58):453–458.

PI TRIGGERS:

- On-Call consult response > 30 Minutes for Emergency/STAT consults
- Treatment protocols not followed
- Open fracture Type I > 24hrs

ORTHOPAEDIC TRAUMA MANAGEMENT

- Open fracture Type II > 12hrs
- Open fracture Type III > 6hrs
- > 24 hours operative management of femur fractures
- > 24 Hours operative management of mid-shaft tibia fractures

PROCEDURE:

- D. All orthopedic trauma consults are initiated to orthopedic service, except when the injuries noted below under section B are present. In those instances, the orthopedic attending is directly contacted.
- E. The following require a prompt response, less than 30 minutes, from the orthopedic attending:
1. Soft tissue / fracture / dislocation with suspected and/or confirmed neurovascular compromise.
 2. Suspected compartment syndrome.
 3. Pelvic/acetabular fractures with potential for hemodynamic compromise. (Refer to TR-P-20).
 4. Suspected necrotizing fasciitis.
- F. The following require a prompt response, less than 30 minutes, from the orthopedic service. The orthopedic team responding will notify the attending orthopedic surgeon of patient's condition and determine plan of care:
1. Open fractures type III C.
 2. Two or more proximal long bone fractures.
 3. Amputations proximal to the ankle or wrist.
 4. Femoral neck fractures in patients < 50 years of age.
 5. Discretion of trauma attending.
- G. Timeline for admitted orthopedic patients to have surgery (from emergency room, after cleared by trauma team):
1. Open fractures (Refer to TR-P-34).

ORTHOPAEDIC TRAUMA MANAGEMENT

- a. Type I: 24 hours
 - b. Type II: 12 hours
 - c. Type III: 6 hours
2. Mid shaft femur fracture: within 24 hours.
 3. Tibia shaft: within 24 hours.
- H. All admitted patients with orthopedic injuries must be seen by the orthopedic attending within 24 hours of initial consult. Documentation on the medical record must reflect the orthopedic attending's active involvement in the patient's plan of care and treatment.

ORTHOPAEDIC TRAUMA MANAGEMENT

Trauma Program Director

Date

Orthopedic Trauma Liaison

Date

Trauma Medical Director

Date

Reviewed/Revised
10/1997
02/2000
08/2001
09/2003
10/2006
04/2008
12/2010
12/2012
09/2016
03/2017
05/2020

PHYSICIAN GUIDELINE FOR BURN PATIENT CARE

POLICY PURPOSE:

To ensure a timely and complete assessment of the burn patient occurs and an appropriate plan of care is executed when transporting to a Regional Burn Center. The patient's burn injury is often the most obvious injury; however, other serious and even life-threatening injuries may be present needing immediate intervention.

RESPONSIBLE:

Emergency Medicine Faculty and Residents
Surgery Faculty and Residents
Emergency Department Nursing Associates
Allied Health Professionals (AHPs)
Trauma Medical Director
Associate Trauma Medical Director
Assistant Trauma Medical Director
Trauma Program Director
Trauma Service Coordinators
Administrator of the Day (AOD)

LITERATURE REFERENCES

American College of Surgeons (2018). *American College of Surgeons Committee on Trauma: Advanced Trauma Life Support: Student Course Manual*. 10th Ed. American College of Surgeons.

American Burn Association (2018). *Advanced Burn Life Support Provider Manual 2018 Update*. Chicago:IL. American Burn Association.

Texas EMS Trauma & Acute Care Foundation (2016). *Burn Clinical Practice Guideline*. Texas EMS Trauma & Acute Care Foundation Trauma Division. Retrieved on March 18, 2020 from https://www.rexsresources.com/uploads/6/5/2/1/6521405/burn_practice_guideline.pdf

PI TRIGGERS:

- Acute Transfer Out
- ED LOS > 2 hours
- Treatment Protocols not Followed

PHYSICIAN GUIDELINE FOR BURN PATIENT CARE

PROCEDURE

Note: Primary and Secondary Survey will be conducted per ATLS and ABLIS guidelines.

- A. The initial evaluation and management of the burn patient should follow the following prior to transfer:
1. Establish Airway Control
 - a) Patients with facial burns, carbonaceous sputum, and/or suspected lower respiratory tract compromise must be carefully assessed and monitored for evolving airway compromise.
 - b) Upper airway and/or pulmonary injuries should be considered, especially in the following instances:
 - i. injury occurred in an enclosed (inside) space;
 - ii. the patient has carbonaceous sputum;
 - iii. elevated arterial carboxyhemoglobin;
 - iv. obvious and significant intra-oral burns seen on physical examination;
 - v. obvious respiratory distress.
 2. Stop the burning process:
 - a) Make sure the patient is completely undressed by removing all clothing, jewelry, and any other compressive device they may have, however, do not peel off adherent clothing.
 - b) Do not let hypothermia develop; cover the patient with warm, clean, dry linens to maintain body temperature. It is imperative that the patient remains warm during stabilization and transfer.
 - c) Burn wounds should be covered with a clean dry sheet. Do not delay transfer for debridement of the wound or application of an antimicrobial ointment.

Note: Do not place ointments (i.e. Silvadene or Bacitracin), creams or moist dressings on the burns.

PHYSICIAN GUIDELINE FOR BURN PATIENT CARE

3. Monitor vital signs at least hourly in burns $\geq 20\%$ TBSA.
4. Fluid resuscitation: Vascular Access and Choice of Fluid:
 - a) Start with reliable peripheral veins (two large bore catheters). Lines may be started through burns if necessary.
 - b) A central line catheter insertion may be necessary if peripherals cannot be obtained.
 - c) Intraosseous route may also be considered.
 - d) **Lactated Ringers (LR) are the fluid of choice.**
5. Goal of Resuscitation for TBSA greater than ($>$) 20% (2nd and 3rd degree burns):
 - a) **Calculate body surface area burned:** Determine % TBSA by using the rule of nines (Refer to Attachment A regarding body surface calculations).
 - b) **Calculate fluid resuscitation:** Once % TBSA is calculated, begin fluid resuscitation using the following resuscitation formulas within tables below.
 - c) Maintain adequate tissue perfusion and organ function to avoid complications with over-resuscitation and under-resuscitation.
 - d) First-degree burns should not be included in the fluid resuscitation calculations, as it is unnecessary and increases the likelihood of over-resuscitation.
 - e) Fluid resuscitation calculations are therefore calculated for 2nd and 3rd degree burns accounting for surface area of burn ($\geq 20\%$) and body weight in kilograms.

Note: It is imperative that fluid resuscitation commence as close to the time of injury as feasible. Start fluids using the following baseline starting point and then adjust based on TBSA %, age and weight calculation. Continue to adjust fluid resuscitation based on urine output.

PHYSICIAN GUIDELINE FOR BURN PATIENT CARE

INITIAL FLUID RATE AS A STARTING POINT	
Age	Lactated Ringers: Fluid Rate
5 years and younger	125ml/hour
6 to 13 years	250ml/hour
14 years and older	500ml/hour

ADJUSTED CALCULATED FLUID RATE		
Category	Age and Weight	Adjusted Fluid Rate
Flame or Scald	Adults and Older Children (≥ 14 years old)	2 ml LR x kg x % TBSA
	Children (< 14 years old)	3 ml LR x kg x % TBSA
	Infants and Young Children (≤30kg)	3 ml LR x kg x % TBSA, plus D5LR at maintenance rate
Electrical Injury	All Ages	4 ml LR x kg x % TBSA plus D5LR at maintenance rate for infants and young children

- e) **Administer fluid:** Give half (1/2) of fluid requirement over the first 8 hours **from time of arrival**, and the second half (1/2) over the next 16 hours. Fluid rates are based on patient response.

Note: Formulas are only for providing a starting rate, after starting at this rate, the amount of fluids will be titrated to the adult or pediatric urine output target. Some patients may require more fluid than the calculated amount to maintain appropriate urine output.

- f) **Monitor urine output:** Insert a Foley catheter to monitor urine output.
- i. In adults using ideal body weight, ideal urine output is 30-50 ml/hr (0.5ml/kg/hr). Those with high voltage electrical burns with evidence of myoglobinuria: 75 to 100ml/hr until urine clears.
 - ii. In young children (weight less than or equal to ≤ 30kg): 1ml/kg/hr.
 - iii. Pediatric (weighting greater than > 30kg, up to the age of 17): 0.5ml/kg/hour.

PHYSICIAN GUIDELINE FOR BURN PATIENT CARE

6. Adequate documentation of neurological status and peripheral pulses are mandatory, as these provide a baseline exam against which future changes may be based.
 - a) Assessment of Extremity Perfusion Frequently re-assess perfusion of the extremities, and elevate affected extremities to decrease swelling.
 - b) Doppler assessment may be necessary if pulses are difficult to palpate.
 - c) Escharotomy with burns may be necessary to relieve elevated pressures in the extremities, chest or abdomen. Judicious fluid titration helps avoid this problem.
 - i. Escharotomy is almost never required prior to burn center transfer, unless there is a delay in transport greater than 12 hours after injury.
 - ii. Consult the nearest burn center when escharotomy is being considered as the margin for error is extremely small in children.
7. If the burns exceed 20% TBSA, a Nasal/Oral Gastric (NG/OG) tube will be considered.

B. Medications

1. Pain medication may be administered with caution and if not contraindicated by other injuries or medical conditions. Morphine is preferred only by the intravenous route and never intramuscular.
2. Benzodiazepines may be indicated to relieve the anxiety associated with burn injury.
3. Tetanus immunization may be given if no history of Tetanus toxoid within the last one year.
4. Clearly document administration of medications on medical record.
5. **Antibiotics are not necessary.** Other IM, oral, or subcutaneous medication is not suggested.

C. Special considerations for electrical injuries, including lightning injuries:

PHYSICIAN GUIDELINE FOR BURN PATIENT CARE

1. Cardiac monitoring should be provided for patients with electrical injuries or for people who are burned with alternating current which may induce ventricular fibrillation at the time of the injury.
2. High voltage electrical injuries are associated with myonecrosis and myoglobinuria. Acute renal failure can develop unless adequate urine output is assured. If myoglobin is visible in the urine, or if patient has a positive lab result for urine myoglobin, fluid resuscitation should be increased to obtain urine output of 75 to 100 ml/hr.

E. Burn Center Transfer Criteria (Refer to Attachment B).

Note: Due to prolonged transport, strongly consider intubation prior to transfer on patients with facial, neck circumferential burns, and /or inhalation injury.

1. In the event of a required transfer of the patient to a Burn Center, the Administrator of the Day (AOD) will coordinate transfer arrangements.
2. Burn patients will be transferred to a regional burn center that has the capacity to accept patient. Consideration will be given to keep family together and/or close to their particular residence when possible.
3. A complete copy of the medical record and radiographic films must accompany patient when transferring to Burn Center. Communication to Pre-Hospital Providers with report will be documented in the Memorandum of Transfer's available field. Transfer documentation records to include:
 - a) Information about the circumstance of injury as well as physical findings and the extent of the burn.
 - b) A flowsheet demonstrating all resuscitation measures.
 - c) Documentation of all treatments and medications administered.
 - d) Laboratory and X-ray results.
 - e) Advanced Directives/Durable Power of Attorney if applicable.

I. Prior to transferring patients with isolated hand burns, contact the Orthopedic Hand Attending on call.

J. Prior to transferring facial burns, contact Oral Maxillofacial Surgeon (OMFS) on call.

K. All patients will be NPO pending transfer to a Burn Center.

L. Care for patients to be transferred:

PHYSICIAN GUIDELINE FOR BURN PATIENT CARE

- a) Monitor vital signs and urine output.
 - b) Cardiac monitoring.
 - c) 100% high flow oxygen, preferably humidified, by facemask for patients who are not intubated is recommended.
 - d) Ventilation by bag or appropriate ventilator if the patient is intubated as recommended by the transferring or receiving physician.
 - e) If the patient has stridor or other signs of respiratory distress and has not been intubated, the patient should not be transported. Stridor occurs late and is an indication for immediate endotracheal intubation prior to transfer. Major burns will not be transported without NG tubes and IV access.
 - f) Have two secured IV access lines.
 - g) If patient is intubated, insert OG or NG. If suction is not available, frequent aspiration of the OG or NG tube with a large syringe is recommended.
 - h) Hypothermia is a major complication. Patients must be kept warm. If the patient is to be transported by air in a cabin that is not well-heated, reflective thermal blankets are suggested.
- M. Refer to Attachment C for Burn Patient Follow-Up Care Algorithm.

PHYSICIAN GUIDELINE FOR BURN PATIENT CARE

Trauma Program Director

Date

Trauma Medical Director

Date

Review/Revision

02/00
07/04
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PHYSICIAN GUIDELINE FOR BURN PATIENT CARE

ATTACHMENT A: BURN PERCENTAGE CALCULATION

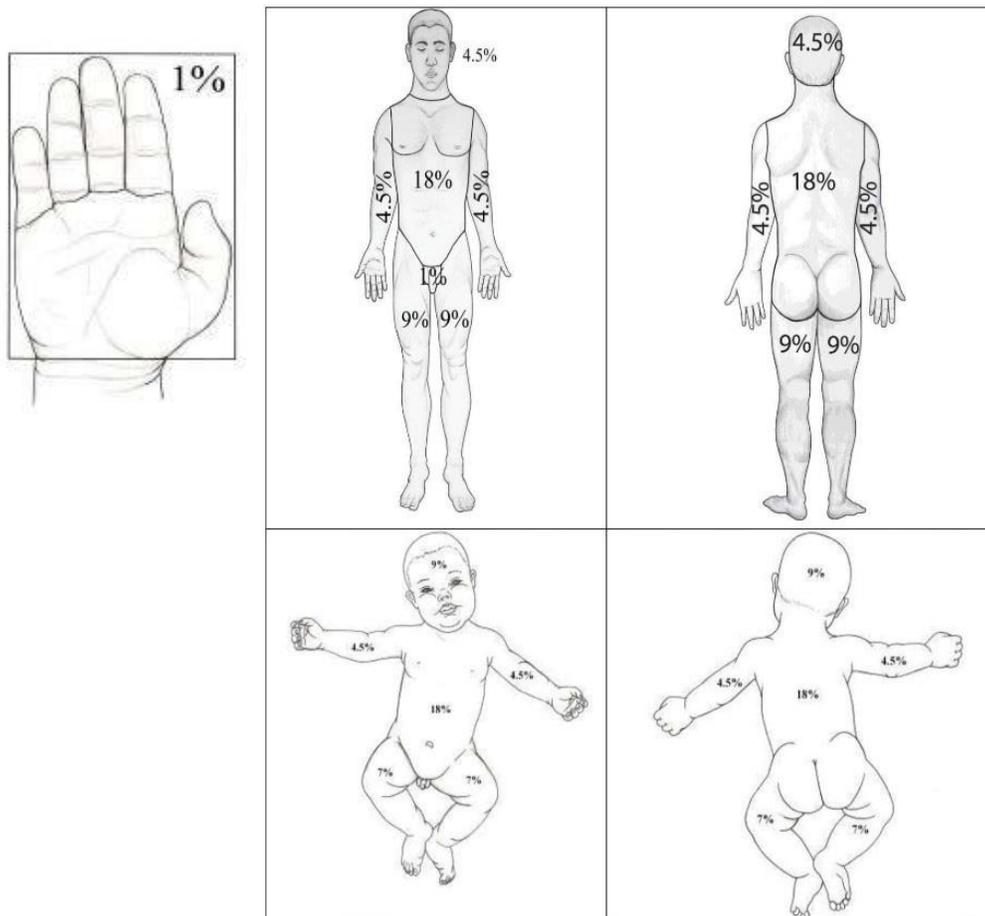
The most commonly used guide to estimate second and deeper degree burns is the “Rule of Nines.”

In adults, distinct anatomic regions represent approximately 9% - or a multiple thereof – of the Total Body Surface Area (TBSA).

In the infant or child, the “Rule” deviates because of the large surface area of the child’s head and the smaller surface area of the lower extremities.

Note: First degree (superficial burn without blister formation) areas are not included in the TBSA burn calculation.

If only part of the anatomical area is burned, calculate the percent TBSA burned based on the percentage of that site injured and not the value of the whole (i.e., if the arm is circumferentially burned from the hand to the elbow, only half the arm is burned for a total of approximately 4.5%).



PHYSICIAN GUIDELINE FOR BURN PATIENT CARE

ATTACHMENT B: BURN CENTER REFERRAL CRITERIA

The American Burn Association has identified the following injuries that should be referred to a Burn Center after initial assessment and stabilization.

Please note: Young children and older adults are less tolerant of burn injuries. The burn team approach, combining the expertise of physicians, nurses, psychologists, dieticians, social workers, and therapists improves the outcomes of individuals with major burn injuries.

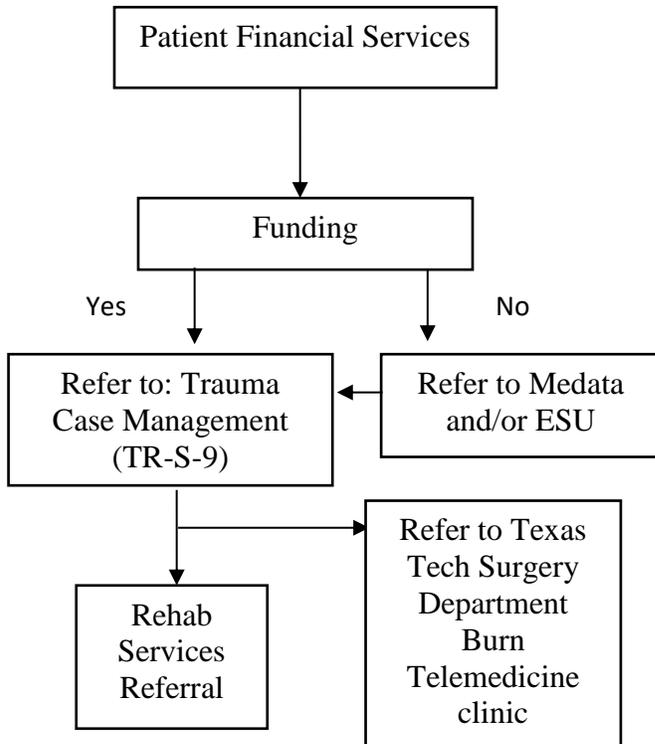
1. Partial thickness burns greater than 10% total body surface area (TBSA.)
2. Burns that involve the face, hands, feet, genitalia, perineum, or major joints.
3. Third-degree (full-thickness) burns in any age group.
4. All pediatric patients with partial thickness burns of ten percent or more total body surface area, or with any full-thickness component should be referred to a burn center for definitive care.
5. Electrical burns, including lightening injury.
6. Chemical burns.
7. Inhalation injury.
8. Burn injury in patients with preexisting medical disorders that could complicate management, prolong recovery, or affect mortality.
9. Any patients with burns and concomitant trauma (such as fractures) in which the burn injury poses the greatest risk of morbidity or mortality. In such cases, if the trauma pose the greater immediate risk, the patient may be stabilized initially in a trauma center before being transferred to a Burn Center. Physician judgment will be necessary in such situations and should be in concert with the regional medical control plan and triage protocols.
10. Burned children in hospitals without qualified personnel or equipment for the care of children.
11. Burn injury in patients who will require special social, emotional or rehabilitative intervention.

For specific patient questions, consult with burn center (i.e.: UMC-Lubbock or Shriners Children's Hospital in Galveston).

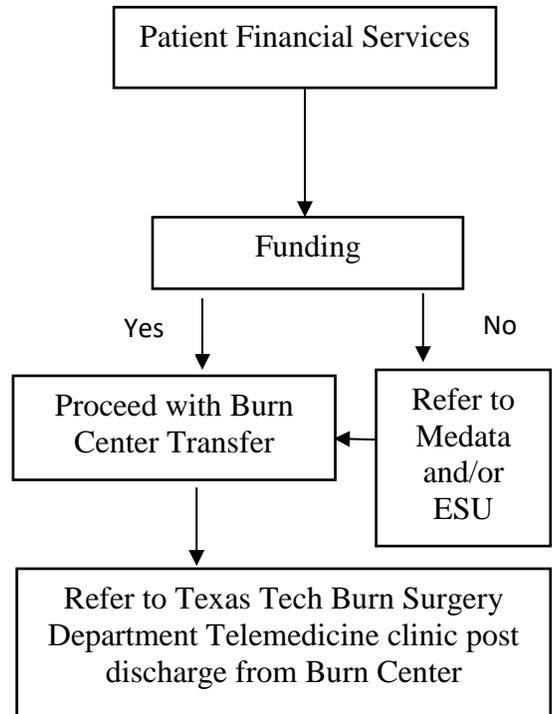
PHYSICIAN GUIDELINE FOR BURN PATIENT CARE

ATTACHMENT C: BURN PATIENT FOLLOW UP CARE

**EMERGENCY DEPARTMENT
VISIT OR ADMISSION**



**TRANSFER TO
BURN CENTER**



**GUIDELINE FOR THE PREVENTION AND/OR TREATMENT OF VENOUS
THROMBOEMBOLIC EVENT (VTE) IN TRAUMA PATIENTS**

POLICY PURPOSE:

To provide a standardize process to assess and identify those patients who are at high risk for the development of thromboembolic events and provide a plan of action to prevent those events whenever possible.

Refer to Attachment A for Background, Definitions and Considerations.

RESPONSIBLE

Trauma Medical Director
Associate Trauma Medical Director
Assistant Trauma Medical Director
Surgery Faculty & Residents
Orthopedic Faculty & Residents
Neurosurgeons
Allied Health Professionals (AHPs)
Trauma Program Director
Trauma Service Coordinators
Nursing Associates

POLICY REFERENCES

NC-CC-15 DVT Prophylaxis

LITERATURE REFERENCES

DeYoung, E., & Minocha, J. (2016, June). Inferior vena cava filters: guidelines, best practice, and expanding indications. In *Seminars in interventional radiology* (Vol 33, No. 02, pp. 065-070). Thieme Medical Publishers.

Frisoli, F.A., Shineski, M., Nwabuobi, L., Zeng, X. L., Adrados, M., Kanter, C., ... & Huang, P.P. (2017). Early venous thromboembolism chemoprophylaxis after traumatic intracranial hemorrhage. *Neurosurgery*, 81(6) 1016-1020.

Kearon, C., Akl, E. A., Ornelas, J., Blavias, A., Jimenez, D., Bounameaux, H., ... Stevens, S. M. (2016). Antithrombotic therapy for VTE disease: CHEST guideline for expert panel report. *Chest*, 149(2), 315-352.

Mahajerin, A., Petty, J. K., Hanson, S. J., Thompson, A. J., O'Brien, S. H., Streck, C. J., ... & Faustino, E. V. S. (2017). Prophylaxis against venous thromboembolism in

**GUIDELINE FOR THE PREVENTION AND/OR TREATMENT OF VENOUS
THROMBOEMBOLIC EVENT (VTE) IN TRAUMA PATIENTS**

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PI TRIGGERS

- DVT
- PE
- Treatment protocols not followed

PROCEDURE

A. Non Pharmacologic and Chemoprophylaxis:

1. Patient is assessed for appropriateness of chemoprophylaxis upon admission.
2. Refer attachment A for Orthopaedic guidelines.
3. Refer to attachment B for Neurosurgery guidelines.
4. Brain and spine consulting service recommendations have priority over other subspecialty recommendations, unless overridden at the discretion of the trauma attending.
5. Trauma patients without Orthopaedic, brain, and/or spine injuries will be assessed for chemoprophylaxis per trauma attending.
6. A physician order is entered into electronic medical record for mechanical and/or chemoprophylaxis.
7. Sequential Compression Devices (SCDs) or foot pumps will be applied to all trauma patients unless contraindicated due to injured extremity. This includes

GUIDELINE FOR THE PREVENTION AND/OR TREATMENT OF VENOUS THROMBOEMBOLIC EVENT (VTE) IN TRAUMA PATIENTS

patients transported to the operating room. Refer to Lippincott Procedure link via UMC intranet clinical applications page.

- a. Chemoprophylaxis Dosing with Enoxaparin:
 - i. 30 mg sc BID
 - ii. Use 40 mg sc BID for patient greater or equal to (\geq) 100Kg
- a. Place order in electronic medical record for anti-Xa level (peak)
 - i. Should be drawn 3-4 hours after 3rd dose (verify dose administration with bedside nurse)
 - ii. Prophylactic anti Xa level should be 0.2 IU/ml - 0.5 IU/ml

Resulting Heparin Anti-Xa Level	Current Dose of Enoxaparin	Dose Adjustment
< 0.2 IU/mL	▪ 30 mg SubQ daily	▪ Increase to 40 mg SubQ daily
	▪ 40 mg SubQ daily	▪ Increase to 30 mg SubQ twice daily
	▪ 30 mg SubQ twice daily	▪ Increase to 40 mg SubQ twice daily
	▪ 40 mg SubQ twice daily	▪ Increase to 50 mg SubQ twice daily
	▪ 50 mg SubQ twice daily	▪ Increase to 60 mg SubQ twice daily
	▪ 60 mg SubQ twice daily	▪ Increase to 70 mg SubQ twice daily
0.2 – 0.5 IU/mL	▪ Continue current dose	▪ No dose adjustment needed
> 0.5 IU/mL*	▪ 50 mg SubQ twice daily	▪ Decrease to 40 mg SubQ twice daily
	▪ 40 mg SubQ twice daily	▪ Decrease to 30 mg SubQ twice daily
	▪ 30 mg SubQ twice daily	▪ Decrease to 40 mg SubQ daily
	▪ 40 mg SubQ daily	▪ Decrease to 30 mg SubQ daily
	▪ 30 mg SubQ daily	▪ Decrease to 20 mg SubQ daily

- iii. Renal dose considerations:
 - 1. Creatinine Clearance (CrCl) less than (<) 30 mL/min use:
 - o 30 mg sc daily or 40 mg sc daily (\geq 100kg)

B. Venous Thromboembolic Event (VTE) Surveillance

- 1. Patients with recent history of an outside facility admission for several days and was subsequently transferred to our trauma center will have a four extremity duplex ultrasound at the discretion of the Trauma Attending.
- 2. If DVT and/or PE is detected, the patient will be considered for anticoagulation.

**GUIDELINE FOR THE PREVENTION AND/OR TREATMENT OF VENOUS
THROMBOEMBOLIC EVENT (VTE) IN TRAUMA PATIENTS**

3. If contraindicated, Inferior Vena Cava (IVC) filter will be considered.
 4. If anticoagulation is not initiated; contraindicated; or must be held for any reason, there must be documentation in the progress note describing why anticoagulation was not initiated.
 5. Patients will undergo daily reassessment as to when or if anticoagulation will be initiated.
- C. Management of VTE:
1. Anticoagulation therapy
 - a. Enoxaparin 1 mg/kg subcutaneous every 12 hours (normal renal function) **or** 1 mg/kg subcutaneous once daily (eCrCl less than 30).
 - b. Warfarin (Coumadin) for three to six (3 to 6) months.
 - c. Direct thrombin inhibitors and factor Xa inhibitors may also be used
 - i. Rivaroxiban (Xeralto)
 - ii. Apixapan (Eliquis)
 - iii. Dabigatran (Pradaxa)
 - iv. Edoxaban (Savaysa)
 - v. Betrixaban (Bevyxxa)
 - d. IVC filter should be considered in patients with VTE only under rare circumstances:
 - i. If available, optional (retrievable) filter should be used
 - ii. Absolute contraindication to anticoagulation:
 1. High risk of uncontrolled bleeding
 2. Severe thrombocytopenia
 3. Acute hemorrhagic stroke
 4. Severe renal or hepatic dysfunction
 - iii. Complication of anticoagulation resulting in cessation of therapy:
 1. Spontaneous or significant unprovoked hemorrhage

**GUIDELINE FOR THE PREVENTION AND/OR TREATMENT OF VENOUS
THROMBOEMBOLIC EVENT (VTE) IN TRAUMA PATIENTS**

- iv. Failure of anticoagulation
 - 1. Inability or failure to reach or maintain therapeutic levels
 - 2. Documentation of progression of DVT or recurrent PE while on therapeutic anticoagulation

- D. Evaluation for patients with Pulmonary Emboli (PE):
 - 1. Rule out other cause of symptoms.
 - 2. Obtain a Chest CT angiography.
 - 3. Obtain a four-extremity ultrasound duplex.
 - 4. Obtain an Electrocardiogram.
 - 5. Consider obtaining EKG, CXR, and ABG's.

- E. Management of patient with PE:
 - 1. Consider admission to IMCU or ICU
 - 2. Pulmonary support
 - a. Oxygen therapy
 - b. Ventilator support
 - c. Hemodynamic support
 - 3. Anticoagulation
 - a. Observation and no therapeutic anticoagulation indicated if the patient has:
 - i. subsegmental PE (no involvement of more proximal pulmonary arteries) AND
 - ii. No proximal DVT
 - b. Enoxaparin 1 mg/kg subcutaneous every 12 hours (normal renal function) **or** 1 mg/kg subcutaneous once daily (eCrCl less than 30).

**GUIDELINE FOR THE PREVENTION AND/OR TREATMENT OF VENOUS
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c. Heparin drip may be considered in the following patients:

1. Patients pending surgical procedures
 2. Severe renal impairment
 4. IVC Filter if anticoagulation contraindicated or in patient with recurrent PE despite therapeutic anticoagulation.
 5. Embolectomy in unstable patients.
- c. Consideration for Warfarin administration.

**GUIDELINE FOR THE PREVENTION AND/OR TREATMENT OF VENOUS
THROMBOEMBOLIC EVENT (VTE) IN TRAUMA PATIENTS**

Trauma Program Director

Date

Trauma Medical Director

Date

Reviewed/Revised
10/1997
02/2000
05/2003
06/2005
10/2006
04/2008
02/2014
03/2017
01/2021

**GUIDELINE FOR THE PREVENTION AND/OR TREATMENT OF VENOUS
THROMBOEMBOLIC EVENT (VTE) IN TRAUMA PATIENTS**

ATTACHMENT A: BACKGROUND, DEFINITIONS AND CONSIDERATIONS

BACKGROUND

VTE is a common cause of preventable death in hospitalized patients. Latest estimates from the Centers for Disease Control and Prevention (CDC) suggest that 60,000 to 100,000 die of VTE each year in the United States. The high incidence of postoperative VTE and the availability of effective methods of prevention warrant that thromboprophylaxis be considered in every surgical patient.

VTE has a significant clinical and social impact due to the high incidence and severe possible sequelae. The incidence of VTE after orthopedic trauma can be up to 40% depending on the patient's risk factor and extent of trauma.

DEFINITIONS

Chemoprophylaxis: Refers to the administration of a medication for preventing disease.

Deep Vein Thrombosis (DVT): Formation of blood clot in the brachial, axillary, subclavian, internal jugular, iliac, femoral and/or popliteal veins.

Mechanical prophylaxis: Refers to the use of sequential compression devices (SCDs) or compression foot pumps.

Pulmonary embolism (PE): Blockage by blood clot of the pulmonary artery and/or its branches.

CONSIDERATIONS

- All trauma patients will be evaluated for use of chemoprophylaxis upon admission.
- Any contraindications, relative contraindications, or special considerations of chemoprophylaxis will be considered prior to initiation.
- If chemoprophylaxis is not initiated or contraindicated or must be held for any reason, there must be documentation every 24 hours in the progress note explaining the rationale. Patients will undergo daily re-assessment as to when or if prophylaxis will be initiated.

GUIDELINE FOR THE PREVENTION AND/OR TREATMENT OF VENOUS THROMBOEMBOLIC EVENT (VTE) IN TRAUMA PATIENTS

- Inferior vena cava (IVC) filter placement for pulmonary embolus prophylaxis will be assessed on a case by case basis after consulting with involved subspecialty(ies), but should be rarely inserted.
- To provide a means to assess and identify those patients who are at high risk for the development of thromboembolic events and provide a plan of action to prevent those events whenever possible.

Contraindications to chemoprophylaxis include but not limited to:

- Active bleeding,
- History of heparin induced thrombocytopenia (HIT),
- Untreated congenital coagulopathies (hemophilia or severe von Willebrand disease and/or,
- Thrombocytopenia.

Relative contraindications to chemoprophylaxis: (See attachment A for Neurosurgery Guidelines)

- Intracranial bleeding (epidural hematoma, subarachnoid, subdural bleeding, intraparenchymal hematoma in evolution) and,
- Spinal column fracture with or without associated spinal cord injury, deemed unstable.

Special considerations before chemoprophylaxis (all ages):

- Individual or family history of major hemorrhage;
- Acquired coagulopathies (i.e. hepatic insufficiency with abnormal coagulation test results and/or platelet count);
- Thrombocytopenia (less than 50,000/uL);
- Severe renal failure (creatinine clearance less than 30 ml/min); only case in which LDH or warfarin should be considered the preferred chemoprophylaxis for trauma patients;
- Cerebral metastases or cerebral angioma at risk of bleeding (confirmed by CT angiography or MRI);
- Recent hemorrhagic stroke;
- Gastric, genitourinary and/or ocular hemorrhage within the previous 2 weeks;
- Third degree arterial hypertension (230/120 mmHg)
- Obesity (\geq 100kg) and,
- Active cancer or cancer treatment.

Pediatric trauma 15 years of age or greater

Prophylactic dose: (Not to exceed 40 mg every 12 hours)

**GUIDELINE FOR THE PREVENTION AND/OR TREATMENT OF VENOUS
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- (Weight less than 60 kg) Enoxaparin 0.5 mg/kg subcutaneous every 12 hours.
- (Weight greater than 60 kg) Enoxaparin 30 mg up to 40mg subcutaneous every 12 hours.

Note: If pediatric trauma patient is diagnosed through imaging with a VTE and/or PE or a history of thrombophilia with current medical treatment for VTE, consider a pediatric hematology consult upon admission.

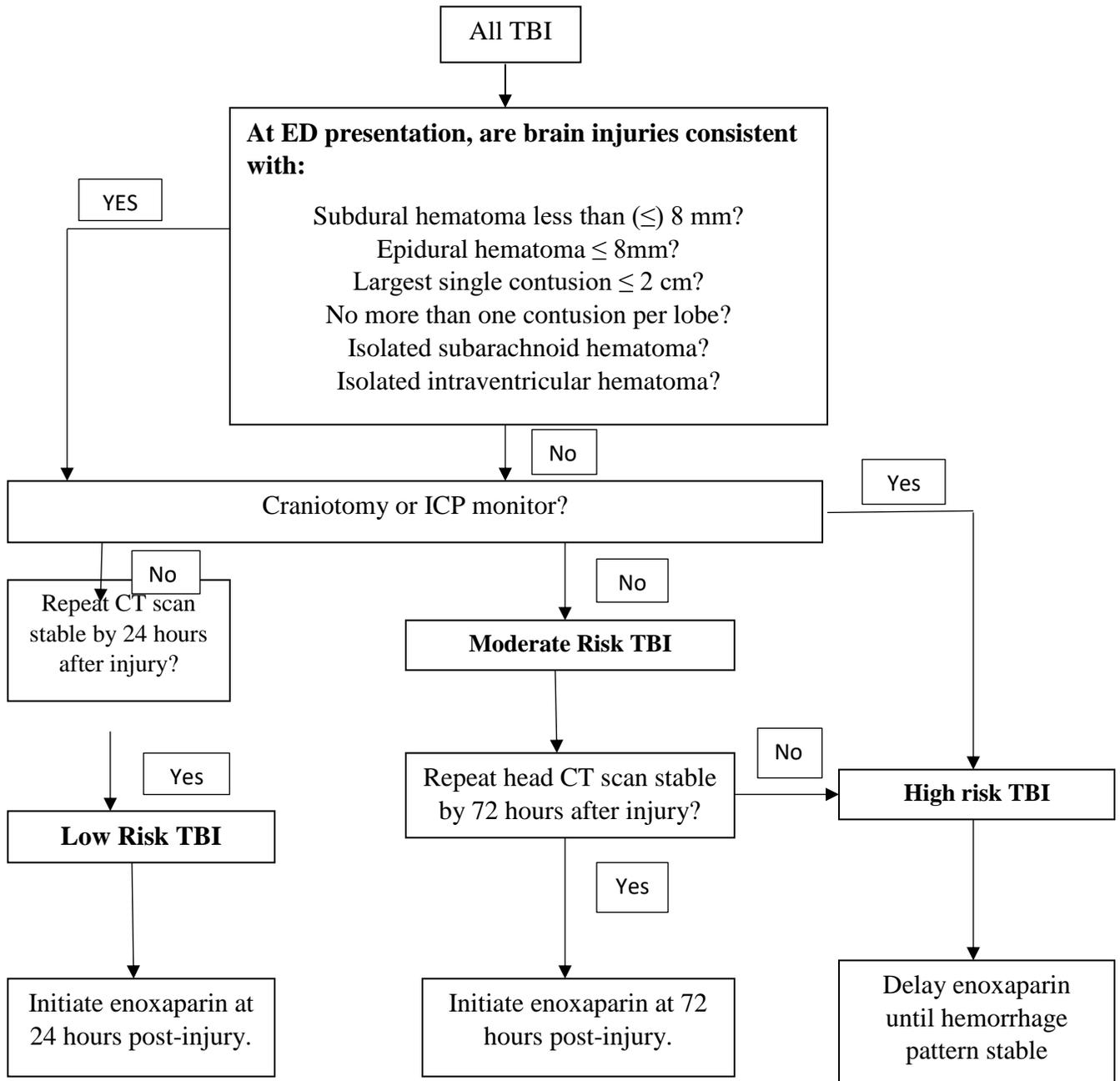
**GUIDELINE FOR THE PREVENTION AND/OR TREATMENT OF VENOUS
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ATTACHMENT B: NEUROSURGERY VTE GUIDELINE (Greater than 15 years of age)

Note: The Guidelines are non-binding. Clinical judgment must be used in the application of these guidelines as individual patients differ both in clinical condition and co-morbidities.

1. All cranial/spinal trauma patients should have mechanical DVT prophylaxis initiated on admission unless contraindicated; i.e. Sequential Compression Devices (SCD).
2. No pharmacologic anticoagulation prophylaxis:
 - a. While ICP bolt, ventriculostomy, or drain is in place and a minimum of 24 hours post removal, **or**
 - b. If clinical picture suggests probable anticipated need for a cranial or spinal procedure within 24 hours.
3. If continuing medications for atrial fibrillation such as Dabigatran (Pradaxa), Rivaroxiban (Xarelto) or Warfarin (Coumadin), discuss with Neurosurgery service prior to commencement or administration of these drugs.
4. In rare instances where IVC filter is deemed appropriate, patients should be scheduled follow-up as required by manufacture for removal of the filter if deemed clinically appropriate and safe.
5. Patient diagnosed with Traumatic Brain Injuries (TBI) will be categorized in to the following categories: mild TBI, moderate TBI, and severe TBI and chemoprophylaxis will be initiated accordingly. (Refer to algorithm below)

GUIDELINE FOR THE PREVENTION AND/OR TREATMENT OF VENOUS THROMBOEMBOLIC EVENT (VTE) IN TRAUMA PATIENTS

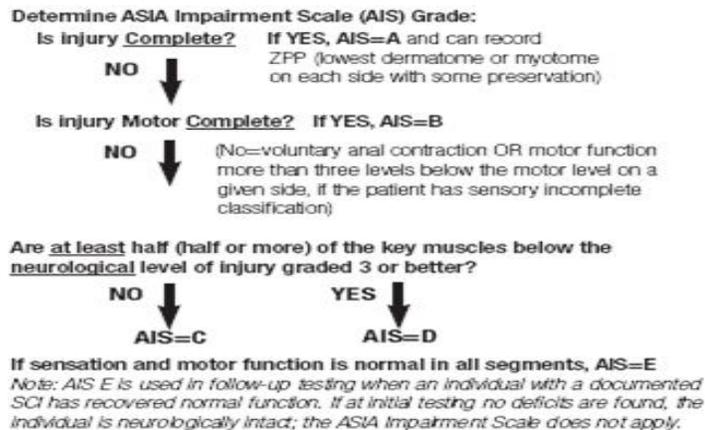


GUIDELINE FOR THE PREVENTION AND/OR TREATMENT OF VENOUS THROMBOEMBOLIC EVENT (VTE) IN TRAUMA PATIENTS

ASIA Impairment Scale

Traumatic spinal cord injury is classified into five categories on the ASIA Impairment Scale:

- **A** indicates a "complete" spinal cord injury where no motor or sensory function is preserved in the sacral segments S4-S5.
- **B** indicates an "incomplete" spinal cord injury where sensory but not motor function is preserved below the neurological level and includes the sacral segments S4-S5. This is typically a transient phase and if the person recovers any motor function below the neurological level, that person essentially becomes a motor incomplete, i.e. ASIA C or D.
- **C** indicates an "incomplete" spinal cord injury where motor function is preserved below the neurological level and more than half of key muscles below the neurological level have a muscle grade of less than 3, which indicates active movement with full range of motion against gravity.
- **D** indicates an "incomplete" spinal cord injury where motor function is preserved below the neurological level and at least half of the key muscles below the neurological level have a muscle grade of 3 or more.
- **E** indicates "normal" where motor and sensory scores are normal. Note that it is possible to have spinal cord injury and neurological deficits with completely normal motor and sensory scores.



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**GUIDELINE FOR THE PREVENTION AND/OR TREATMENT OF VENOUS
THROMBOEMBOLIC EVENT (VTE) IN TRAUMA PATIENTS**

Committee on Trauma (2015). ACS TQIP Best practices in the management of traumatic brain injury: Guidelines. Chicago, IL: American College of Surgeons.

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**GUIDELINE FOR THE PREVENTION AND/OR TREATMENT OF VENOUS
THROMBOEMBOLIC EVENT (VTE) IN TRAUMA PATIENTS**

ATTACHMENT C: ORTHOPAEDIC TRAUMA VTE GUIDELINE

Chemoprophylaxis

- Pharmacologic prophylaxis is based on LMWH (enoxaparin) subcutaneous injection.
- Oral prophylaxis (Rivaroxaban) may be used based on surgeon preference.
- Aspirin can be used for lower risk patients who do not have contraindication.

Mechanical Prophylaxis

- Combined early use of mechanical pneumatic compression devices and chemoprophylaxis should be utilized whenever possible.
- Recommend use in all patients in which the devices can be safely and effectively applied. Calf pumps should be applied preferentially over foot pumps.

Timing of chemoprophylaxis

- LMWH should be started within 24 hours of hospital admission if there is no contraindication.
- LMWH should not be held for operative procedures unless specified by the Orthopaedic or Trauma attending.

Duration of chemoprophylaxis

- Minimum of 10 to 14 days
Patients at a high risk for VTE should have the duration of their chemoprophylaxis extended to 28 days from operative intervention.

Pharmacological chemoprophylaxis recommendations based on injury type

- **Pelvic fractures/acetabular fractures and proximal femur fractures** (neck fracture/trochanteric/subtrochanteric fracture):
 - Pharmacological thromboprophylaxis is administered unless contraindicated.
 - LMWH SC injection.
- **Lower extremity fracture** (shaft femur, distal femur, proximal tibia, shaft tibia, distal tibia, ankle and foot) (operative and cast treatment):
 - Patients with isolated lower extremity fractures and no other risk factors for VTE, who are able to independently mobilize do not require chemoprophylaxis upon discharge from the hospital. (see risk factors below)

**GUIDELINE FOR THE PREVENTION AND/OR TREATMENT OF VENOUS
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Aspirin can be utilized in these patients at the discretion of the attending surgeon.

- **Upper extremity fracture:**
 - Patients with isolated upper extremity fractures and who are at low risk for VTE, do not require pharmacological thromboprophylaxis after discharge from the hospital.
 - High risk patients should continue to receive chemoprophylaxis:
 - History of VTE
 - Immobile/bed-bound/non-ambulatory patients
 - Aspirin can be utilized in these patients at the discretion of the attending/treating surgeon.

Pediatric Patients

- Pediatric patients with isolated orthopaedic injuries usually do not need chemoprophylaxis unless directed by treating surgeon.

Risk Factors:

1. Older than 40 years of age
2. BMI > 30
3. Personal history of VTE
4. Family history of VTE
5. History of malignancy
6. History of smoking
7. Hormonal birth control
8. Inability to mobilize (weight bearing restriction or due to condition)
9. Spinal Cord Injury
10. Hypercoagulable predisposition (e.g. protein C and S deficiency and COVID-19).

**POST-OPERATIVE ORDERS FOR PATIENTS UNDERGOING
ORTHOPEDIC PROCEDURES**

POLICY PURPOSE:

To ensure the injured patient undergoing an orthopedic procedure while on the trauma service receives consistent means of communication and coordinated post-operative care. This process excludes the geriatric isolated hip fracture population unless critical care services are required.

RESPONSIBLE:

Trauma Medical Director
Associate Trauma Medical Director
Assistant Trauma Medical Director
Trauma Program Director
Trauma Service Coordinators
Orthopedic Faculty and Residents
Surgery Faculty and Residents
Anesthesiology Services
Allied Health Professionals (AHPs)

PI TRIGGERS:

- Trauma Admission to Non-Surgical Service
- Treatment Protocols not Followed

PROCEDURE:

- A. For any trauma service patient requiring an orthopedic procedure, the orthopedic service will inform the trauma attending or senior surgical resident and obtain operative clearance prior to the proposed procedure.
- B. Upon completion of the operation, the orthopedic resident will write orders relevant to the patient's orthopedic related injury and procedure.
- C. The orthopedic resident will contact the appropriate service to complete the remaining post-operative orders.
 1. This interaction will be initiated in the Post Anesthesia Care Unit (PACU) and orders must be completed immediately after procedure.
 2. The orthopedic resident should not depend solely on a communication order through the nurse; this will be a physician to physician conversation.

**POST-OPERATIVE ORDERS FOR PATIENTS UNDERGOING
ORTHOPEDIC PROCEDURES**

- D. All patients requiring admission post operatively will be admitted to the trauma service.
 - 1. The senior SICU resident, or the SICU attending, will be informed of this prior to the planned orthopedic procedure.
 - 2. Intraoperatively decision for SICU or PICU services, will be informed by anesthesia services to SICU attending.
 - 3. Post operatively decision for SICU or PICU admission will be informed by orthopedic services to trauma attending.
- E. The orthopedic resident will notify the Medical or Trauma team for co-management for all other adult patients admitted to the general wards (i.e. surgical, trauma-orthopedic floor).
- F. The orthopedic resident will notify trauma services for co-management for all other pediatric patients to be admitted to the general pediatric floor. Trauma services will notify pediatric services if meets age criteria (Pediatric hospitalist will see trauma patients 15 years of age and younger).

**POST-OPERATIVE ORDERS FOR PATIENTS UNDERGOING
ORTHOPEDIC PROCEDURES**

Trauma Program Director

Date

Trauma Medical Director

Date

Reviewed/Revised
02/2000
09/2006
04/2008
12/2010
03/2013
03/2017
03/2020

**PHYSICIAN PROTOCOL FOR
THE ACUTE TREATMENT OF PELVIC INJURIES IN HEMODYNAMICALLY
UNSTABLE PATIENTS**

POLICY PURPOSE:

Provider guideline outlining the assessment, identification and treatment of pelvic injuries in hemodynamically unstable patients.

RESPONSIBLE:

Surgery Faculty & Residents
Emergency Medicine Faculty & Residents
Trauma Medical Director
Associate Trauma Medical Director
Assistant Trauma Medical Director
Trauma Program Director
Orthopedic Faculty & Residents
Radiologist

POLICY REFERNCES

TR-S-19 *Massive Transfusion Guideline (MTG) in Trauma*

BACKGROUND:

The initial management of the patient with a hemodynamically and mechanically unstable pelvic fracture must follow Advanced Trauma Life Support (ATLS) guidelines. Evaluation focuses on the pelvic fracture in addition to ruling out other injuries (i.e., hemoperitoneum, hemothorax, pneumothorax, long bone fractures, cerebral injury, spinal cord injury, scalp laceration, etc.). Normotensive pelvic injury patients have a 3% mortality rate, whereas, patients with a systolic pressure less than (<) 90 mm Hg have a 38% mortality rate.

Bleeding due to the pelvic fracture is from three sources: cancellous bone at the fracture sites, retroperitoneal lumbar plexus venous injury or pelvic arterial injury. Most pelvic bleeding is of venous origin (90%). The use of external fixation devices such as a sheet and towel clip, C-clamp, external fixator with a distal femur traction pin, MAST trousers or a beanbag, therefore, should control most hemorrhage. If pelvic hemorrhage is not controlled after compression (<10% of cases), the patient should be promptly transferred to the angiography suite for embolization.

LITERATURE REFERENCES

American College of Surgeons (2018). *American College of Surgeons Committee on Trauma:*

**PHYSICIAN PROTOCOL FOR
THE ACUTE TREATMENT OF PELVIC INJURIES IN HEMODYNAMICALLY
UNSTABLE PATIENTS**

Advanced Trauma Life Support for Doctors: Student Course Manual. 10th Ed. Chicago: IL.

Cullinane, D. C., Schiller, H. J., Zielinski, M. D., Bilaniuk, J. W., Collier, B. R., Como, J., Wynne, J. L. (2011). Eastern Association for the Surgery of Trauma Practice Management Guidelines for Hemorrhage in Pelvic Fracture-Update and Systematic Review (Vol. 71). Lippincott Williams & Wilkins. doi: 10.1097/TA.0b013e31823dca9a

PI TRIGGERS FOR REVIEW

- Delays in identification of injuries
- Laparotomy >1 hour with abdominal injury and SBP <90 mmHg
- Laparotomy >4 hours after arrival
- Trauma code/alert and trauma triage decision scheme
- No trauma team activation for major trauma patient

KEY POINTS / PROCEDURES:

- A. Hemodynamically instability: Defined as SBP < 90 mm Hg (SBP < 110 mmHg for age greater than (>) 65), HR greater than (>) 120, Base Deficit less than (<) 6, Hgb less than (<) 10 (on ABG), excessive fluid requirements (> 2 Liters) or any blood product transfusion en route and/or during Trauma Bay resuscitation.
- B. Hemodynamically unstable patient requires immediate external stabilization (by sheet, binder or external fixator), fluid resuscitation, and FAST performed. Resuscitation should be prompt and aggressive with focus directed at correcting acidosis, anemia, hypothermia, coagulopathy & thrombocytopenia.
- C. An abdominal CT scan is inadvisable in a hemodynamically unstable patient. If the FAST examination is equivocal or performed by an inexperienced examiner, a diagnostic peritoneal tap should be considered in the unstable patient. A grossly positive tap (5ml gross blood) is an indication for an emergent exploratory laparotomy. If the tap is microscopically positive ($\geq 100,000$ RBC or ≥ 500 WBC) and the patient is hemodynamically unstable, the hemorrhage is most likely not from the abdominal cavity, but either from the pelvis or another site. A microscopically positive tap, however, will necessitate further evaluation. The FAST or diagnostic peritoneal tap does not evaluate the retroperitoneum.
- D. Unstable pelvis is defined as clinically unstable (bony pelvis is unstable to pelvic compression on clinical examination) &/or radiologically unstable (widening of more

**PHYSICIAN PROTOCOL FOR
THE ACUTE TREATMENT OF PELVIC INJURIES IN HEMODYNAMICALLY
UNSTABLE PATIENTS**

- than 2.5cm in the symphysis pubis or any widening of the posterior pelvic ring on the AP pelvic radiograph). Requires a prompt response, within 30 minutes from being called, from the Orthopedic attending.
- E. Consider early activation of the Mass Transfusion Protocol. Use Point Of Care Testing (POCT)/Rotational Thromboelastography (ROTEM) to guide resuscitation (TR-S-19).
 - F. Interventional Radiology (IR) should be notified early and informed that there is the potential need for angiography and embolization.
 - G. For open book pelvis, if the pelvis is unstable even after binder application, external stabilization or C-clamp application should be performed as indicated in section D by orthopedic team or surgical team.
 - H. If patient continues to deteriorate despite adequate resuscitation intervention and external immobilization, or has signs of ongoing bleeding after non-pelvic sources of blood loss have been ruled out, IR should be considered for pelvic angiography and/or embolization. Additionally, laparotomy with possible retroperitoneal packing or direct vascular control should be considered.
 - I. A contrast study of the genitourinary tract should be delayed until after angiography has been completed, as this may obscure the angiographic field.

**PHYSICIAN PROTOCOL FOR
THE ACUTE TREATMENT OF PELVIC INJURIES IN HEMODYNAMICALLY
UNSTABLE PATIENTS**

Trauma Program Director

Date

Chair, Orthopedics Department

Date

Trauma Medical Director

Date

Reviewed/Revised
07/2001
05/2004
10/2007
12/2010
05/2013
10/2016
12/2019

TRAUMA ECHOCARDIOGRAM

POLICY PURPOSE: Process description when ordering an echocardiogram.

- Echocardiograms are done on a routine basis Monday through Friday from 0800– 1630.
- STAT echocardiograms after business day working hours will be performed by the technician on call after approved by Cardiologist.

RESPONSIBLE

Trauma Medical Director
Associate Trauma Medical Director
Assistant Trauma Medical Director
Surgery Faculty and Residents
Cardiologists, Cardiac Fellows
Trauma Program Director
Nurse Manager, Cardiovascular Services
Administrative Director of Perioperative and Cardiovascular Services
Nursing Associates
Echocardiography Technician

POLICY REFERENCE

NC-B2-28 Computer Downtime
NC-CVS-13 Computer System Downtime
NC-CVS-15 Critical Results Reporting

PI TRIGGERS FOR REVIEW:

- Treatment Protocols not Followed
- On-Call Consult Response >30 minutes (Emergency STAT consults)

PROCEDURE

- A. All requests for echocardiograms will have an appropriate diagnosis, pertinent cardiac clinical information indicating the purpose of the study and the patient's clinical diagnosis documented prior to performing the echocardiogram study.
- B. A requisition for inpatient studies will be received through the Clinical Management System (CMS) or following appropriate computer system downtime procedures (See policy NC-CVS-13 and NC-B2-28).
- C. In the event of a STAT echocardiogram after normal working hours, the requesting physician will notify the Cardiologist on-call or Cardiology Fellow of the need for the exam. Once the Cardiologist on-call or Cardiology Fellow approves the study, the

TRAUMA ECHOCARDIOGRAM

requesting physician, Registered Nurse or Health Unit Coordinator will notify the echocardiography technician (echo tech) on call of the echocardiogram (echo) order. If the Trauma Attending wishes emergent interpretation, he/she will directly contact the Cardiologist on-call or Cardiology Fellow. Trauma echocardiograms not discussed with the attending Cardiologist will be read routinely.

- D. The pediatric Cardiologist will approve all pediatric echocardiograms.
- E. If the echo tech performing the test recognizes abnormal findings, the procedures indicated below will be followed:
 - 1. The echo tech will inform the attending Cardiologist or the patient's primary physician (in the event the attending Cardiologist is not in-house) of the findings.
 - 2. A critical finding will be reported and documented according to policy NC-CVS-15.

TRAUMA ECHOCARDIOGRAM

Nurse Manager, Cardiovascular Services

Date

Trauma Program Director

Date

Administrative Director, Cardiovascular Services

Date

Echo Lab Medical Director

Date

Trauma Medical Director

Date

Reviewed/Revised
03/1991
07/1992
03/1994
04/1996
06/1999
01/2003
05/2004
11/2005
04/2008
12/2010
02/2014
05/2017
03/2020

ADULT SEVERE TRAUMATIC BRAIN INJURY MANAGEMENT GUIDELINE

POLICY PURPOSE

The purpose of this guideline is to direct management for the adult population sustaining a severe traumatic brain injury as evidenced by a Glasgow Coma Score (GCS) between three (3) and eight (8); an abnormal brain computed tomography (CT) scan; and/or an abnormal clinical examination. Refer to Attachment A for background and Attachment B for tiered system management process.

RESPONSIBLE

Trauma Faculty, Residents, and Advanced Healthcare Practitioners (AHPs)
Neurosurgery Attending and AHPs
Nursing Associates
Pharmacist
Respiratory Therapist

PI TRIGGERS FOR REVIEW

- Trauma Death
- On-Call Consult Response >30 minutes (Emergency-STAT consults)
- Craniotomy > 4 hours after arrival
- Treatment Protocols not Followed (to include TR-P-7 Head Injury Guideline related to Neurosurgical Consult criteria).

LITERATURE REFERENCES

Committee on Trauma, American College of Surgeons (2015). ACS TQIP Best practices in the management of traumatic brain injury: Guidelines. Chicago: IL.

Brain Trauma Foundation. (2016). *Guidelines for the management of severe traumatic brain injury* (4th ed.). Campbell:CA.

Committee on Trauma, American College of Surgeons (2019). *American College of Surgeons Committee on Trauma: Advanced Trauma Life Support for Doctors: Student Course Manual*. (10th ed.). Chicago:IL.

PROCEDURE

- J. Assessment
1. Clinical assessment of severity of brain injury includes the following: level of consciousness; motor strength; motor tone; cranial nerve exam (pupillary response, extraocular movements, facial symmetry, corneal and

ADULT SEVERE TRAUMATIC BRAIN INJURY MANAGEMENT GUIDELINE

gag reflexes); vital signs, Glasgow Coma Score (GCS); note any seizure activity and complete neurological exam.

2. Diagnostic assessment of brain injury includes the following: CT scan of the brain, MRI of the brain, ICP monitor readings, External Ventricular Drain (EVD) drainage and/or Bispectral (BIS) monitoring for patients under Pentobarbital coma. (Refer to policy TR-P-23 and 24).
3. Notify Neurosurgical Services and Trauma Services immediately if patient demonstrates a decrease of GCS by two (2) or more points without any pharmaceutical interventions to include intentional pupil dilation for ophthalmological exam.

K. Plan

1. Secure the airway and provide oxygenation, ventilation and intravenous fluids during trauma resuscitation.

Treatment Goals:

- a. Pulse oximetry $\geq 95\%$
- b. PaO₂ > 100 mmHg
- c. PaCO₂ 35-40 mm Hg.
- d. SBP ≥ 100 mm of Hg.
- e. pH of 7.35-7.45
- f. ICP $< 20-25$ mmHg.
- g. CPP ≥ 60 mmHg
- h. Temperature 36.0-38.0° C
- i. Glucose 110-160mg/dL
- j. Serum sodium 140-150 mmol/L
- k. INR ≤ 1.4
- l. Platelets $\geq 75 \times 10^3$ /mm³
- m. Hemoglobin ≥ 7 g/dL

L. Implementation

1. Continue to assess and implement resuscitation by following Advanced Trauma Life Support (ATLS) guidelines.
2. Implementation of the “NSICU Traumatic Brain Injury Admission” power plan may be initiated by Trauma team physicians, Neurosurgeon, and/or Advanced Healthcare Practitioners.

ADULT SEVERE TRAUMATIC BRAIN INJURY MANAGEMENT GUIDELINE

3. Identification of patients with severe head injury includes the following: GCS between three (3) to eight (8); abnormal CT scan of the brain; and/or abnormal clinical exam.
 4. Identification of patients who meet criteria for ICP monitoring includes the following: GCS between three (3) and eight (8) with abnormal CT scan, unless otherwise indicated by Neurosurgeon.
 5. Consider placement of a External Ventricular Drain (EVD) and/or ICP monitoring probe with the following:
 - a. GCS between three (3) and eight (8); abnormal CT scan of brain, and/or abnormal neurological clinical exam.
 - b. Intraventricular or Subarachnoid hemorrhage causing obstructive hydrocephalus.
 - c. Traumatic brain injury causing external hydrocephalus.
 - d. Contusions ≥ 2 cm
 6. Place arterial and vascular access lines.
 7. Place a noninvasive hemodynamic monitoring device if not contraindicated.
- M. Management: Tiered System approach for management of intracranial hypertension.
1. *Tier 1*
 - a. Patient Body Positioning:
 - i. Elevate Head of Bed (HOB) 30 degrees, or if contraindicated, reverse trendelenburg.
 - ii. Maintain the neck in a neutral position and maintain midline body alignment. Avoid neck compression (excess tightening of cervical collar).
 - iii. Avoid bending of knees/hips.
 - iv. Okay to turn and reposition patient laterally every two hours so long as ICP does not sustain readings ≥ 25 mmHg for more than 10 minutes.
 - b. Pharmacological Interventions:

ADULT SEVERE TRAUMATIC BRAIN INJURY MANAGEMENT GUIDELINE

- i. Initiate sedation and/or analgesia using recommended short-acting agents (i.e. Dexmedetomidine, Diprivan, Fentanyl, Midazolam).
- c. Diagnostic Interventions:
 - i. Consider intermittent drainage of CSF. Continuous drainage is not recommended. Consult Neurosurgical Services regarding EVD drainage chamber recommended set level in cmH₂O.
 - ii. Repeat head CT imaging with neurological examination should be considered to rule out the development of a surgical mass lesion and guide treatment.

If ICP is ≥ 20 to 25mmHg and remains sustained for more than 10 minutes proceed to Tier 2.

2. Tier 2

- a. In patients with parenchymal ICP monitor, an EVD should be considered to allow for intermittent CSF drainage. Drain CSF as indicated by Neurosurgery service.
- b. Hyperosmolar therapy should be given intermittently as needed for ICP elevation and not on routine schedule.
 - i. Mannitol should be administered in intermittent boluses (0.5-1gm/kg body weight) slowly over twenty minutes. Mannitol may also be held if there is evidence of hypovolemia.
 - ii. Check serum sodium and osmolarity every 6 hours.
 - iii. Hold additional doses if serum osmolality exceeds 320 mOsm/L.
 - iv. Hypertonic saline may be administered in intermittent bolus of 3% sodium chloride solution (250ml over ½ hour).
 - v. 1.8% sodium chloride may be administered as a continuous infusion at 40-60ml/hr. or other concentrations (e.g., 30 cc of 23.4%). (Refer to Guideline for Hypertonic Saline).
 - vi. Serum sodium should be assessed every 6 hours and additional doses should be held if serum sodium exceeds 160 mEq/L.
- c. Repeat head CT imaging and neurological examination should be considered to rule out the development of a surgical mass lesion and guide treatment.

ADULT SEVERE TRAUMATIC BRAIN INJURY MANAGEMENT GUIDELINE

- d. Consider neuromuscular blockade with “test dose” if the above measures fails to lower ICP and restore CPP. If there is positive response with test bolus, continuous infusion of a neuromuscular blocking agent should be employed (See Tier 3)

If ICP remains $\geq 20-25$ mmHg and sustained for more than 10 minutes proceed to Tier 3

3. Tier 3

- a. Decompressive hemi-craniectomy or bilateral craniectomy should only be performed if treatments in Tiers 1 and 2 are not sufficient or are limited by development of side effects of medical treatment.
- b. Neuromuscular paralysis via continuous infusion of neuromuscular blocking agent can be employed if there is a positive response to a bolus dose (See Tier 2). The infusion should be maintained to train of four (TOF) of 2 out of 4 twitches using peripheral nerve stimulator. Therapeutic sedation must be simultaneously administered.
- c. Barbiturate coma may be induced for those patients that have failed to respond to aggressive measures to control malignant intracranial hypertension, however it should only be instituted if the patient responds well to a test dose of barbiturate which results in ICP decrease, thereby identifying patient as a responder. (Refer to TR-P-23 Pentobarbital coma)
- d. Hypothermia is not currently recommended as initial severe traumatic injury treatment.

4. For SBP less than 100mmHg: Initially increase patients volume by administering normal saline/colloids/blood products for a goal of a CPP no less than 60 mmHg. (Consider any active bleeding, by monitoring Hemoglobin/Hematocrit, PT, PTT, PLT count, Platelet Function Test, ROTEM and/or noninvasive hemodynamic monitoring.

- a. Once volume load measures are performed and CPP remains less than 60 mmHg with ICP greater than 20 mmHg, then consider the following.
 - i. Administer vasopressors such as Norepinephrine (Levophed)
 - a. Start dose of 1 mcg/min

ADULT SEVERE TRAUMATIC BRAIN INJURY MANAGEMENT GUIDELINE

- b. Maximum dose of 20 mcg/min.
 - c. Titrate for goal values by adjusting 1mcg/minute every two (2) minutes and call surgeon.
 - d. Maintain SBP >100mmHg and MAP >65mmHg.
 - ii. Reassess all previous management steps (i.e.: blood volume, CPP, hypertonic saline, serum labs).
 5. Begin nutrition via appropriate route as soon as possible within 24 to 48 hours after admission. Obtain dietary consult.
 6. Monitor glucose values and order glucometers to monitor levels.
 - a. Implementation of the Intensive Glucose Management Protocol may become necessary pending glucometer results. (Refer to NC-CC-41).
 7. Recommend appropriate interventions in Electronic Medical Record (EMR) and/or patient chart. Recommendations will be ordered by surgical team and carried out.
 8. Obtain consults for occupational therapy and physical therapy within 24hrs of admission.
 9. Consider placement of tracheostomy within 8 days of injury.
 10. Assess need to initiate venous thromboembolism prophylaxis; refer to TR-P-18.
- N. Monitoring: Diagnostics and Patient Responses
1. Monitor changes in neurological status and clinical exam.
 2. Reassess patient responses to ordered therapies.
 3. Monitor ABG's: PaCO₂; PaO₂; HCO₃, BE, and pH values.
 4. Monitor ICP/MAP and calculate CPP.
 5. Monitor hemodynamic data as indicated: Mean Arterial Pressure (MAP), Continuous Cardiac Output (CCO), Stroke Volume (SV), Stroke Volume Variation (SVV), Pulse Pressure Variation (PPV), Systemic Vascular Resistance (SVR), Saturated Venous Oxygenation (SVO₂), and systemic oxygen consumption (depends on types of invasive and noninvasive lines).

ADULT SEVERE TRAUMATIC BRAIN INJURY MANAGEMENT GUIDELINE

6. Monitor serum electrolytes especially sodium, serum osmolarity, potassium, ionized calcium/magnesium, phosphorus daily and as necessary pending interventions.
 7. Monitor CBC, PT, PTT, PLT count, Platelet Function Test and viscoelastic tests such as the Rotational Thromboelastometry (ROTEM), as necessary pending interventions.
 8. Implement ICP weaning algorithm as ICP decreases to less than 20 mmHg for 24 hours without aggressive interventions per physician order.
 - a. Wean to discontinue:
Diprivan drip or Benzodiazepines or
Barbiturate coma. (TR-P-23)
 - b. Wean analgesia/sedation as directed by physician.
 - c. Normalize PaCO₂ to 35 to 40 then discontinue paralytic agents. Check for full recovery with neuromuscular blockade monitor.
 - d. Discontinue ICP and CPP therapy per Neurosurgery Services.
 - e. Hold cerebral spinal fluid (CSF) drainage per Neurosurgery Service's order.
- O. Evaluation/Outcomes
1. Continue rehabilitation consult to evaluate for rehabilitation and discharge needs.
 2. Ongoing involvement from social worker and trauma service coordinators for placement to a non-acute care setting (if applicable). For example, a rehabilitation facility, long term care facility, or patient's home.
- P. Termination of Guidelines
1. Patient demonstrating clinical improvement with interventions.
 2. Physician order to terminate guidelines at any point during clinical course.

ADULT SEVERE TRAUMATIC BRAIN INJURY MANAGEMENT GUIDELINE

Trauma Program Director

Date

Neurosurgery Medical Director

Date

Trauma Medical Director

Date

Reviewed/Revised
03/06
11/06
05/07
08/07
04/08
10/12
12/2016
05/2020

ADULT SEVERE TRAUMATIC BRAIN INJURY MANAGEMENT GUIDELINE

ATTACHMENT A: BACKGROUND AND KEY POINTS

BACKGROUND INFORMATION

Patients with severe traumatic brain injury sustain the primary insult at the time of the event. Secondary damage to the brain occurs as a result of increased pressure inside the cranium leading to perfusion deficits, reduced oxygen delivery to tissues, and cellular chemical alterations.

These guidelines are developed to provide team members with information on:

- a) identifying patients at risk for secondary injury and
- b) suggesting interventions to maintain adequate cerebral perfusion pressure and reduce increased intracranial pressure (ICP) in order to enhance oxygen delivery to injured brain tissue.

KEY POINTS

- A single episode of hypotension doubles mortality, the combination of hypotension and hypoxia is associated with 75% mortality
- If patient requires Orthopedic procedures, these should ideally be delayed 24 to 48 hrs if possible and cleared by Neurosurgery Services.
- To assess motor response, only the reaction of the arms should be observed, not the legs.
- ICP monitoring is indicated in comatose patients ($GCS \leq 8$) with evidence of structural brain damage on initial CT scan, require surgical intervention, and/or are hemodynamically unstable.
- ICP monitoring should be considered in patients with $GCS \geq 8$ who have structural damage with high risk for progression. i.e. large multiple contusions > 2 cm or coagulopathy).
- External Ventricular Device (EVD) is the gold standard for ICP measurement.

ADULT SEVERE TRAUMATIC BRAIN INJURY MANAGEMENT GUIDELINE

ATTACHMENT B: TIERED SYSTEM APPROACH

Severe Traumatic Brain Injury Guideline	
Tiered System Approach to Manage Increased Intracranial Hypertension (TR-P-22)	
Treatment Goals:	If patient has sustained ICP > 20-25mmHg for more than 10 mins., proceed with tiered system approach.
Pulse oximetry 95%	Tier 1: Patient positioning: HOB 30°; or if contraindicated, reverse Trendelenburg.
PaO ₂ ≥ 100 mmHg	Maintain neck in neutral position with C-collar.
PaCO ₂ 35-40 mm Hg.	Maintain midline body alignment; avoid bending knees/hips.
SBP ≥ 100 mm of Hg.	Avoid neck compression (excessive tightening of C-collar).
pH of 7.35-7.45	Sedation/Analgesia: Recommend short-acting agents (Diprivan, Dexmedetamine, Fentanyl, Midazolam).
ICP < 20-25mmHg.	CSF Drainage: If EVD present, consider intermittent CSF drainage, not to exceed >20mls/hr.
CPP ≥60 mmHg	Repeat neurological exam and consider CT imaging.
Temperature 36.0-38.0° C	If patient has sustained ICP > 20-25mmHg for more than 10 mins., proceed to Tier 2.
Glucose 110-160mg/dL	Tier 2: CSF drainage: If EVD present, drain CSF as indicated by Neurosurgery Service.
Serum sodium 140-150 mmol/L	Verify and Optimize treatment goals:
INR ≤1.4	Oxygenation/Perfusion/Sedation/Analgesia/Serum Na level/ Glucose/ Hgb/ PLT count/ INR/
Platelets ≥ 75 x 10 ³ /mm ³	Core Body Temperature (no Tylenol administration).
Hemoglobin ≥7 g/dL	Consider Hyperosmolar Therapy:
For SBP <100mmHg:	Assess NonInvasive Hemodynamic Values and Serum Osmolality.
Increase patient volume with: NS/Colloids/Blood	Mannitol administration (0.25-1gm/kg body weight) with no evidence of existing hypovolemia. Hold additional Mannitol doses if serum osmolality exceeds 320mOsm/L.
Once volume load measures are done & CPP remains <60mmHg/ICP >20mmHg;	Consider Hypertonic saline, intermittent or continuous as ordered (1.8%, 3% or 23.4%).
Consider the following:	Refer to Hypertonic Saline Guideline (access via intranet: Stroke link).
Vasopressors (Levophed)	Assess Serum Sodium (Na) q 6 hrs (Na goal not to exceed 160mEq/L).
Titrate for goal values.	Repeat neurological exam and notify Resident. Consider CT imaging if not already done.
Start at 1mcg/min. Max 20mcg/min.	Consider neuromuscular blockade x1 dose, should 1 dose have (+) effect, consider continuous infusion.
A-line placement; connect to Flo Trac	If patient has sustained ICP > 20-25mmHg for more than 10 mins., proceed to Tier 3.
Glucose Management (refer to NC-CC-41)	Tier 3: Verify and Optimize treatment goals:
Consults for OT/PT within 24 hours	Oxygenation/Perfusion/Sedation/Analgesia/Serum Na level/ Glucose/ Hgb/ PLT count/ INR/
Consider Lidocaine to minimize coughing	Viscoelastic tests (ROTEM)/ CPP no less than 60mmHg/ controlled body temp. & pt positioning.
Begin nutrition within 24-48 hours Dietary Consult	Notify resident on-call & neurosurgery services with measures taken & latest neurological exam.
Assess for VTE prophylaxis (refer to TR-P-18)	Considerations:
Consider tracheostomy within 8 days	<ul style="list-style-type: none"> • Neuromuscular agents, Barbiturate Coma (Refer to TR-P-23) and surgical intervention with decompressive craniectomy. • Continuous neuromuscular agent infusion: maintain Train of Four (TOF) of 2 out of 4 twitches. • Adequate sedation must be maintained (BIS 20-30). • Repeat CT imaging.
Consider switching OGT from Salem to	
Keofeed when tolerating feedings.	Weaning Process:
Assess for DI or Rhabdomyolysis development.	Wean to discontinue sedation (Propofol/Benzodiazepines or Barbiturate coma).
	If receiving neuromuscular agent, normalize PaCO ₂ to 35-40mmHg, then discontinue.
	Discontinue ICP & CPP therapy per Neurosurgery Service.
	EVD management (if applicable) per Neurosurgery Service.
<small>(effective date 03/06/17) revised 03/03/2020</small>	

PENTOBARBITAL COMA

POLICY

- The procedures described below will be followed to ensure the proper use of pentobarbital in the Intensive Care Unit setting. The guidelines will assist in the identification of patients who are candidates for this therapy. Further, the guidelines will ensure that patients receiving pentobarbital for comatose effects receive the proper dosage and monitoring required.

RESPONSIBLE

Physician
Allied Health Professionals (AHPs)
Registered Nurse
Pharmacist
Respiratory Therapist

PI TRIGGERS

- Neurotrauma Patient without Sequential Neurological Assessment
- Documentation of Assessments not Present
- Treatment Protocols not Followed

BACKGROUND INFORMATION

High-dose barbiturate therapy lowers intracranial pressure and decreases the cerebral metabolic usage of oxygen by altering vascular tone, suppressing metabolism, inhibiting free radical mediated lipid peroxidation, and coupling cerebral blood flow to regional metabolic demands. This has a beneficial effect on intracranial pressure and global cerebral perfusion.

High-dose barbiturate therapy is used in patients with severe brain injury when intracranial hypertension is refractory to maximal medical and/or surgical intracranial pressure lowering therapy.

The patient population includes severe brain injured patients with increased intracranial pressure refractory to maximal medical and surgical therapy and patients in status epilepticus or recurrent seizures uncontrollable with standard anticonvulsant therapy.

POLICY REFERENCES

TR-P-22 Management of severe traumatic brain injury
TR-P-24 Bispectral Index (BIS) monitor

PENTOBARBITAL COMA

LITERATURE REFERENCES

- Greenberg, M.S. (2016). Handbook of Neurosurgery: 8th Ed. New York, NY: Thieme.
- Committee on Trauma. (2015). ACS TQIP Best practices in the management of traumatic brain injury guidelines. Chicago, IL: American College of Surgeons.
- Haddad, S.H. & Arabi, Y.M. (2012). Critical care management of severe traumatic brain injury in adults. Scandinavian Journal of Trauma, Resuscitation and Emergency Medicine. Vol. 20. doi: 10.1186/1757-20-12

PROCEDURE

- A. The neurosurgeon, trauma attending or AHP will assess patient for treatment appropriateness. Patients sustaining the following listed conditions are candidates for pentobarbital coma therapy:
1. Traumatic brain injury with increased and sustained intracranial pressure (ICP), greater than 25 mmHg, not controlled with maximal medical or surgical interventions.
 2. Intracerebral hemorrhage including subarachnoid hemorrhage.
 3. Status epilepticus.
- B. Upon receipt of the providers order to administer pentobarbital for chemically induced coma, ensure the patient has the following supportive equipment:
1. Mechanical ventilator and pulse oximeter and end tidal carbon dioxide (ETCO₂) monitors.
 2. Cardiac monitor.
 3. Arterial catheter for invasive continuous blood pressure monitoring.
 4. Vascular access sufficient to allow fluid and medication administration.
 5. Bedside Electroencephalography (EEG) monitor or Bispectral Index (BIS) monitor.
 6. Sequential Compression Device (SCDs)

PENTOBARBITAL COMA

7. ICP monitor.

C. Patient Assessment Parameters

Assess the patient's clinical status. Prior to initiating pentobarbital (barbiturate) therapy, validate the following:

1. Ventilatory status is secured by mechanical ventilation. Maintain partial arterial oxygenation (PaO₂) greater than 100mm Hg and titrate partial arterial carbon dioxide (PaCO₂) for ICP control per TR-P-22 policy: Management of severe traumatic brain injury.
2. The patient is euvolemic with a Stroke Volume Variation (SVV) less than 13%.
3. Cerebral Perfusion Pressure (CPP) is greater than 60 mmHg and/or is optimal for patient per neurosurgery service recommendations. Utilize vasopressors as needed to achieve optimal CPP.
4. SCDs are in place.
5. BIS bedside monitor(s) are attached and continuously monitoring. Record BIS values at least every hour via patient Electronic Medical Record (EMR).

D. Management Guidelines

1. Loading Dose: 10mg/kg of pentobarbital sodium intravenously over 30 minutes followed by 5 mg/kg/hr intravenously for (3) three hours followed by the maintenance dose.
2. Maintenance Dose: pentobarbital sodium 1 mg/kg/hr intravenously titrated as necessary up to 3 mg/kg/hr to achieve EEG burst suppression to be defined objectively as EEG burst activity every 10 to 12 seconds on continuous EEG and/or achievement of a score between 10 and 20 on the BIS. Notify the senior surgical resident on-call, and neurosurgeon on call, if unable to achieve stated goal.
3. If the patient is on Diprivan (propofol) at the time of induction of barbiturate therapy, reduce Diprivan (propofol) at a rate of 10 mcg/kg/min every 10 minutes unless orders indicate otherwise. Once Diprivan

PENTOBARBITAL COMA

(propofol) is discontinued, follow the above dosing guidelines for loading and maintenance of pentobarbital.

4. Assess the patient closely while on pentobarbital therapy. A one to one nurse patient ratio is recommended. Monitor neurological status continuously and record Glasgow Coma Scale (GCS) and pupillary assessment every hour via EMR.
5. Upon physician order to discontinue the chemically induced coma, titrate pentobarbital to slowly withdraw the medication. Decrease 0.5 mg/kg/hr (unless physician orders otherwise) every hour while monitoring the effects on ICP, and hemodynamic parameters.

PENTOBARBITAL COMA

Director of Neurosciences and Adult
Med/Surg Critical Care

Date

Trauma Program Director

Date

Neurosurgery Medical Director

Date

Trauma Medical Director

Date

Reviewed/Revised
04/2006
08/2006
04/2008
07/2012
07/2015
07/2018

TRAUMATIC COAGULOPATHY FACTOR VIIA GUIDELINES

POLICY

To provide a means to assess and identify those patients who have ongoing bleeding and coagulopathy despite surgical intervention and repeated transfusion.

RESPONSIBLE

Trauma Attending
Pharmacists
Nursing Associates
Physicians and Allied Health Professionals
Trauma Program Director
Trauma Service Coordinators

DEFINITIONS

Exclusions: Profound acidosis (pH < 7.1 or base deficit > 30); profound hypothermia (<33C or <91.4F); lethal head injury after consultation with the Neurosurgeon.

INDICATION

- Patients who have required at least 10 units of packed red blood cells, 6 units fresh frozen plasma (FFP), and 10 packs of platelets within 6 hours.
- Reserved for patients with significant hemorrhage and severe injuries (Cannon et al., 2017)
- Trauma Attending discretion

REFERENCES

- Committee on Trauma of the American College of Surgeons. (2015). ACS TQIP Massive Transfusion in Trauma Guidelines. American College of Surgeons; Chicago, IL.
- Cannon, J. W., Khan, M. A., Raja, A. S., Cohen, M. J., Como, J. J., Cotton, B. A., ... & Holcomb, J. B. (2017). Damage control resuscitation in patients with severe traumatic hemorrhage: a practice management guideline from the Eastern Association for the Surgery of Trauma. *Journal of Trauma and Acute Care Surgery*, 82(3), 605-617.

PROCEDURE

- A. Obtain ROTEM and laboratory studies as per Mass Transfusion Protocol (TR-S-19).

TRAUMATIC COAGULOPATHY FACTOR VIIA GUIDELINES

- B. The Trauma Attending is responsible for determining the need for Factor VIIa administration.
- C. The Trauma Resident is responsible for entering the order in the electronic medical record.
- D. The order must be written/entered as STAT.
- E. Dose: 50 mcg/kg IV bolus; repeat dose in two (2) hours only if there is a response with initial dose; maximum of two (2) doses are to be given.
- F. All cases will go for concurrent review of medical management by Trauma Medical Director during Sub-Trauma Performance Improvement Patient Safety (TPIPS).

TRAUMATIC COAGULOPATHY FACTOR VIIA GUIDELINES

Trauma Program Director

Date

Trauma Medical Director

Date

Review/Revision History:

12/2010
01/2013
03/2016
03/2019

**POST-OPERATIVE ORDERS FOR PATIENTS UNDERGOING NEUROSURGICAL
PROCEDURES**

POLICY:

- To ensure a consistent mean of communication and coordination for the postoperative patient undergoing a neurosurgical procedure.

RESPONSIBLE:

Trauma Medical Director
Physicians, Residents and Allied Health Professionals (AHPs)
Trauma Program Director
Director, Neurosciences and Adult Medical/Surgical Critical Care
Nursing Associates

PI TRIGGERS:

- Treatment Protocols not Followed
- Lack of Physician Documentation

PROCEDURE:

- A. The Neurosurgeon or AHP will discuss a patient requiring any neurosurgical intervention with the primary care physician.
- B. The senior resident will approve medical clearance prior to patient being transported to the operating room for neurosurgical intervention, unless otherwise determined by Attending Physician.
- C. Upon the completion of surgery, the AHP or Neurosurgeon will enter post-operative orders into Electronic Medical Record (EMR). Orders will be relevant to the patient's neurosurgical condition.
- D. The Neurosurgeon or AHP, as directed by the Neurosurgeon, will contact the Senior Resident or trauma attending and provide an update of the patient's neurosurgical related condition. This interaction will include postoperative neurosurgical orders. The Senior Resident, AHP or designee will then enter the remaining post-operative orders.

**POST-OPERATIVE ORDERS FOR PATIENTS UNDERGOING NEUROSURGICAL
PROCEDURES**

Director, Neurosciences & Adult
Med/Surg Critical Care

Date

Trauma Program Director

Date

Neurosurgery Medical Director

Date

Trauma Medical Director

Date

Review/Revision History:

09/2006
04/2008
07/2012
07/2015
06/2018

GUIDELINES FOR MANAGEMENT OF BLUNT ABDOMINAL TRAUMA

POLICY

To identify patients at risk for intra-abdominal injury following blunt trauma and to standardize the evaluation for intra-abdominal injury in these patients.

RESPONSIBLE

Trauma Medical Director
Surgery Faculty & Residents
Emergency Medicine Faculty & Residents
Trauma Program Director
Nursing Associates

POLICY RERENCES

TR-P-31 Non-operative management of blunt spleen and liver injuries

REFERENCES

American College of Surgeons (2018). *American College of Surgeons Committee on Trauma: Advanced Trauma Life Support for Doctors: Student Course Manual*. 10th Ed. Chicago:IL.

Hoff, W., Holevar, M., Nagy, K., Patterson, L., Young, J., Arrillaga, A., Narjarian, M., Valenziano, C. (2002). EAST practice management guidelines work group. Practice management guidelines for the evaluation of blunt abdominal trauma. Retrieved from www.east.org on April 16, 2019.

PROCEDURE

A. Initial evaluation:

1. Perform the primary and secondary surveys. Secondary survey should include a detailed abdominal exam, rectal exam and back exam as well as a Focused Assessment with Sonography for Trauma (FAST).
2. Patients who are neurologically normal, not intoxicated, have a normal abdominal exam and do not have a painful distracting injury (i.e. long bone fracture, large wounds, burns, etc) are candidates for serial examination. However, one should consider performing a second FAST approximately four (4) hours after the initial FAST.

GUIDELINES FOR MANAGEMENT OF BLUNT ABDOMINAL TRAUMA

3. Patients at risk for intra-abdominal injury may be characterized by the following situations:
 - a. Abdominal pain or tenderness to palpation with or without peritoneal signs.
 - b. External signs of trauma to abdomen or back (lacerations, contusions, abrasions or seat belt signs)
 - c. Lower rib fractures or mediastinal injury
 - d. Pelvic fractures
 - e. Thoracolumbar fractures
 - f. Unexplained episodes of shock
 - g. Gross Hematuria
 - h. Mechanism of injury consistent with possible abdominal impact and one or more of the following:
 - 1) Altered sensorium secondary to head injury, intoxicants, dementia, etc.
 - 2) Preverbal age group
 - 3) Focal neurologic deficit (spinal cord injury)
 - 4) Distracting injuries
 - 5) A period of time when the patient is under general anesthetic
 - 6) Transfer patients that arrive intubated
 - 7) Patients with cirrhosis or receiving Anticoagulation Therapy
4. Patients with obvious need for laparotomy (i.e. ruptured diaphragm or peritonitis) need no further abdominal evaluation.
5. In patients with unstable vital signs, a positive FAST is an indication for emergent exploratory laparotomy (Do not proceed with a CT scan).
 - a. If the FAST is Negative: Evaluate for other causes of shock (i.e. cardiac tamponade, blunt cardiac injury, myocardial infarction, tension pneumothorax, or neurogenic shock as well as shock due to hemorrhage from long bone fractures, hemothoraces or external hemorrhage before transporting the patient to CT scan or considering a laparotomy).
 - b. If FAST is equivocal or performed by an inexperienced examiner: a diagnostic peritoneal tap should be considered in the unstable patient. A grossly positive tap (5 ml gross blood) is an indication for an emergent exploratory laparotomy.
 - c. The FAST or diagnostic peritoneal tap does not evaluate the retroperitoneum.

GUIDELINES FOR MANAGEMENT OF BLUNT ABDOMINAL TRAUMA

6. A CT scan of the abdomen/pelvis with IV contrast should be performed in patients with stable vital signs at risk for intra-abdominal injury (as defined above) and no other obvious need for laparotomy. Patients with gross hematuria or severe pelvic fracture should have a simultaneous CT cystogram performed.
7. If there is evidence of a liver or spleen injury on CT scan, refer to Policy TR-P-31: Non-operative management of blunt liver and spleen injuries.
8. In patients with free fluid without solid organ injury, one should consider an exploratory laparotomy to rule out hollow viscus or mesenteric injury or perform a diagnostic peritoneal tap to characterize the fluid. Laparoscopy may be considered but one must recognize its limitations in the trauma setting.
9. Patients without evidence of intra-abdominal injuries, but show apparent seatbelt sign, should be admitted for observation and serial physical examinations should be performed.

GUIDELINES FOR MANAGEMENT OF BLUNT ABDOMINAL TRAUMA

Trauma Medical Director

Date

Trauma Program Director

Date

Review/Revision History:

Review /Revised
12/2010
1/2013
3/2016
4/2019

NON-OPERATIVE MANAGEMENT OF BLUNT LIVER AND SPLEEN INJURIES

POLICY PURPOSE

Provider guideline to assess, identify and guide patient treatment with splenic or hepatic injuries benefiting from non-operative management.

RESPONSIBLE

Surgery Faculty & Residents
Trauma Medical Director
Trauma Program Director
Trauma Services Coordinators
Nursing Associates

LITERATURE REFERENCES

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PI TRIGGERS FOR REVIEW

- Lack of injury grading documentation
- Administration of prophylactic thrombolytic therapy > 48 hours from admission
- Unplanned admission to ICU
- Interventional Radiology response team timeliness
- Vaccinations not ordered/not administered

A. PROCEDURE FOR NON-OPERATIVE SPLEEN AND LIVER MANAGEMENT

1. Obtain CT scan of abdomen/pelvis with IV contrast for hemodynamically stable patients only.
2. Grade the splenic/liver injury per AAST scale. Refer to Attachment A.
3. Evaluate CT for evidence of contrast blush or vascular extravasation.

NON-OPERATIVE MANAGEMENT OF BLUNT LIVER AND SPLEEN INJURIES

4. Contrast blush/extravasation/pseudoaneurysm present and patient is stable proceed with angiography plus embolization. Refer to Attachment B.
5. If Grade III injury or greater, consider angiography plus embolization. Refer to Attachment B.
6. No contrast blush/extravasation/pseudoaneurysm present proceed with admission process.
7. If the patient is hemodynamically stable with a stable hemoglobin, the patient can be started on prophylactic Lovenox within 24-48 hours after approval by attending.

B. ADMISSION GUIDELINES FOR SPLEEN AND LIVER INJURIES

1. **Grade I or II** injuries may be admitted to Intermediate Care Unit (IMC) pending patient condition and associated injuries.
 - a. Vital signs every 2 hours.
 - b. Baseline Type & Screen (T&S).
 - c. Baseline Complete Blood Count (CBC), CHEM-7 & Prothrombin Time (PT)/Partial Thromboplastin Time (aPTT) and repeat in 24 hours. Include LFTs for liver injuries.
 - d. Hemoglobin and Hematocrit (H&H) every 6 to 8 hours x three (3).
 - e. Nil per os; nothing by mouth (NPO).
 - f. Bedrest.
 - g. Notify trauma attending, chief resident or senior resident of any transfusion requirement, drop in Hct by 3 points, hemodynamic instability, worsening base deficit or worsening abdominal exam.
 - h. Most patients should be monitored until stable for 24 hours.
 - i. Transfer to floor when stable for 24 hours.
 - j. Daily Complete Blood Count (CBC).
 - k. Advance diet as tolerated.
 - l. Advance activity to ad lib unless precluded by other injuries.

NON-OPERATIVE MANAGEMENT OF BLUNT LIVER AND SPLEEN INJURIES

- m. Repeat LFTs at day of anticipated discharged for liver injury patients.
- 2. **Grade III and higher** injuries are to be admitted to the Intensive Care Unit (ICU).
 - a. T&C for two (2) units of packed red blood cells (pRBC).
 - b. Baseline CBC, Chem-7, PT/aPPT and repeat in 24 hours. Include LFTs for liver injury patients.
 - c. Hemoglobin and Hematocrit (H&) every 6 to 8 hours times three (3).
 - d. Bedrest.
 - e. Hourly vital signs and urine output monitoring.
 - f. Notify trauma attending, chief resident or senior resident of any transfusion requirement, drop in hematocrit by 3 points, hemodynamic instability, worsening base deficit or worsening abdominal exam.
 - g. Patients should be monitored until stable for 24 to 48 hours.
 - h. Transfer to floor when stable for 24 to 48 hours and no other patient critical care concerns.
 - i. Daily CBC.
 - j. Advance diet as tolerated.
 - k. Advance activity to ad lib unless precluded by other injuries.
 - l. Repeat LFTs at day of anticipated discharge for liver injury patients.

C. PATIENT ACTIVITY RESTRICTION:

Spleen or Liver Injury Grade	Hospital Stay	Activity Restriction
Grade 1 – 2	Injury grade (+) 1 day	Injury grade (+) 2 weeks
Grade 3 or more	Injury grade (+) ICU stay	Injury grade (+) 3 weeks

- 1. Activity restriction applies to normal daily activities and not contact sports.
- 2. Follow-up CT scan is recommended for Grade IV or V injuries or for patients that are involved in rigorous activity (i.e. bull riding, football, hockey, etc).

NON-OPERATIVE MANAGEMENT OF BLUNT LIVER AND SPLEEN INJURIES

D. POTENTIAL NON-OPERATIVE SPLENIC COMPLICATIONS:

1. OPSI (Overwhelming Post-Splenectomy Infection):
 - a. If the patient had splenic embolization, patient should receive the three (3) vaccinations prior to ICU discharge and be given instructions to go to the ED or contact patient's primary care physician if patient develops upper respiratory or flu-like symptoms.
 - b. Documentation of the vaccination status will be documented in the physician progress note and discharge summary as applicable.
 - c. In particular circumstances such as in patients with large subcapsular hematomas, high grade splenic injuries (grade III or more) or those that underwent embolization, some surgeons recommend a follow-up CT scan prior to discharge to identify patients at increase risk of delayed hemorrhage.

E. POTENTIAL NON-OPERATIVE HEPATIC COMPLICATIONS:

1. Elevated bilirubin or alkaline phosphates or jaundice may indicate a biloma and prompt a follow-up CT scan.
2. Delayed hemorrhage from a hepatic artery pseudoaneurysm may present as an upper GI hemorrhage due to hemobilia and require angiography and embolization.
3. Fever and/or leukocytosis may indicate a hepatic abscess and prompt a CT scan.

Attachments:

Attachment A: Guiding Principles and Grading
Attachment B: Management Diagram

NON-OPERATIVE MANAGEMENT OF BLUNT LIVER AND SPLEEN INJURIES

Trauma Program Director

Date

Trauma Medical Director

Date

Review/Revision History:

12/2010
01/2013
08/2016
08/2019

NON-OPERATIVE MANAGEMENT OF BLUNT LIVER AND SPLEEN INJURIES

ATTACHMENT A: KEY POINTS AND INJURY DESCRIPTION

KEY POINTS

- Non-operative management is the treatment of choice for blunt hepatic and splenic injuries in hemodynamically stable patients. Non-operative management is the standard of care in hemodynamically stable children with isolated blunt and splenic injuries, irrespective of the grade of injury.
- Abdominal/Pelvic Computed Tomography (CT) scan with intravenous contrast is the most reliable test to identify and assess the severity of blunt hepatic and splenic injuries.
- Injury grade, degree of hemoperitoneum, neurologic status and/or the presence of associated injuries are not contraindications to non-operative management.
- Hemodynamic status is the most reliable criteria for non-operative management.
- Angiographic embolization is an adjunct to non-operative management of stable patients with evidence of ongoing hemorrhage or the presence of a contrast blush.
- There is no evidence that routine serial CT scans without clinical indications influences either the outcome or the management of the patient. Clinical status of the patient should dictate the frequency of subsequent CT scans.
- Medical clearance to resume normal activity should be based on evidence of healing and typically not by a follow-up CT scan.

NON-OPERATIVE MANAGEMENT OF BLUNT LIVER AND SPLEEN INJURIES

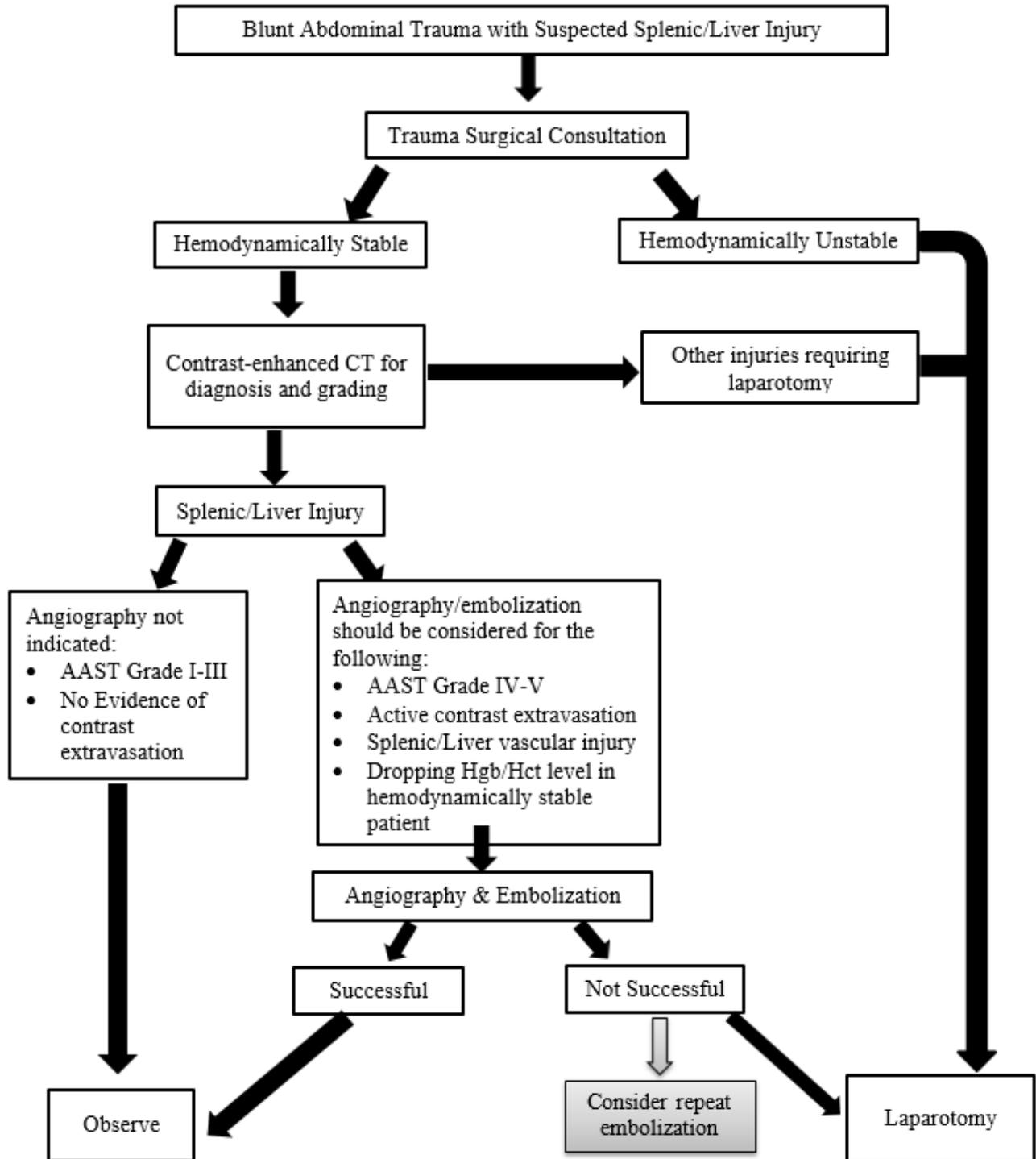
**AMERICAN ASSOCIATION FOR THE SURGERY OF TRAUMA (AAST)
GRADING INJURY:**

SPLEEN		
Grade	Injury	Description
1	Hematoma	Subcapsular: <10% of surface area.
	Laceration	Capsular tear: parenchymal laceration <1cm depth.
2	Hematoma	Subcapsular: 10-50% surface area, <5cm in diameter Intraparenchymal: <5cm in diameter.
	Laceration	1-3cm parenchymal depth & does not involve a vessel.
3	Hematoma	Subcapsular: >50% surface area or expanding, Intraparenchymal: >5cm.
	Laceration	>3cm parenchymal depth or involving a vessel.
4	Hematoma	Ruptured intraparenchymal hematomas with bleeding.
	Laceration	Involving segmental or hilar vessels with >25% splenic devascularization.
5	Hematoma	Completely shattered spleen.
	Laceration	Hilar vascular injury with devascularized spleen.

LIVER		
Grade	Injury	Description
1	Hematoma	Subcapsular, nonexpanding <10cm surface area.
	Laceration	Capsular tear, <1cm parenchymal depth.
2	Hematoma	Subcapsular, non-expanding 10-50% surface area Intraparenchymal, <10cm in diameter.
	Laceration	Capsular tear, 1-3cm parenchymal depth, 10cm length, active bleeding.
3	Hematoma	Subcapsular, >50% surface area, ruptured subcapsular hematomas with active bleeding. Intraparenchymal hematoma, >10cm or expanding.
	Laceration	Capsular tear >3cm parenchymal depth. Vascular injury with active bleeding contained within liver parenchyma.
4	Hematoma	Ruptured intraparenchymal hematomas with bleeding.
	Laceration	Parenchymal disruption involving 25-75% of hepatic lobe or 1-3 Couinaud segments.
5	Hematoma	Parenchymal disruption involving >75% of hepatic lobe or >3 Couinaud segments.
	Laceration	Juxtahepatic venous injuries (i.e., retrohepatic venacava/central major hepatic veins).
6		Hepatic avulsion

NON-OPERATIVE MANAGEMENT OF BLUNT LIVER AND SPLEEN INJURIES

ATTACHMENT B: EVALUATION AND MANAGEMENT



EXTREMITY COMPARTMENT SYNDROME MANAGMENT

POLICY PURPOSE

- Management guideline for acute compartment syndrome of traumatized extremities. Failure or delayed recognition of this insult can result in major functional loss for the patient.
- Intracompartmental pressure monitoring device will be stored in the ED and ICU accessed by the charge nurse(s).
- Patients with Compartment Syndrome (CS) requiring amputation are reviewed by Trauma PIPS or equivalent committee within the hospital.

RESPONSIBLE

Trauma Medical Director
Surgery Faculty and Residents
Emergency Faculty and Residents
Orthopedic Faculty and Residents
Allied Health Providers (AHPs)
Trauma Program Director
Certified Trauma Service Coordinators
Trauma Service Coordinator
Registered Nurses (RNs)

LITERATURE REFERENCE

American College of Surgeons. (2015). TQIP Best Practices in the Management of Orthopedic Trauma. Committee on Trauma.

American Academy of Orthopaedic Surgeons. (2018). Management of acute compartment syndrome. Clinical practice guideline. Major Extremity Trauma and Rehabilitation Consortium in collaboration with the American Academy of Orthopaedic Surgeons. Rosemont: IL. Retrieved August 13, 2019 from https://www.aaos.org/uploadedFiles/PreProduction/Quality/Guidelines_and_Reviews/guidelines/ACSguideline.pdf

PI TRIGGERS FOR REVIEW

- Compartment Syndrome
- Amputation

EXTREMITY COMPARTMENT SYNDROME MANAGEMENT

PROCEDURE

- E. Clinical presentation of CS include the following:
- Excruciating pain (conscious and cooperative).
 - Tense non-compressible swelling.
 - Increased pain with dorsiflexion of the wrist and fingers/ankle and toes.
 - Increased narcotic requirement.
 - Tingling.
 - Sequential physical exams should be performed for individuals at risk of compartment syndrome since a single exam at one point in time is unreliable.
1. Orthopedic team is to be consulted immediately if not already present during examination for immediate fasciotomy.
 - a. Orthopedic team will perform procedure.
 - b. Surgical or Vascular team may perform procedure as needed.
 2. The treating surgeon can perform compartment pressure measuring if provider is not sure of the diagnosis or wants to get objective measurements of the pressure.
 3. The following signs should NOT be part of the assessment of CS, as they are **late** and **not sensitive** for diagnosis of CS.
 - Pulse quality
 - Pulse oximetry
 - Pallor
 - Coldness
- B. Patients with signs of trauma to any extremity are to be examined of all four extremities by inspection and palpation. Signs of trauma include:
- Abrasion
 - Deformity
 - Swelling
 - Tender to palpation
 - Fractures detected by radiographic films

EXTREMITY COMPARTMENT SYNDROME MANAGMENT

1. Continuous monitoring is recommended for the following cases of the unconscious or non-cooperative patient.
 - Leg (tibial shaft or tibial plateau)/ forearm fracture
 - Post-operative procedure to leg/ forearm
 - Edematous extremity due to trauma (crush injury, dislocation, burn, or any other injury)
 - Any situation per physician clinical judgement.
 2. Continuous monitoring can be performed by the orthopedic or trauma resident, AHP, or attending.
- C. RN will document readings every one (1) hour for 48 hours from insertion, unless otherwise indicated by surgeon.
1. RN will document both Absolute Compartment and Delta Compartment pressures in the electronic medical record.
 2. RN will immediately notify the Orthopedic and Trauma surgeons If Delta Compartment Pressure is 30 mmHg or less.

See formula below:

$$\text{Diastolic Blood Pressure minus (-) Absolute Compartment Pressure} = \text{Delta Compartment Pressure}$$

D. Fasciotomy:

1. Use generous skin/ fascial incisions to release all the compartments of the involved limb.
2. The incisions should be left open at end of procedure with possible wound VAC application.

EXTREMITY COMPARTMENT SYNDROME MANAGMENT

Trauma Program Director

Date

Chair, Orthopedics Department

Date

Trauma Medical Director

Date

Reviewed/Revised
06/2016
08/2019

**TRAUMATIC HEMORRHAGE: ANTIFIBRINOLYTIC CONTROL
TRANEXAMIC ACID (TXA)**

POLICY PURPOSE

To provide a means to assess, identify, and treat trauma patients who have ongoing bleeding within three (3) hours of the initial traumatic injury.

RESPONSIBLE

Trauma Faculty, Residents, and Advanced Healthcare Practitioners (AHPs)
Trauma Medical Director
Associate Trauma Medical Director
Assistant Trauma Medical Director
Trauma Program Director
Trauma Service Coordinators
Licensed Nursing Associates
Pharmacists

LITERATURE REVIEW

American College of Surgeons Committee on Trauma. (2013). ACS TQIP Massive Transfusion in Trauma. https://www.facs.org/-/media/files/quality-programs/trauma/tqip/transfusion_guidelines.ashx

Morrison, J., Dubose, J., Rasmussen, T., & Midwinter, M. (2012). Military application of tranexamic acid in trauma emergency resuscitation (MATTERS) study. *Archives of Surgery*, 147(2), 113-119. doi: 10.1001/archsurg.2011.287

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WHO Model List of Essential Medicines, 21st list. (2019).
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PI TRIGGERS FOR REVIEW

- Trauma Death
- Treatment Protocols not Followed

BACKGROUND

**TRAUMATIC HEMORRHAGE: ANTIFIBRINOLYTIC CONTROL
TRANEXAMIC ACID (TXA)**

Inclusion for TXA Treatment: Trauma patients 18 years of age or greater who meet two (2) or more of the shock resuscitation criteria as described below:

- Heart Rate (HR) greater than 120 bpm
 - Systolic Blood Pressure (SBP) of 90 mm/Hg or less (trauma patients greater than 65, use SBP of 110 or less)
 - Hemoglobin (Hgb) of 11.0 g/dl or less
 - International Normalized Ratio (INR) greater than 1.5
 - Base Deficit (BD) 6 mEq/L or greater
 - Positive (+) Focused Assessment with Sonography in Trauma (FAST)
 - Greater than two (2) transfused units of Packed Red Blood Cells (PRBCs)
- or**
- Administration of whole blood

Contraindications for TXA Treatment:

- Greater than three (3) hours from initial injury
- History of thrombophilia
- Pulmonary Embolism (PE) or Deep Venous Thrombosis (DVT)
- Renal failure
- Isolated Subarachnoid Hemorrhage (SAH)

PROCEDURE

- A. The Trauma Attending or designee, is responsible for ordering TXA (trauma paper order set or Electronic Medical Record (EMR).
- B. The order must be written/entered as STAT:
 1. Adult Trauma Patients who meet the 2-Shock Resuscitation Criteria (see **Inclusion for TXA Treatment** above), who have received greater than two (2) PRBCs or received whole blood.
 2. Less than three (3) hours from time of injury
 3. Obtain Type and Cross-match (T&C), INR, Venous Blood Gas (VBG) or Arterial Blood Gas (ABG) with electrolytes and lactate prior to loading dose.
- C. TXA Loading Dose:

**TRAUMATIC HEMORRHAGE: ANTIFIBRINOLYTIC CONTROL
TRANEXAMIC ACID (TXA)**

- One (1) gram intravenous (IV) over 10 minutes (1 ampule (1g/10ml) added to 100 ml sodium chloride 0.9% (110 ml final volume and infused over 10 minutes).
- Do not repeat loading dose if already administered by pre-hospital or at transferring facility. Based on patient's condition, it is the physician's discretion to proceed with maintenance dose when loading dose was administered prior to patient's arrival.

D. TXA Maintenance Dose

1. One (1) gram IV over eight (8) hours.
2. One (1) ampule (1g/10ml) added to 500 ml of sodium chloride 0.9% (510 ml final volume) and infused at 125 mg/hr (64 ml/hr) for about 8 hours.
3. Do not:
 - a. Mix
 - b. Administer via Y-site injection
 - c. Infuse with blood or
 - d. Infuse with solutions containing Penicillin or Mannitol.

E. All patients receiving TXA will undergo concurrent review and any fallout will be reviewed via the trauma performance improvement process.

F. See Attachment A for TXA flowchart.

**TRAUMATIC HEMORRHAGE: ANTIFIBRINOLYTIC CONTROL
TRANEXAMIC ACID (TXA)**

Trauma Program Director

Date

Dir. Pharmaceutical Clinical Services

Date

Trauma Medical Director

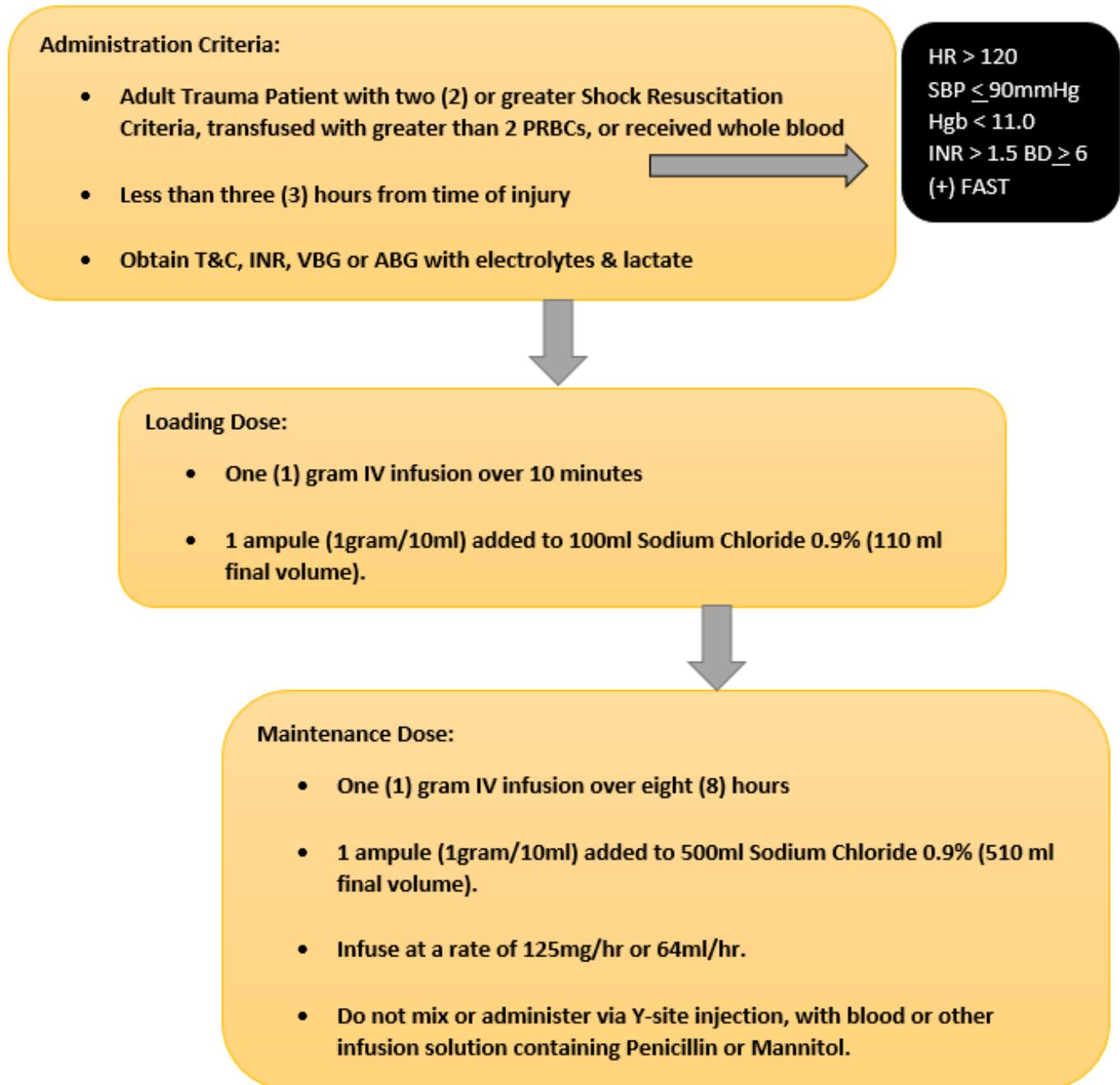
Date

Review/Revision History:

Trauma Department	Pharmacy & Therapeutics Committee
12/13	12/13
03/17	06/18
05/2020	06/20

TRAUMATIC HEMORRHAGE: ANTIFIBRINOLYTIC CONTROL
TRANEXAMIC ACID (TXA)

ATTACHMENT A:
TRAUMATIC HEMORRHAGE: ANTIFIBRINOLYTIC CONTROL
TRANEXAMIC ACID (TXA)



PHYSICIAN GUIDELINE FOR OPEN FRACTURES

POLICY PURPOSE:

- Guideline to assess open fracture management with performance measures.
- Open long bone extremity fractures are associated with significant trauma. The expedient and appropriate management of these injuries ensures the best possible fracture treatment outcome.

RESPONSIBLE:

Emergency Medicine Physicians
Emergency Department (ED) Nursing Associates
Allied Health Professionals (AHPs)
Orthopedic Surgeons
Trauma Medical Director
Trauma Program Director
Trauma Service Coordinators

LITERATURE REFERENCES

American College of Surgeons Trauma Quality Improvement Program. (2016). Best practices in the management of orthopaedic trauma. Open fractures: pp. 6-8. Accessed via:

<https://www.facs.org/~media/files/quality%20programs/trauma/tqip/tqip%20bpgs%20in%20the%20management%20of%20orthopaedic%20traumafinal.ashx>

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Hoff, W., Bonadies, J.A., Cachecho, R. & Dorlac, W.C. (2011). East practice management guideline work group: Update to practice management guidelines for prophylactic antibiotic use in open fractures. *The Journal of Trauma Injury, Infection and Critical Care*. 70 (3): 751-754.

PI TRIGGERS FOR REVIEW

- Open fracture Type I: >24 hours
- Open fracture Type II: >12 hours
- Open fracture Type III:> 6 hours
- Antibiotics not given within 1 hour of ED arrival

PHYSICIAN GUIDELINE FOR OPEN FRACTURES

PROCEDURE

- A. Determine the type of open fracture (refer to index below). The type of the open fracture can be upgraded after intra-operative assessment.

Open Fracture Classification Index	
Type I	
-wound is usually \leq 1cm in length -associated with low energy forces with minimally soft tissue crushing	
Type II	
-wound is \geq 1cm and \leq 10cm -associated with more soft tissue injury secondary to the higher energy forces.	
Type III which are further sub-classified into three subgroups	
-wound is $>$ 10cm in length -associated with high energy forces -involves extensive muscle damage	
Type III A	-limited periosteal and muscle stripping from bone.
Type III B	-extensive periosteal stripping, and bone coverage is not possible without plastic reconstructive procedures (i.e., local or free flap)
Type III C	-vascular injury requiring repair.
Fractures Associated with Gunshot Wound (GSW)	
Low velocity GSWs are considered minimal risk. Manage as Type I open fracture for antibiotic considerations.	High velocity GSWs are considered high risk: -Cefazolin and Gentamicin should be administered. -If gross contamination is found, Penicillin G is added.

- B. Antibiotic administration should be given as soon as possible or within one hour of ED presentation. This has been found to decrease the risk of infection.
6. Duration of antibiotic administration is variable to surgical wound closure. If wound can be surgically closed then antibiotics will be administered for up to 24 hours. If wound cannot be closed then antibiotic coverage may extend past 48 hours. Antibiotic administration is repeated with any secondary procedures such as another debridement, skin graft or flaps.

PHYSICIAN GUIDELINE FOR OPEN FRACTURES

7. Choice of antibiotics varies with the classification of the open fracture which in turn reflects its degree of contamination. Refer to Attachment A.
 - a) For types I and II open fractures: First generation Cephalosporin (Ancef).
 - i. Adults: 2 gram IV every 8 hours (3 grams IV if patient weighs more than 100 kg at same intervals: every 8 hours).
 - ii. Pediatrics: 50 mg/kg IV every 8 hours. (Maximum dose of 1gm IV every 8 hours).
 - b) For type III open fractures: Aminoglycoside (Gentamicin) should be added.
 - i. Adults: 6mg/kg IV times one dose.
 - ii. Pediatric 5mg/kg/day IV in three divided doses (maximum 80mg per dose/ 240mg per day).
 - c) For gross contamination and deep wounds to guard against anaerobes (ie: farm injuries), administer Penicillin G (Pediatric dose: 100,000 – 400,000 units/kg/day IV in four divided doses. Adult dose: 2 to 4 million units IV every 4 hours for 72 hours).
 - d) For patients with penicillin allergy:
 - i. Cefazolin is replaced with Clindamycin 900 mg IV every 8 hours.
 - ii. Penicillin is replaced with Metronidazole 500mg IV every 8 hours.
 - iii. If there is shortages of Cefazolin administer Cefuroxime 1.5g IV every 8 hours for adults and 30 mg/kg IV every 8 hours doses for children, with a maximum dose of 1gm IV every 8 hours.
- C. Urgent orthopedic consult for proper management (stabilization, wound care, further fracture classification, and definitive fracture management).
 1. Patients should have a surgical debridement in the operating room as early as possible.
 - i. Type III open fractures within 6 hours

PHYSICIAN GUIDELINE FOR OPEN FRACTURES

- ii. Type II open fractures within 12 hours
 - iii. Type I open fractures within 24 hours
2. Surgical intervention is performed pending the general condition of the patient.

D. Wound management

- 1. The limb should be aligned and splinted.
- 2. Cover the wound with sterile dressing.
- 3. In the emergency department, broken bone ends protruding from skin wounds should be irrigated with sterile saline and gross contamination (ie: grass) removed before reducing the bone ends through the skin wound to avoid introducing contamination in the deep tissues.

Note: This cleaning is not a substitute for the debridement in the operating room.

E. Neurovascular assessments distal to the fracture.

- 1. If there are decreased pulses distal to the fracture perform a reduction of the fracture and reassess.
- 2. If pulses are still absent or weak perform an urgent Computed Tomography (CT) angiogram.

F. Tetanus vaccination assessment.

- 1. Assess patient's tetanus toxoid booster eligibility.
- 2. If history unclear or patient's last booster was greater than 10 years prior, administer dose.

PHYSICIAN GUIDELINE FOR OPEN FRACTURES

Trauma Program Director

Date

Orthopedic Trauma Liaison

Date

Trauma Medical Director

Date

Review/Revision

05/2017
02/2019

PHYSICIAN GUIDELINE FOR OPEN FRACTURES

ATTACHMENT A: ANTIBIOTIC ADMINISTRATION FOR OPEN FRACTURES

Open Fracture Type	Antibiotic	Dose	Interval	PCN Allergy		
				Use	Dose	Interval
Type I <ul style="list-style-type: none"> < 1 cm wound in length Contamination: Clean to Moderate 	1 st Generation Cephalosporin (Cefazolin)	2g IV (3g for weight > 100kg)	Every 8 hours for 48 hours	Clindamycin in place of ↓ Cefazolin	900mg IV	Every 8 hours for 48 hours
		50mg/kg IV (Pediatric)	Max dose of 1gm every 8 hours			
	*Cefazolin shortage: Administer Cefuroxime	1.5g IV (Adult)	Every 8 hours			
		30mg/kg IV (Pediatric)	(max. dose: 1gm IV every 8 hours)			
Type II <ul style="list-style-type: none"> > 1 cm - < 10cm wound in length Contamination: Moderate 	As above for type I	As above for type I	As above for type I	As above	As above	As above

PHYSICIAN GUIDELINE FOR OPEN FRACTURES

Open Fracture Type	Antibiotic	Dose	Interval	PCN Allergy					
				Use	Dose	Interval			
Type III <ul style="list-style-type: none"> >10cm wound in length Contamination: Extensive to Grossly Contaminated 	As above antibiotic treatment for Type II	<i>As above antibiotic treatment for Type II</i>	As above antibiotic treatment for Type II	Metronidazole (Flagyl) in place of ↓	Adults: 500 mg IV	Every 8 hours for 48 hours			
	&	&	&		Pediatric: 30mg/kg/day IV	Every 8 hours for 48 hours			
	Aminoglycoside (Gentamicin)	6mg/kg IV (Adult)	x 1 dose (Adjust dose for Renal Insufficiency)	Penicillin G					
		5mg/kg/day IV (Pediatric)	x 3 divided doses (max. 80mg per dose/ 240mg per day IV).						
&	&	&							
Gross contamination/deep wounds add: Penicillin G	&	Adult: 2 to 4 million units IV Pediatric: 100,000 to 400,000 units/kg IV	Every 4 hours for 72 hours (Adjust dose for Renal Insufficiency)						

**MANAGEMENT OF SEVERE TRAUMATIC BRAIN INJURY IN INFANTS,
CHILDREN AND ADOLESCENTS**

POLICY PURPOSE

To provide a management guideline when treating infants, children and adolescents who have sustained a severe traumatic brain injury as evidenced by an assessed Glasgow Coma Scale (GCS) of three (3) to eight (8); abnormal computed tomography (CT) scan of the brain; and/or an abnormal clinical examination.

RESPONSIBLE

Trauma Faculty, Residents, and Advanced Healthcare Practitioners (AHPs)
Neurosurgery Faculty
Pediatric Intensivist
Pharmacist
Nursing Associates
Respiratory Therapist

POLICY REFERENCES

TR-P-18: *Guideline for the prevention and/or treatment of venous thromboembolic event in trauma patients.*

TR-P-39: *Pediatric diagnostic imaging guideline.*

LITERATURE REFERENCES

American College of Surgeons Committee on Trauma (2018). *Advanced Trauma Life Support for Doctors Course Manual*. 10th ed. American College of Surgeons. Chicago, IL: American College of Surgeons.

Brain Trauma Foundation. (2016). *Guidelines for the management of severe traumatic brain injury* (4th ed.).

Chestnut, P. M., Temkin N., Carney, N., Dikmen, S., Rondina C., Videtta, W., & et al. (2012). A trial of intracranial pressure monitoring in traumatic brain injury. *New England Journal of Medicine*, 367, 2471-2481.

Greenwald, B. D, Hammond, F., Harrison-Felix, C. L., Nakase-Richardson, R., Howe, L. L., & Kreider, S. (2015). Mortality following traumatic brain injury among individuals unable to follow commands at the time of rehabilitation admission: A NIDRR TBI model system study. *Journal of Neurotrauma*, 32 (23), 1883-1892.

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**MANAGEMENT OF SEVERE TRAUMATIC BRAIN INJURY IN INFANTS,
CHILDREN AND ADOLESCENTS**

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Pineda, J. A., Leonard, J. R., Mazotas, I. G., Noetzel, M., Limbrick, D. D., Keller, M. S., & et al. (2013). Effect of implementation of a pediatric Neurocritical care program on outcomes after severe traumatic brain injury: A retrospective cohort study. *Lancet Neurology* (12) 45-52.

PI TRIGGERS FOR REVIEW

- Craniotomy >4 hours after arrival, excluding ICP monitoring procedure
- Treatment protocols not followed
- Trauma Death
- On-Call Consult Response >30 Minutes for Emergency/STAT consults

PROCEDURE

Q. Assessment

1. Clinical assessment of severity of brain injury includes the following: level of consciousness; motor strength; motor tone; cranial nerve exam (pupillary response, extraocular movements, facial symmetry, corneal and gag reflexes); vital signs, Glasgow Coma Score (GCS); note any seizure activity.

Diagnostic assessment of brain injury includes the following: CT scan of the brain, MRI of the brain, ICP monitor, and/or Bispectral (BIS) monitoring for patients under Pentobarbital coma.

R. Plan

1. Secure the airway and provide oxygenation, ventilation and intravenous fluids during trauma resuscitation. Treatment goals as follows:
 - a. Pulse oximetry 100%

**MANAGEMENT OF SEVERE TRAUMATIC BRAIN INJURY IN INFANTS,
CHILDREN AND ADOLESCENTS**

- b. PaO₂ 100 mmHg
- c. PaCO₂ 32-37mmHg
- d. ICP <20mmHg
- e. Maintain CPP as per age
- f. Temperature 37.0+/-0.5° C
- g. Glucose 90-160mg/dL
- h. Serum sodium 140-150
- i. Consider maintaining hemoglobin ≥8 g/dL
- j. Treat coagulopathy

S. Implementation

- 1. Continue to assess and implement resuscitation by following Advanced Trauma Life Support (ATLS) guidelines.
- 2. Implementation of the Pediatric Traumatic Brain Injury Admission power plan may be initiated by Trauma team physicians, Neurosurgeon, Pediatric Intensivists, and/or Advanced Healthcare Practitioners.
- 3. Identification of patients with severe head injury includes the following: GCS of 3 to 8; abnormal CT scan of the brain; and/or abnormal clinical exam.
- 4. Patients with CT scan (+) for lesion, diffuse or focal swelling. In patients with GCS < 8 proceed with intubation, insertion of arterial line, and insertion of ICP monitor. Monitor patient's ETCO₂, CPP, and core temperature.

T. Management

- 1. Three-Tiered System approach for management of intracranial pressure.

Tier 1

- a. HOB >30 degrees, or if contraindicated, reverse Trendelenburg. Maintain the neck in a neutral position with a cervical collar, body alignment maintained midline. Avoid bending of knees/hips. Avoid neck compression (excess tightening of cervical collar).
- b. Maintain normothermia and euglycemia.
- c. Avoid hypoxia and hypotension.
- d. EEG as indicated.

**MANAGEMENT OF SEVERE TRAUMATIC BRAIN INJURY IN INFANTS,
CHILDREN AND ADOLESCENTS**

- e. Seizure prophylaxis-Fosphenytoin x7 days. If no seizure activity, medication to be discontinued after day 7.

Tier 2

- e. Maintain adequate MAP and CPP appropriate for age.
- 0-24 months: 45-50mmHg CPP
 - 2-8 years: 50-55mmHg CPP
 - 9-13 years: 55-60mmHg CPP
 - >13 years: >65mmHg CPP
- f. Maintain Serum Sodium (Na^+) 140-150.
- g. Consider maintaining Hgb >8.
- h. Adequate sedation, analgesia, and neuromuscular blockade as per physician.
- i. Maintain brain/core temperature $37.0^{\circ}\text{C} \pm 0.5^{\circ}\text{C}$.
- j. Maintain O_2 saturation >93%. Controlled hyperventilation- PCO_2 32-37mmHg. Prophylactic severe hyperventilation to a $\text{PCO}_2 < 30$ should be avoided.
- k. Glucose control 90-160mg/dL.
- l. Seizure prophylaxis.
- m. Start tube feeds in the first 72 hours as soon as deemed appropriate by the treating physician.

If ICP is >20mmHg and sustained for ≥ 5 minutes despite intervention:

- a. Consider converting ICP bolt to EVD. Drain CSF as indicated by Neurosurgery service.
- b. Hyperosmolar Therapy
- 3% Saline 5-10ml/kg bolus over 30 minutes.
 - 0.1-1.0ml/kg/hr 3% saline drip to maintain goal Na^+ 150-160, serum osmolarity <360mOsm/L (higher levels of serum osmolarity may be tolerated in children when induced with hypertonic saline vs. mannitol).

Tier 3 (Intractable intracranial hypertension)

- e. Reassess if the patient is salvageable
- f. Induced barbiturate coma
- Pentobarbital 5-10mg/kg IV bolus over 30 minutes.
 - Infusion of Pentobarbital 1-2mg/kg/hr with a goal of burst suppression on EEG.

**MANAGEMENT OF SEVERE TRAUMATIC BRAIN INJURY IN INFANTS,
CHILDREN AND ADOLESCENTS**

applicable). For example, a rehabilitation facility, long term care facility, or patient's home.

- W. Termination of Guidelines
 - 1. Patient demonstrating clinical improvement with interventions.
 - 2. Physician order to terminate guidelines at any point during clinical course.

**MANAGEMENT OF SEVERE TRAUMATIC BRAIN INJURY IN INFANTS,
CHILDREN AND ADOLESCENTS**

Trauma Program Director

Date

Neurosurgery Medical Director

Date

PICU Medical Director

Date

Trauma Medical Director

Date

Reviewed/Revised
05/2020

**MANAGEMENT OF SEVERE TRAUMATIC BRAIN INJURY IN INFANTS,
CHILDREN AND ADOLESCENTS**

**ATTACHMENT A: BACKGROUND AND KEY POINTS FOR THE INFANTS,
CHILDREN AND ADOLESCENTS**

BACKGROUND INFORMATION

Pediatric patients presenting with alteration in behavior require a high level of suspicion for neurologic conditions. The most common cause of mortality in the pediatric trauma patient is from a head injury. The most common mechanism of these head injuries are from blunt trauma as a result from falls, motor vehicle collisions, sports, recreation injuries and intentional or unintentional abuse. Penetrating injuries may result from stab wounds, gunshot wounds and/or wounds made from other piercing tools.

It is important to remember when caring for infants, pediatric and adolescent population there are other neurologic impairments that can further impede severe traumatic brain injury management such as genetic defects/deficiencies, prematurity, neoplasms, infections, ingestions, shock or skeletal injuries due to intentional or unintentional trauma.

The deployment growth for newborns is also another important factor to consider. Newborns are born with fontanels in an open position to allow for brain growth and development. The posterior fontanel usually closes by age two months. The anterior fontanel usually closes between nine to eighteen months of age.

The goal in treating Severe Traumatic Brain Injury (STBI) is to reduce secondary brain injury. These guidelines provide team members with information on a) identifying patients at risk for secondary injury and b) suggesting interventions to maintain adequate cerebral perfusion pressure and reduce increased intracranial pressure (ICP) in order to enhance oxygen delivery to tissues.

KEY POINTS

- ICP monitoring or surgical intervention is indicated in comatose patients (GCS \leq 8) with evidence of structural brain damage on initial CT scan or hemodynamic instability.
- ICP monitoring should be considered in patients with GCS \geq 8 who have structural damage with high risk for progression. i.e. large multiple contusions $>$ 2 cm or coagulopathy.
- To improve clinical decision making and safely decrease the use of unnecessary CT with STBI refer to TR-P-39 Pediatric Diagnostic Imaging Guideline.
- Consult the Child life specialist and social services to address patient and family needs/support.

**MANAGEMENT OF SEVERE TRAUMATIC BRAIN INJURY IN INFANTS,
CHILDREN AND ADOLESCENTS**

ATTACHMENT B: TIERED SYSTEM APPROACH

Pediatric Severe Traumatic Brain Injury Guideline	
Tiered System Approach to Manage Increased Intracranial Hypertension (TR-P-35)	
Treatment Goals:	If patient has sustained ICP > 20 mmHg for more than 10 mins., proceed with tiered system approach.
● Pulse oximetry 100%	Tier 1: Patient positioning: HOB 30°, or if contraindicated, reverse Trendelenburg.
● PaO ₂ ≥ 100 mmHg	Maintain neck in neutral position with C-collar.
● PaCO ₂ : 32-37 mm Hg.	Maintain midline body alignment; avoid bending knees/hips.
● ICP < 20 mmHg.	Avoid neck compression (excessive tightening of C-collar).
● Maintain CPP per age	Avoid hypoxia and hypotension
● Temperature 37.0 +/-0.5° C	EEG as indicated
● Glucose 90-160 mg/dL	Seizure prophylaxis- Fosphenytoin x7 days. If no seizure activity, medication to be discontinued after day 7.
● Serum sodium 140-150 mmol/L	If patient has sustained ICP > 20 mmHg for more than 10 mins., proceed to Tier 2.
● Hemoglobin ≥8 g/dL	Tier 2: MAP and CPP: 0-24 months: 45-50mmHg CPP
● Treat coagulopathy	2-8 years: 50-55mmHg CPP
● For hypotension	9-13 years: 55-60mmHg CPP
● Increase patient volume with: NS/Colloids/Blood	>13 years: >65mmHg CPP
● Once volume load measures are done & CPP remains low	Maintain Serum Sodium (Na ⁺) 140-150.
● Consider the following:	Consider maintaining Hgb >8.
● Vasopressors (Levophed)	Adequate sedation, analgesia, and neuromuscular blockade as per physician.
● Titrate for goal values.	Maintain brain/core temperature 37.0°C +/- 0.5°C.
● Start at 0.05-0.1mcg/kg/min. Max 1-2 mcg/kg/min.	Maintain O ₂ saturation >93%. Controlled hyperventilation-PCO ₂ 32-37mmHg
● A-line placement	Prophylactic severe hyperventilation to a PCO ₂ <30 should be avoided.
● Glucose Management	Glucose control 90-160mg/dL
● Consults for OT/PT within 24 hours	Start tube feeds in the first 72 hours as soon as deemed appropriate by the treating physician.
● Consider Lidocaine to minimize coughing	If patient has sustained ICP > 20 mmHg for more than 10 mins., proceed to Tier 3.
● Begin nutrition within 24-48 hours Dietary Consult	Tier 3: Reassess if the patient is salvageable
● Assess for VTE prophylaxis (refer to TR-P-18)	Induced barbiturate coma:
● Consider tracheostomy within 8 days	Pentobarbital 5-10mg/kg IV bolus over 30 minutes.
● Consider switching OGT from Salem to Keofeed when tolerating feedings.	Infusion of Pentobarbital 1-2mg/kg/hr with a goal of burst suppression on EEG.
● Assess for DI or Rhabdomyolysis development.	Mannitol 0.25-0.50gm/kg for rescue therapy only when Na ⁺ 150-160 and serum osmolarity <320mOsm/L due to suggested risk of the development of acute tubular necrosis and renal failure.
	Consider decompressive craniectomy.
	Reassess and implement all previous recommendations.
	Weaning Process:
	Wean to discontinue sedation (Propofol/Benzodiazepines or Barbiturate coma).
	If receiving neuromuscular agent, normalize PaCO ₂ : to 35-40mmHg, then discontinue.
	Discontinue ICP & CPP therapy per Neurosurgery Service.
	EVD management (if applicable) per Neurosurgery Service.
(effective date 05/2020)	

**VASCULAR INVOLVEMENT IN ORTHOPAEDIC INJURED POLYTRAUMATIZED
PATIENTS**

POLICY PURPOSE:

- The need for vascular repair or revascularization of a traumatized extremity should be important to all members of the trauma team. A well-defined process will accomplish this goal.

RESPONSIBLE

Trauma Medical Director
Trauma Surgeons
Orthopedic Surgeons
Cardiovascular Surgeons
Residents
Allied Healthcare Providers (AHPs)
Trauma Program Director
Trauma Service Coordinators
Nursing Associates

PI TRIGGERS

- Delays in Identification of Injuries
- Compartmental Syndrome
- Unplanned Return to OR
- Ortho did not assess pt at bedside after neurovascular compromise

LITERATURE REFERENCES

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Fowler, J., Macintyre, N., Rehman, S., Gaughan, J. P., & Leslie, S. (2009). The importance of surgical sequence in the treatment of lower extremity injuries with concomitant vascular injury: A meta-analysis. *Injury*, 40(1), 72-76. doi:10.1016/j.injury.2008.08.043

**VASCULAR INVOLVEMENT IN ORTHOPAEDIC INJURED POLYTRAUMATIZED
PATIENTS**

IX. PROCESS

- D. Life threatening injuries such as evolving traumatic head injury in an unstable patient, blunt or penetrating trauma to the chest or abdomen in an unstable patient, take precedence.
- E. Initial management of these patients (Airway, Breathing, Circulation, etc.) should be unhindered by management of extremity injuries.
- F. If safe, concurrent stabilization of extremity injuries can be managed during this time, the extremity should be stabilized as quickly as possible (basic splint or traction).
- G. Getting these injuries provisionally reduced and immobilized decreases bleeding and further damage.
- H. A pulseless or cold extremity after reduction warrants vascular surgery involvement, which can be requested by the Trauma General Surgery Attending/Senior Resident or by the Orthopaedic Traumatologist/Resident. This consult should be placed as STAT at the discretion of EITHER the Trauma or Orthopaedic teams.
- I. If the patient has a chest, abdomen or pelvis injury AND an emergent extremity injury, that is unstable and requires an immediate trip to the operating room, effort should be made to allow for concurrent surgery between the Trauma surgeon and the Orthopaedic/Vascular surgeon.
- J. If a patient is cleared from a trauma perspective and needs emergent evaluation and management of extremity injuries, they should proceed as follows:
 - a. If lower extremity or proximal to the elbow:
 - i. If the Orthopaedic team is immediately available for damage control stabilization, the patient should be taken emergently to any available operating room for damage control stabilization and perform fasciotomies if indicated. The vascular surgeon will follow and perform definitive vascular repair.
 - ii. If Vascular and Orthopaedics are immediately available, repair and revascularization will be performed by vascular first, followed by the orthopaedic surgeon. Fasciotomies will also be performed by Orthopaedics if indicated. However, the vascular team should be

**VASCULAR INVOLVEMENT IN ORTHOPAEDIC INJURED POLYTRAUMATIZED
PATIENTS**

immediately available during and after the orthopaedic procedure in case the patient needs further vascular intervention.

b. If distal to the elbow:

i. The Orthopaedic/ hand surgeon will perform the orthopaedic and vascular repair

X. PERFORMANCE IMPROVEMENT PROCESS

G. The Trauma Program Service Coordinators in collaboration with Trauma Program Director will monitor compliance to guideline outlined.

H. Deviations will be referred to Trauma Medical Director, Orthopedic Trauma Liaison and Cardiovascular Surgeon involved for their review.

**VASCULAR INVOLVEMENT IN ORTHOPAEDIC INJURED POLYTRAUMATIZED
PATIENTS**

Trauma Program Director

Date

Trauma Medical Director

Date

Reviewed/Revised

GERIATRIC ISOLATED HIP FRACTURE MANGEMENT GUIDELINE

POLICY PURPOSE

- Outlines isolated hip fracture patient management by incorporating best practices to promptly stabilize fracture within twenty four (24) to forty eight (48) hours from presenting to the emergency department.

RESPONSIBLE

Emergency Medicine Physicians and Allied Health Providers (AHPs)
Orthopaedic Surgeons and AHPs
Family Medicine Physicians
Trauma Surgeons and AHPs
Nursing Associates
Administrator On Duty (AOD)
Rehabilitation Services (Physical Therapists)
Case Management (Case Manager and Social Worker)

LITERATURE REFENCES

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GERIATRIC ISOLATED HIP FRACTURE MANGEMENT GUIDELINE

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Retrieved January 29, 2019: <https://www.guidelinecentral.com/summaries/american-academy-of-orthopaedic-surgeons-clinical-practice-guideline-on-management-of-hip-fractures-in-the-elderly/#section-society>

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Stitgen, A., Poludnianyk, K., Dulaney-Cripe, E., Markert, R., & Prayson, M., (2015). Adherence to preoperative cardiac clearance guidelines in hip fracture patients. *Journal of Orthopaedic Trauma*, 29(11), 500-503.

PROCEDURE

Patient arriving in the Emergency Department (ED) with a clear or questionable diagnosis of a hip fracture by three different arrival modes will be managed as described below. Refer also to Attachment A: Code Hip Activation Process.

A. Mode of Arrival from Scene:

1. Patient is evaluated by Emergency Medicine (EM). Upon identification of possible hip fracture, a Code Hip is activated by an EM physician or designee.
2. ED Health Unit Coordinator (HUC) or designee will place a call to the operator requesting Code Hip activation to be initiated via group pager. An overhead announcement within the ED is also instituted by the ED HUC or designee.
3. The operator will page:
 - a. Anesthesia service provider on-call
 - b. OR Charge RN
 - c. AODs
 - d. Orthopaedic Resident
 - e. Family Medicine Resident
 - f. Social Worker Manager
 - g. ED Social Worker
 - h. Trauma Service Coordinator
 - i. Trauma Program Director

GERIATRIC ISOLATED HIP FRACTURE MANGEMENT GUIDELINE

4. Emergency Medicine will initiate the ED Code Hip power plan.
5. Orthopaedic Services will:
 - a. Respond and evaluate patient within 30 minutes of Code Hip Activation.
 - b. Be the responsible medical service in the Emergency Department pending patient evaluation and admission by Family Medicine Services.
 - c. Enter admission pre-operative Code Hip power plan in the Electronic Medical Record.
 - d. If the patient's condition warrants critical care services, the Orthopaedic will consult the Surgical Intensive Care Unit (SICU) Attending for admission.
6. If patient does not require SICU services, Family Medicine will:
 - a. Respond and evaluate patient within one (1) hour of Code Hip Activation.
 - b. Assume the role of primary team on arrival to patient bedside.
 - c. To facilitate immediate perioperative period to timely post operative discharge, patient evaluation will include the following:
 - i. Frailty scoring
 - ii. Pain management
 - iii. Delirium management (5 precipitating risk factors: immobility, malnutrition, three or more medications, use of bladder catheter and any iatrogenic event during hospitalization).
 - iv. Skin assessment and consult wound care management if appropriate.
 - v. Medication reconciliation and input from Pharmacists regarding medication interactions.

GERIATRIC ISOLATED HIP FRACTURE MANGEMENT GUIDELINE

7. Anesthesia Provider will:
 - a. Respond to the bedside within two hours of Code Hip activation.
 - b. Determine pain management pre-operatively.
 - c. Be responsible for determining patient's surgery clearance.
 - d. Complete preoperative evaluation/assessment form (purple sheet: 660-029-15).
 - e. If abnormalities are noted, the Anesthesia Services Provider will inform the Orthopaedic and/or Family Medicine service of the need for further work up or consultation such as a cardiologist and/or nephrologist.

B. Inter-facility Patient Transfer accepted by Orthopaedic Service:

1. ED nurse will page Orthopaedic Resident on-call upon patient arrival.
2. Patient is evaluated by an Orthopaedic Resident within 10 minutes.
3. Upon confirmation of hip fracture, Code Hip is activated by Orthopaedic Resident or designee.
4. Code Hip notification process is the same as described in section (A) steps five through eight.

C. Inter-facility Patient Transfer accepted by Trauma Services:

1. ED nurse will page Trauma Resident upon patient arrival. The Trauma Resident evaluates the patient within 10 minutes.
2. The Trauma Surgeon will consult Orthopaedic Services.
3. The Orthopaedic Resident will assess patient within 30 minutes. Upon confirmation of hip fracture, Code Hip activation will be at the discretion of Trauma and Orthopaedic services.
4. Code Hip notification process is the same as described in section (A) steps

GERIATRIC ISOLATED HIP FRACTURE MANGEMENT GUIDELINE

five through eight.

D. Post operatively Orthopaedic Services will enter the Post Op
Code Hip power plan.

E. In preparation for patient discharge, the primary services will enter the Discharge
Code Hip power plan.

ATTACHMENTS:

Attachment A: Code Hip Activation Process

FORMS:

Pre-Operative Assessment/Evaluation Form

660-029-15 (rev. 04/19)

GERIATRIC ISOLATED HIP FRACTURE MANGEMENT GUIDELINE

Trauma Program Director

Date

Anesthesiology Trauma Liaison

Date

Orthopaedic Surgery Trauma Liaison

Date

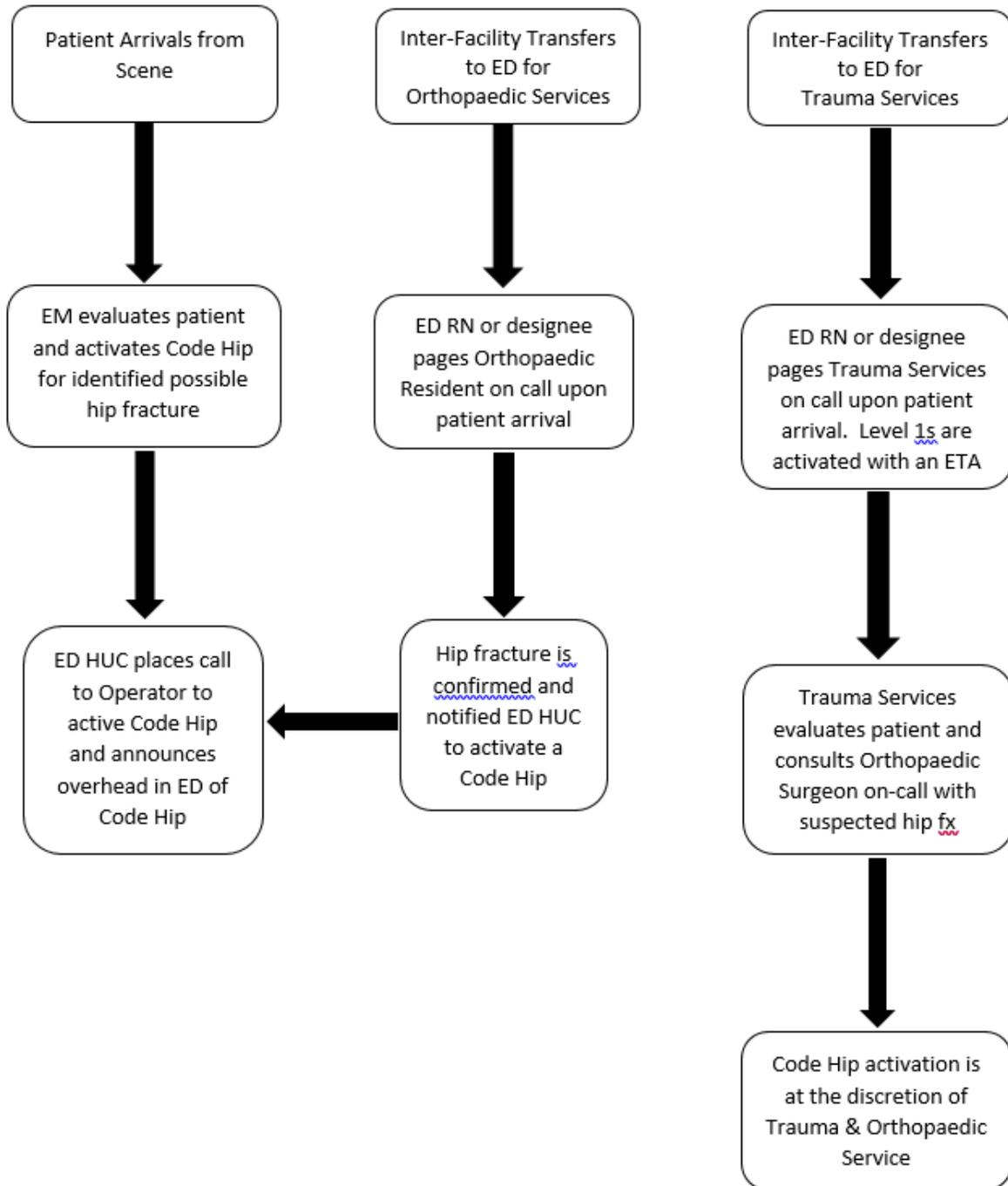
Trauma Medical Director

Date

Reviewed/Revised

GERIATRIC ISOLATED HIP FRACTURE MANGEMENT GUIDELINE

ATTACHMENT A: CODE HIP ACTIVATION PROCESS



PEDIATRIC DIAGNOSTIC IMAGING GUIDELINE

POLICY PURPOSE:

- To ensure adequate diagnostic imaging is performed while minimizing ionizing radiation exposure to pediatric patients (less than 18 years of age).

RESPONSIBLE

Trauma Medical Director
Associate Trauma Medical Director
Assistant Trauma Medical Director
Trauma Program Director
Physicians, Residents, Allied Health Professionals (AHPs)
Diagnostic Imaging Department Associates
Trauma Service Coordinators

LITERATURE REFERENCES

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PEDIATRIC DIAGNOSTIC IMAGING GUIDELINE

Radiology : JACR, 14(5S), S338–S349.

<https://doi.org/10.1016/j.jacr.2017.01.036201710011559411924763799>

BACKGROUND INFORMATION

The individual risk from necessary imaging exams is minimal when compared to the benefits of aiding in accurate diagnosis. Regardless, efforts should still be made to minimize radiation exposure to the pediatric population. Computerized tomography (CT) scans of the head and abdomen during childhood have shown a 10 fold increase in the estimated risk of radiation-induced fatal cancers compared to CT scans in adults. The use of abdominal ultrasound or Focus Assessment with Sonography for Trauma (FAST) exams has gained popularity due to the ability to aid in the diagnostic process without unnecessary radiation. The type and extent of initial and subsequent imaging for pediatric patients is dependent on the age of the child, the presence of neurologic signs and symptoms, and evidence of thoracic and abdominopelvic injuries. A head CT should be performed in selected neurologically asymptomatic patients and contrast-enhanced CT of the abdomen and pelvis is utilized for suspected intra-abdominal or pelvic injury. The choice of imaging is based on mechanism of injury, signs and symptoms of injury, and physical exam findings.

PI TRIGGERS

- Treatment protocols not followed
- Delay in identification of injury
- Laparotomy > 1 hour with abdominal injury and SBP < 90
- Laparotomy > 4 hours after arrival
- Negative exploratory laparotomy
- Craniotomy > 4 hours after arrival
- False negative FAST or abdominal ultrasound

PROCEDURE

XI. ACUTE HEAD TRAUMA (< 24 hours from injury and no suspicion of non-accidental trauma)

- A. Decision rule for very low risk of intracranial injury who are younger than two (2) years of age and those aged two (2) years and older with Glasgow Coma Scale (GCS) scores of 14-15 after head trauma.
- B. Refer to Attachment A: Head Imaging PECARN Algorithm.

XII. SUSPECTED PHYSICAL ABUSE

PEDIATRIC DIAGNOSTIC IMAGING GUIDELINE

A. The following with physical abuse concerns:

1. Infants: irritable infants < six (6) months without fever or other identifiable cause, Apparent Life – Threatening Event (ALTE), altered mental status, respiratory distress, unexplained vomiting, and unexplained bruising.
2. All children < five (5) years old presenting with injury.
3. Obtain skeletal survey when physical exam findings are suggestive of abuse, to include bruising in infants < six (6) months of age or non-ambulatory infants in unusual locations in any pediatric age (ear pinna, neck under chin, torso, gluteal area) patterned bruises.
 - Ordered at El Paso Children’s Hospital upon admission.
 - Should not delay care of obvious injuries.
4. Refer to Policy TR-P-40 Non-Accidental Trauma Evaluation Guideline.

XIII. SUSPECTED TRAUMATIC SPINAL CORD INJURY

A. The following patients are considered to be at special risk for spinal trauma:

1. Patients with suspected abusive head trauma.
2. Patients presenting with polytrauma.
3. Patients involved in motor vehicle collision who were inadequately restrained.
4. Patients who were ejected from motor vehicle during collision.
5. Drivers or riders of motorcycles and All-Terrain Vehicles (ATVs).
6. Patients who are unconscious following trauma.
7. Patients with head and torso injuries.

B. Refer to Attachment B titled: Suspected Cervical Spine Injury

XIV. EVALUATION OF BLUNT ABDOMINAL SOLID ORGAN INJURY

A. Initial evaluation:

10. Perform the primary and secondary surveys.
11. Secondary survey should include a detailed abdominal exam, and back exam as well as a FAST.

B. The following are considered to be at special risk for abdominal trauma:

1. Motor vehicle collision: high speed (≥ 40 mph), ejection, or rollover.
2. Automobile vs. pedestrian/bicycle: moderate speed (≥ 5 mph).
3. Drivers or riders of motorcycles and ATVs.

PEDIATRIC DIAGNOSTIC IMAGING GUIDELINE

4. Unconscious patients.
 5. Patients presenting with crush injury to the torso.
 6. Physical assault to torso and abdomen.
 7. Patients sustaining falls \geq 20ft (Level 2 Trauma).
- C. Obtain abdominal laboratory series on patients with suspected abdominal injury.
1. Liver Function Test (LFTs).
 2. Complete Blood Count (CBC).
 3. Amylase Level.
 4. Lipase Level.
 5. Complete Urinalysis with micro (UA).
- D. Refer to Attachment C: CT Abdomen Not Needed.
- E. Refer to Attachment D: CT Abdominal Trauma Algorithm.
- F. Refer to TR-P-41 Pediatric Liver and Spleen Injury Management Guideline.
- G. For renal injuries grade 3 and greater, obtain delayed cuts/imaging to evaluate for contrast extravasation indicating damage to the collecting system.
1. The trauma attending or radiologist can request delayed imaging series and relay to technologist.
 2. Technologist may also initiate delayed imaging with approval of radiologist or trauma resident.
 3. Delayed imaging series should be completed 15 minutes after contrast injection.

V. SUSPECTED EXTREMITY FRACTURE AND RECOMMENDED FILMS

- I. Refer to Table 1- Minimum Recommended Routine Views.
- J. All efforts should be made to minimize radiation exposure to the health care workers and family members involved in patient positioning and immobilization.
- K. Certain pathologic processes may warrant evaluation of both the right and left sides

PEDIATRIC DIAGNOSTIC IMAGING GUIDELINE

Trauma Program Director

Date

Assistant Trauma Medical Director

Date

Trauma Medical Director

Date

Review/Revision Date

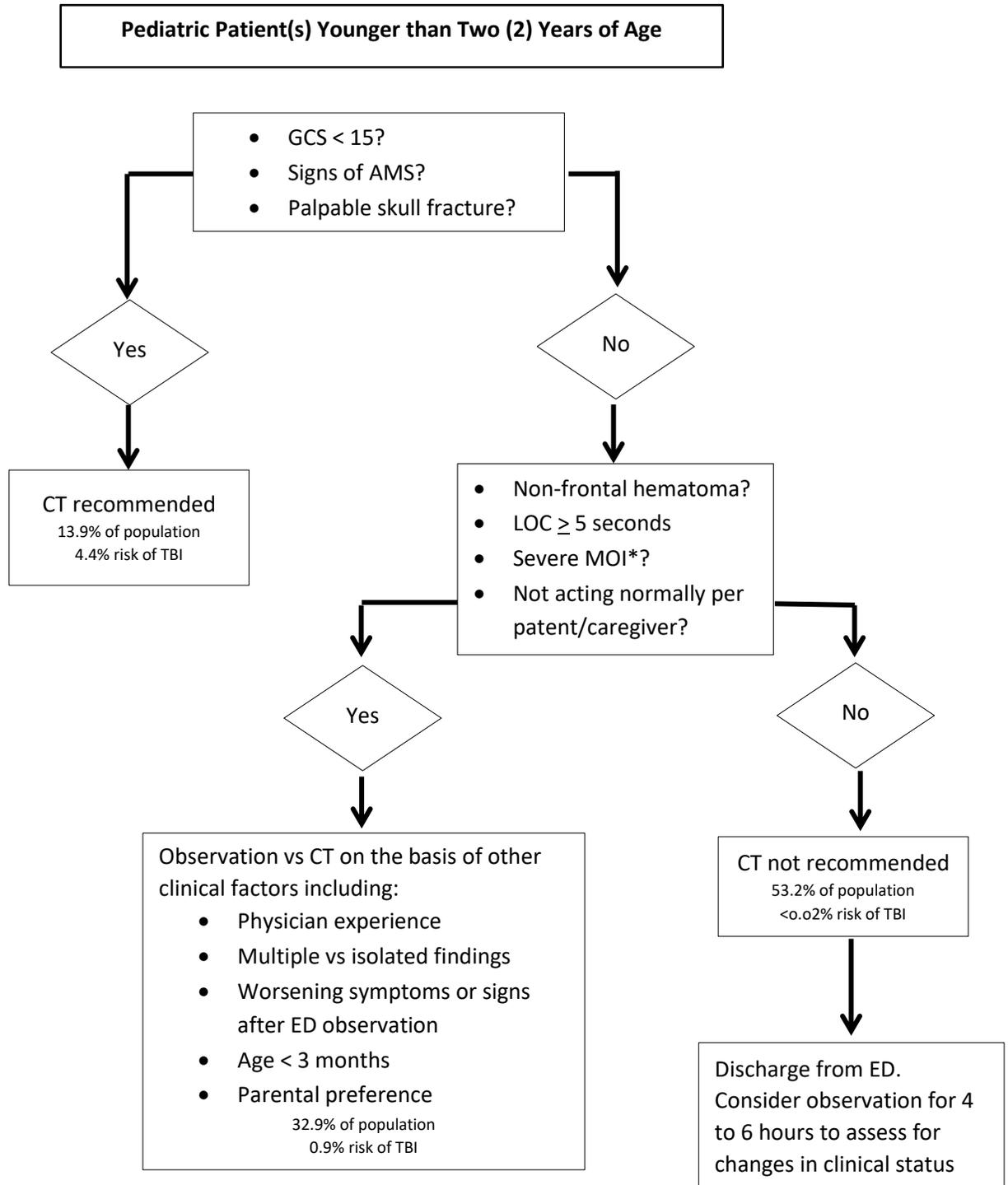
PEDIATRIC DIAGNOSTIC IMAGING GUIDELINE

TABLE 1: MINIMUM RECOMMENDED ROUTINE VIEWS

Anatomic Area	Views
Scapula	AP and lateral
Clavicle	AP and AP angulated view
Acromioclavicular (AC) joint	Upright AP and outlet (lateral) view collimated to the AC joint
Shoulder	Two views, one of which should be AP or Grashey, and additional view(s) as indicated by clinical circumstances
Humerus	AP and lateral
Elbow	AP, lateral and radial head view for trauma patients
Forearm	AP and lateral
Wrist	PA, oblique, and lateral
Hand	PA and oblique
Hand bone age	PA, left hand and wrist
Fingers	PA, oblique, and lateral
Hip	AP and lateral (frog-leg, cross-table, or other lateral options)
Pelvis	AP
Femur	AP and lateral
Patella	Lateral and patellar/axial
Knee	AP and lateral (cross-table lateral recommended for trauma patients)
Tibia-fibula	AP and lateral
Ankle	AP, oblique (mortise), and lateral
Calcaneus	Lateral and axial
Foot	AP, oblique, and lateral
Toes	AP, oblique, and lateral

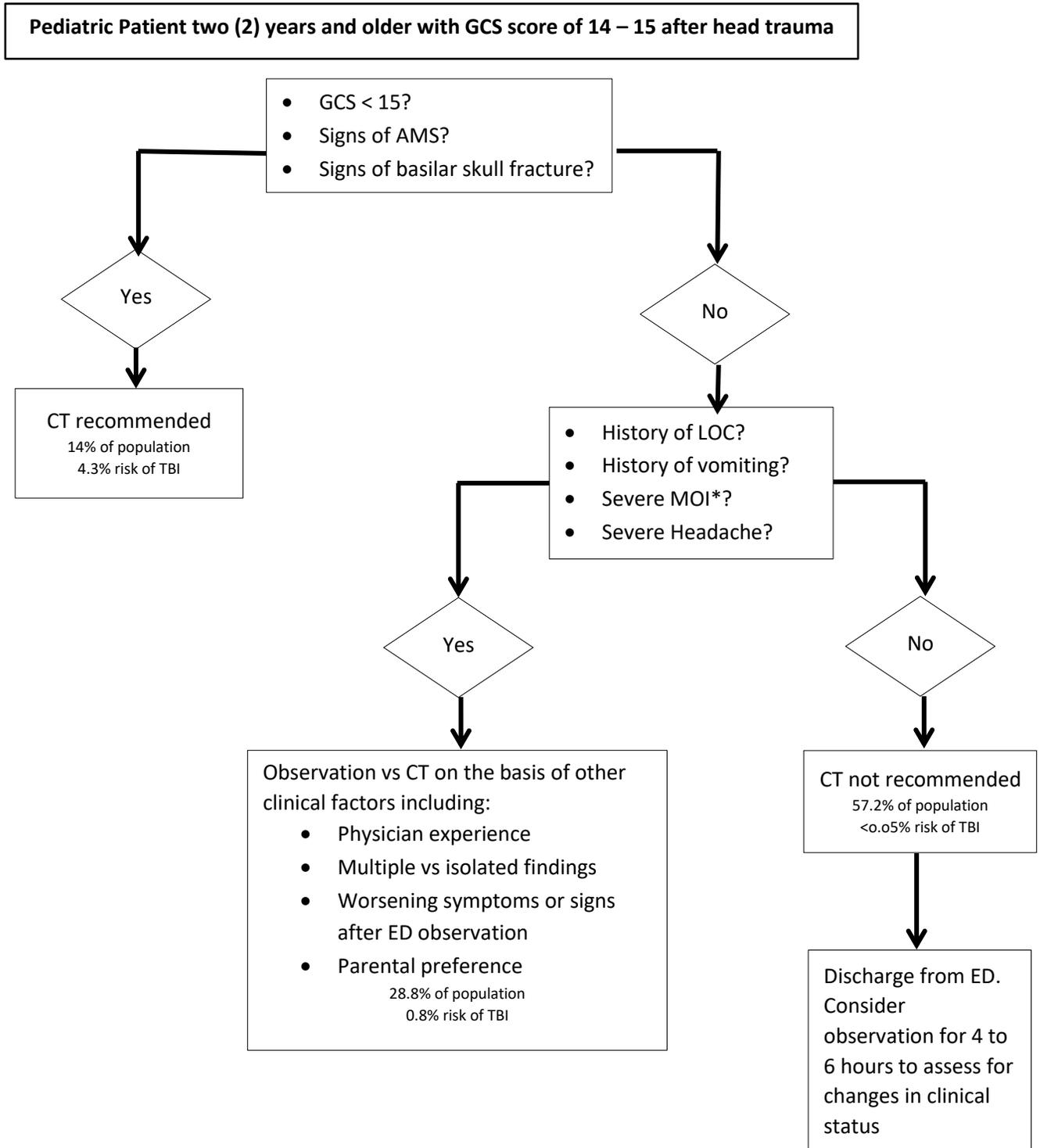
PEDIATRIC DIAGNOSTIC IMAGING GUIDELINE

ATTACHMENT A: HEAD IMAGING PECARN ALGORITHM



*Severe MOI: Level II Trauma Activation Criteria

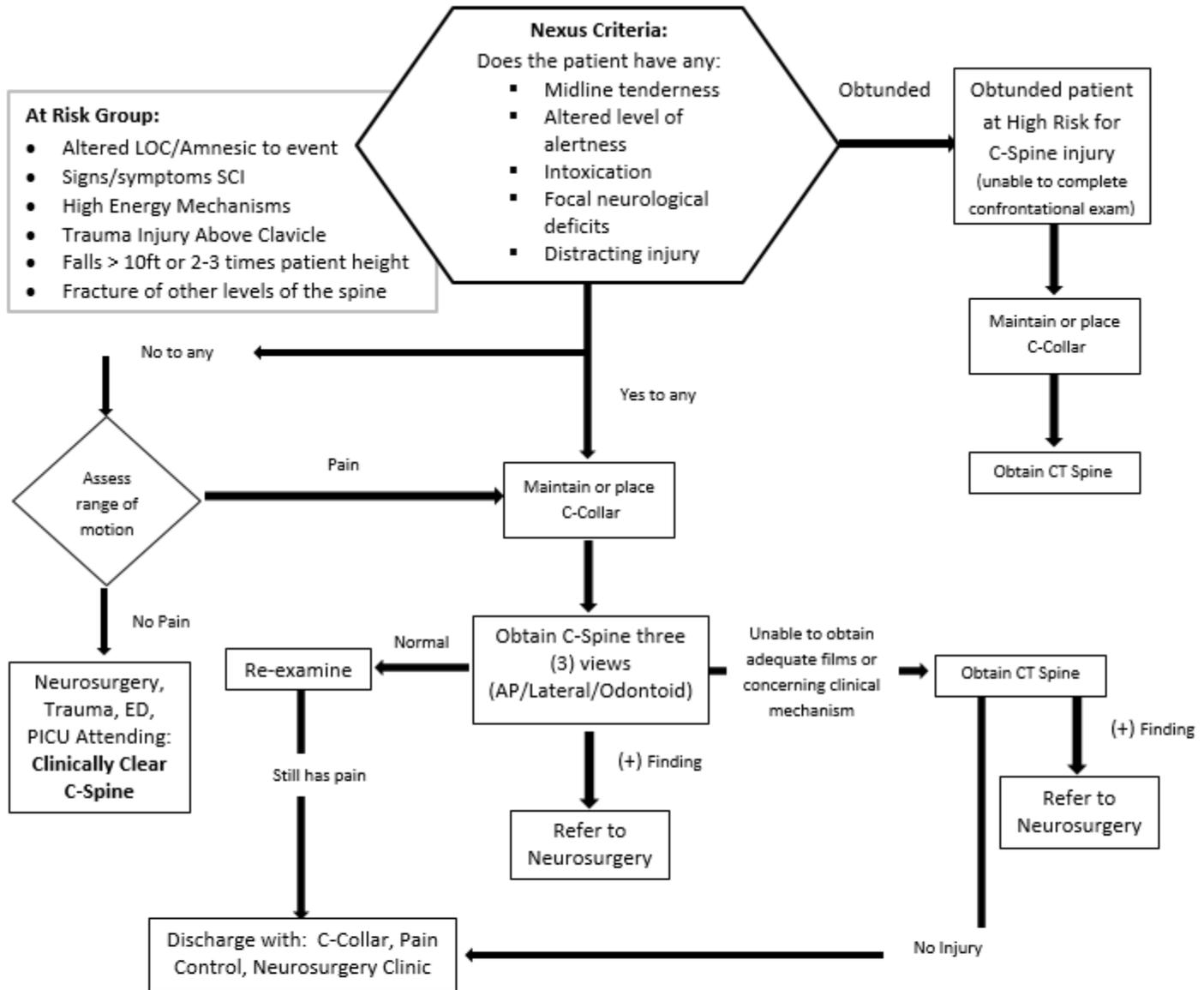
PEDIATRIC DIAGNOSTIC IMAGING GUIDELINE



*Severe MOI: Level II Trauma Activation Criteria

PEDIATRIC DIAGNOSTIC IMAGING GUIDELINE

ATTACHMENT B: SUSPECTED CERVICAL SPINE INJURY



Evaluation of the thoracolumbar spine should be done by radiography (anteroposterior, lateral) unless the patient has already had a CT of Chest, ABD and Pelvis:
Reconstruct Images of the Spine

**MRI indicated to evaluate:
Ligamentous Injuries**

- C-Spine MRA/CTA indications:**
- Penetrating trauma near carotid/vertebral vessels
 - Transverse process fracture of C6 and above
 - Severe cervical spine distraction injury
 - Jumped/perched facet injuries

PEDIATRIC DIAGNOSTIC IMAGING GUIDELINE

ATTACHMENT C: CT ABDOMEN NOT INDICATED

If All Are Present, CT Abdomen Is Not Indicated:

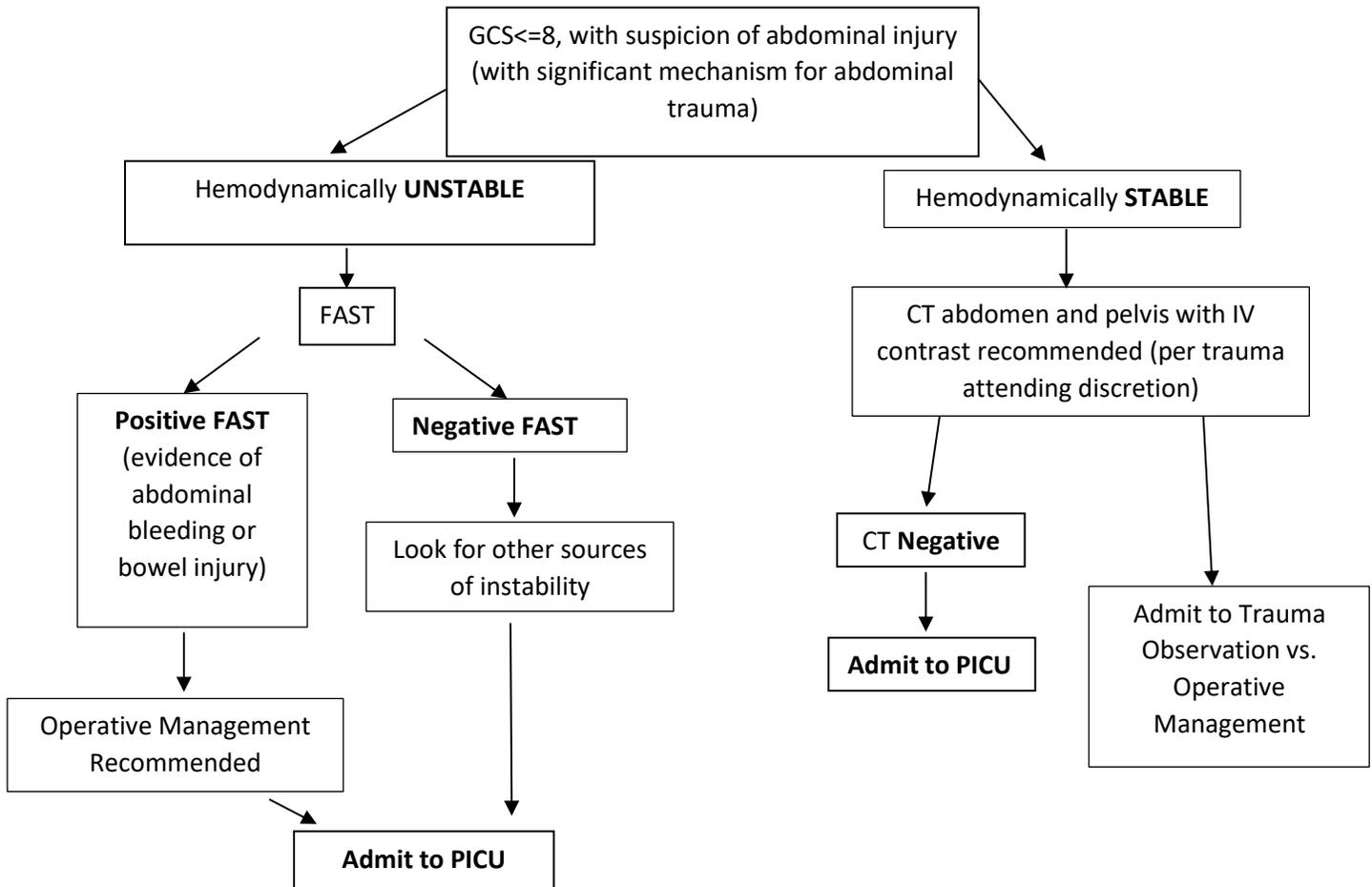
- No evidence of abdominal wall trauma or seat belt sign
- GCS score greater than 13
- No abdominal tenderness
- No evidence of thoracic wall trauma
- No complaints of abdominal pain
- No decreased breath sounds
- No vomiting

99% sensitive for detecting clinically important intra-abdominal blunt injuries.

PEDIATRIC DIAGNOSTIC IMAGING GUIDELINE

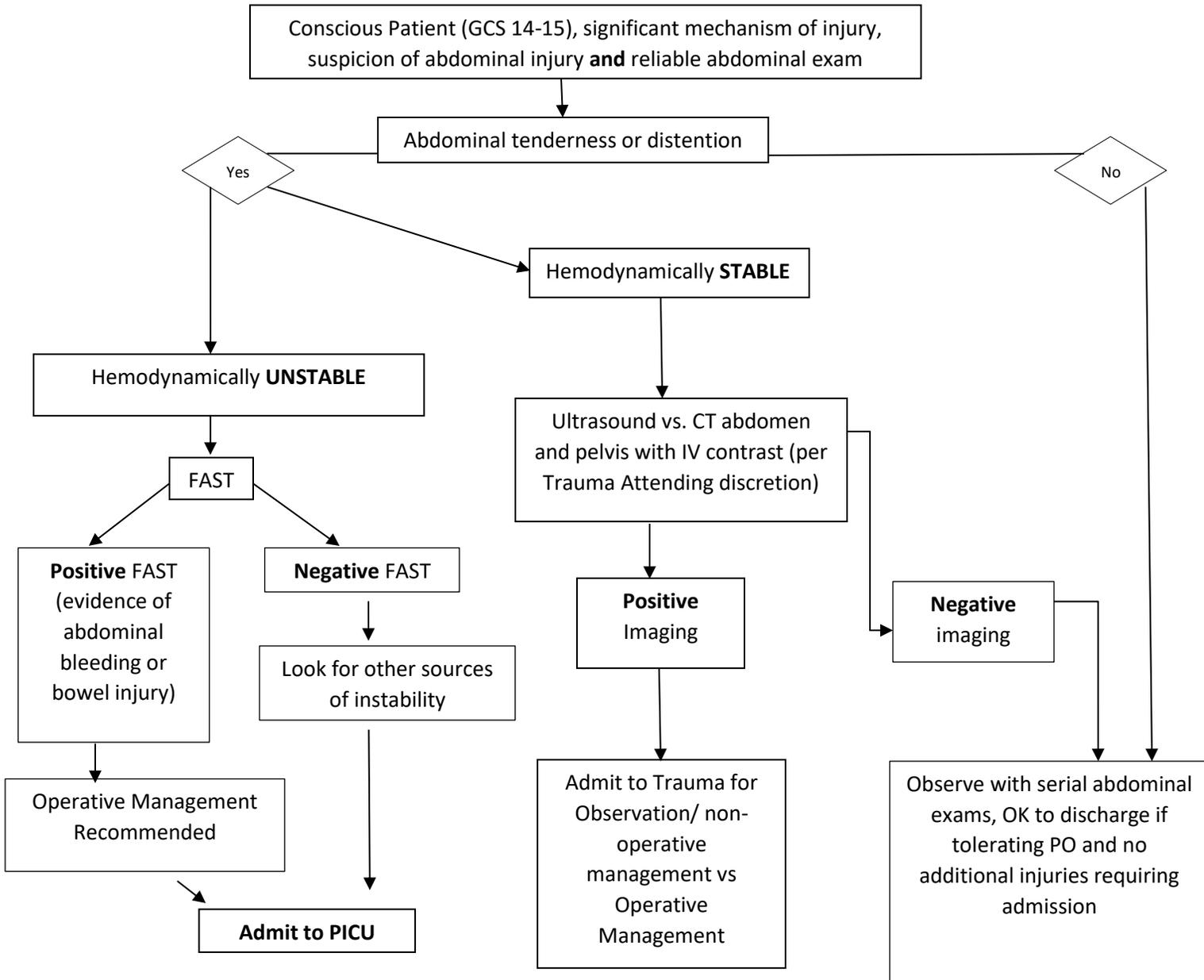
ATTACHMENT D: CT ABDOMINAL IMAGING ALGORITHM

Blunt Abdominal Trauma in the **Unconscious** Patient



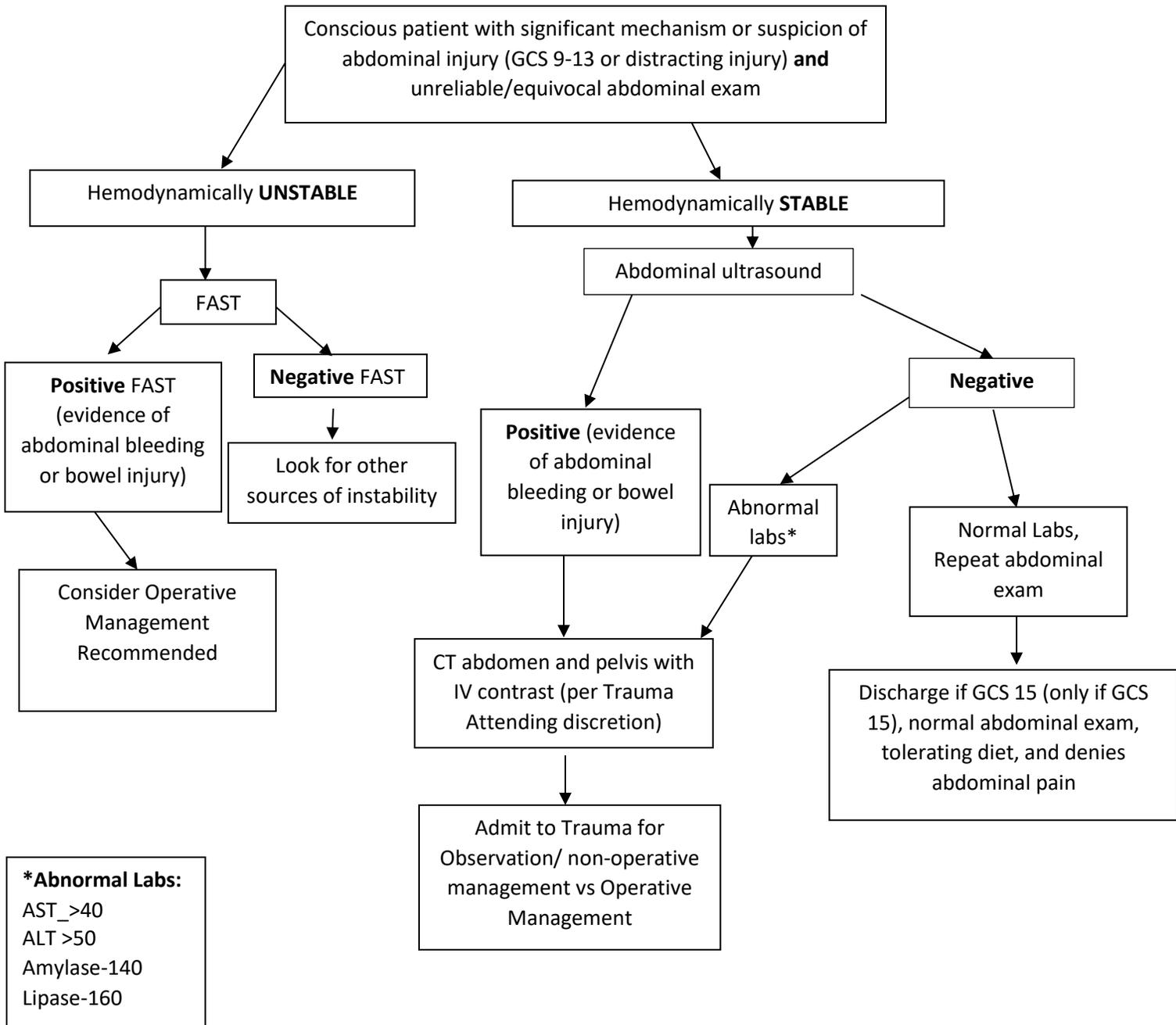
PEDIATRIC DIAGNOSTIC IMAGING GUIDELINE

Blunt Abdominal Trauma in the **Conscious** Patient with
Reliable Abdominal Exam



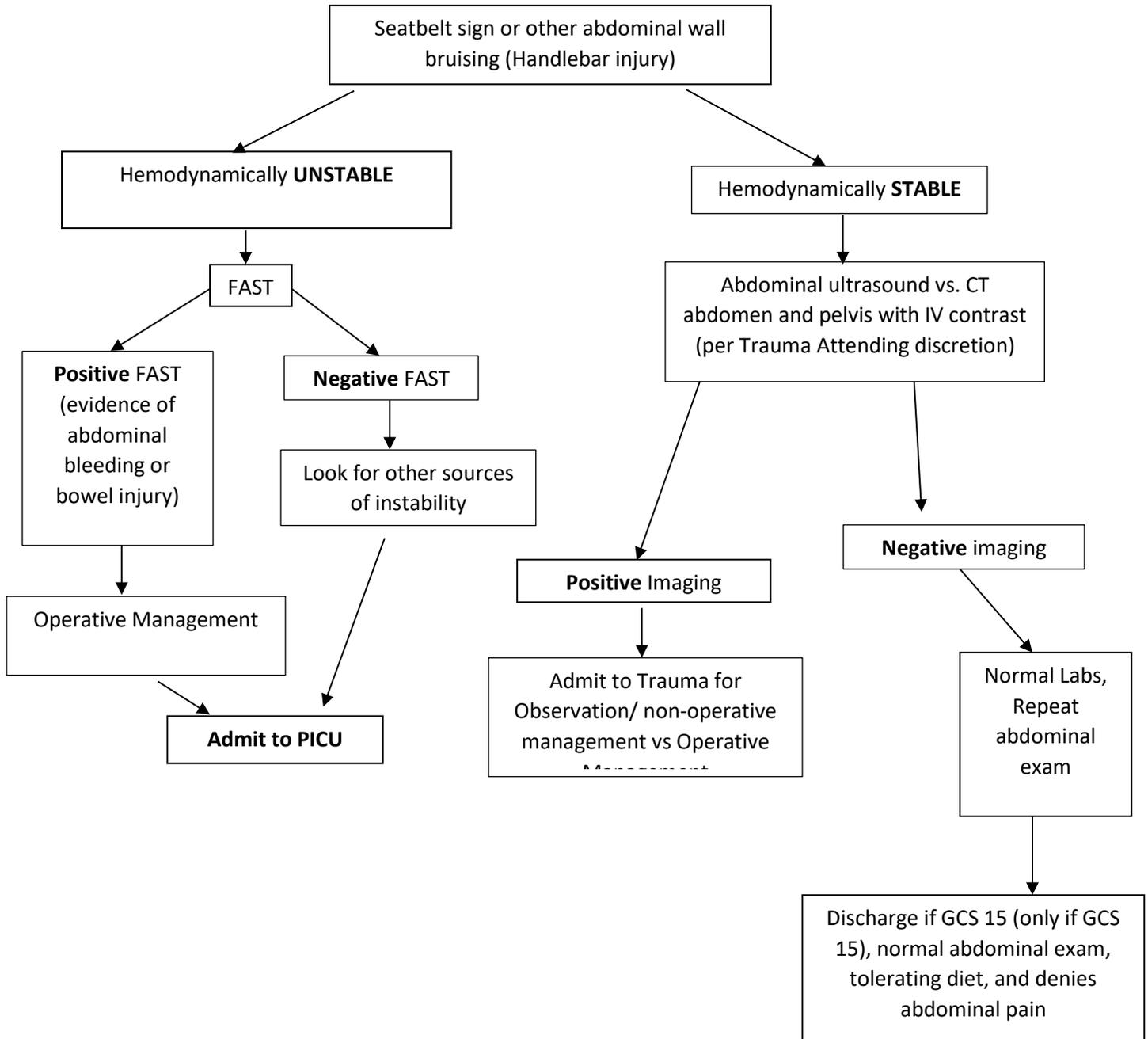
PEDIATRIC DIAGNOSTIC IMAGING GUIDELINE

Blunt Abdominal Trauma in the Conscious Patient with Unreliable Abdominal Exam



PEDIATRIC DIAGNOSTIC IMAGING GUIDELINE

Blunt Abdominal Trauma
Abdominal Wall Bruising



NON ACCIDENTAL TRAUMA MANAGEMENT

POLICY PURPOSE:

To provide guidance in the recognition and management of suspected non accidental trauma and provided timely and appropriate evaluations in an organized and coordinated manner to maximize outcome.

RESPONSIBLE

Trauma Medical Director
Associate Trauma Medical Director
Assistant Trauma Medical Director
Trauma Program Director
Physicians and Allied Health Professionals (AHPs)
Diagnostic Imaging Department Associates
Trauma Service Coordinators

LITERATURE REFERENCES

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PI TRIGGERS FOR REVIEW

- Trauma Death
- Admission to Non-Surgical Service
- Treatment Protocols not Followed
- Delay in identification of injuries

NON ACCIDENTAL TRAUMA MANAGEMENT

PROCEDURE

- B. Identify possible Non Accidental Trauma (NAT), child abuse:
 - I. Determine if child is at risk for child abuse. Refer to Attachment A- Red Flags and NAT Algorithm and consider the below during initial assessment:
 - a. History of present illness.
 - b. Physical exam findings infant.
 - c. Radiologic findings.
 - II. Treat known and life threatening injuries:
 - a. Activate trauma team as appropriate. Refer to TR-S-1: Trauma Team Activation and Admission.
 - b. Do not delay care for child abuse evaluation.
 - III. Contact Authorities:
 - a. Contact Child Protective Services
 - 1. By Texas Family Code Section 261.101 (a)- this is not a delegable task
 - 2. For Texas residents
 - a. By phone: 1-800-252-5400
 - b. Online: txabusehotline.org (Do not use website to report urgent or emergency situations)
 - 3. For New Mexico residents -Child, Youth, Family Department (CYFD)
 - a. By phone: 1-855-333-SAFE [7233]
 - 4. Document case number or reference number as part of History and Physical (H&P)

NON ACCIDENTAL TRAUMA MANAGEMENT

C. Assessment

I. Physical exam

- a. Complete primary and secondary surveys per ATLS guidelines
- b. Describe and note any bruising (if possible obtain pictures) refer to Attachment D- Special Considerations

II. Laboratory studies for consideration:

- a. Completed for most patients:
 1. Complete Blood Count with differential (CBC)
 2. Complete Metabolic Panel (CMP)
 3. Coagulation panel (INR/PT/PTT)
 4. Platelet aggregation studies
 5. Complete urinalysis with reflex culture
- b. Suspected abdominal abuse:
 1. Liver Function Test (LFTs)
 2. Amylase
 3. Lipase
 4. Stool for occult blood
- c. Presence of fractures:
 1. Phosphate level
 2. Parathyroid hormone
 3. Vitamin D 25-hydroxy
- d. Presence of altered mental status or seizure activity

NON ACCIDENTAL TRAUMA MANAGEMENT

1. Urine toxicology screen (if suspicion of substance abuse)

III. Imaging Guidelines (Refer to TR-P-39 Pediatric Diagnostic Imaging Guideline)

- a. Skeletal Imaging (for children < age 2)-, (Refer to Attachment B-Skeletal Survey)

1. Order AFTER admission to El Paso Children's Hospital.
2. AP views of bilateral humerus, forearm, hand, femur, lower leg, and feet; thorax; pelvis; lateral view axial skeleton (infants); and AP and lateral views of skull.
3. Consider 99mTc bone scintigraphy if the radiographic skeletal survey is negative but the clinical suspicion is high .
4. A full body "babygram" is not an acceptable substitute.

- b. Head Imaging

1. Obtain a CT of the head without contrast for any child with suspected intracranial injury
2. All patients less than (<) six (6) months of age with other findings of abuse
3. Bruising to face or head AND less than (<) 12 months of age
4. Neurologic symptoms less than (<) 12 months of age (including symptoms such as vomiting, fussiness)
5. Follow-up imaging to be obtained at the discretion of the ED/Trauma attending, or Neurosurgeon

- c. Ocular Examination

1. For children less than (<) age two (2)
- ii. Ocular Examination to be completed and documented by Ophthalmologist.

NON ACCIDENTAL TRAUMA MANAGEMENT

2. Place Ophthalmology consult AFTER written documentation that the patient is cleared for pupil dilation by Neurosurgery and Trauma teams.

d. Neck Imaging

1. Consider MRI of cervical, thoracic, lumbar imaging if intracranial injuries are present
2. Consider CTA/MRA in patients with known C1-C3 fractures

e. Thoracic Imaging

1. Routine CT of the chest is not recommended
2. Chest CT with IV contrast may be indicated if the following are suspected: hemopericardium, cardiac contusion, and cardiac laceration.

f. Abdominal Imaging

1. If the child is stable, CT scan with IV contrast is the best imaging modality for solid organ and hollow viscus injury secondary to blunt trauma.
2. Intravenous contrast (at a dose of 2 mL/kg body weight) is vital to demonstrate solid organ parenchymal injuries and vascular injuries accurately.
3. Oral contrast administration is not recommended as it may delay imaging.
4. If duodenal injury is suspected and CT findings are equivocal, consider an upper GI series.
5. Signs and/ symptoms of abdominal trauma
6. ALT or AST if twice normal

D. Consults

I. Referrals

NON ACCIDENTAL TRAUMA MANAGEMENT

- a. Place consult to Social Worker (SW)
 - 1. SW will notify appropriate law enforcement agency
 - 2. SW will notify military law enforcement authorities (if applicable)
 - 3. SW will notify appropriate tribal authorities (if applicable)
- b. Place Consult for C.A.R.E.S Clinic
- c. Consult Child Life Specialist
- d. Consult neurosurgery, orthopedic surgery, otolaryngology, ophthalmology, plastic surgery, urology, dental and oral maxillofacial surgery as indicated
- e. No need for Ophthalmology consult if ALL the following are present:
 - a. Normal head CT scan, with only a single non occipital skull fracture
 - b. Normal mental status/neurological exam
 - c. No facial bruising
- f. Refer to Attachment C: Diagnosis Coded for Defining Fatal Abuse Head Trauma in Children

II. Disposition

- a. If any suspicion of NAT has been raised during the ED encounter, a face-to-face care team “huddle” must take place prior to ED discharge. All members involved in the patient’s care should participate including (at a minimum) the ED physician, ED RN and Social Worker.
- b. Prior to hospital discharge clearance must be obtained from Trauma Attending and Child Protective Agency as documented by Social Worker/ Case Manager
- c. Outpatient follow-up made with C.A.R.E.S. Clinic

NON ACCIDENTAL TRAUMA MANAGEMENT

E. Communication

I. Communicating with families

- a. Clearly state your role as an advocate for the child or adolescent.
- b. Be direct and objective as you proceed through the screening process.
- c. Use a neutral tone and avoid accusatory statements to present the appearance of being nonjudgmental.
- d. Notify parents that physical abuse is a consideration in the trauma work up of their child and that abuse can occur without obvious physical examination findings.

ATTACHMENTS

Attachment A: Red Flags and NAT Algorithm

Attachment B: Skeletal Survey

Attachment C: Diagnosis Coded for Defining Fatal Abuse Head Trauma in Children

Attachment D: Special Considerations

NON ACCIDENTAL TRAUMA MANAGEMENT

Trauma Program Director

Date

Assistant Trauma Medical Director

Date

Trauma Medical Director

Date

Review/Revision Date
08/2020

NON ACCIDENTAL TRAUMA MANAGEMENT

ATTACHMENT A: RED FLAGS AND NAT ALGORITHM

“Red Flag” History of Present Injury

- No history or inconsistent history
- Changing history
- Unwitnessed injury
- Delay in seeking care
- Prior ED visit
- Domestic Violence in home
- Premature infant (< 37 weeks)
- Low birth weight/Intrauterine growth restriction
- Chronic medical conditions
- Injuries described as self-inflicted or inflicted by another child
- Injuries not compatible with developmental stage of the child

“Red Flag” Physical Exam Findings

- Torn frenulum
- FTT (weight, length, head circumference)
- Large heads in infants (consider measuring of OFC in children < 1 yr)
- Any bruise in any non-ambulating child - “if you don’t cruise you don’t bruise”
- Any bruise in a non-exploratory location {especially the TEN region-Torso (area covered by a standard girl’s bathing suit), Ears and Neck} < 4yrs old (TEN-4)
- Bruises, marks, or scars in patterns that suggest hitting with an object
- Multiple injuries with different stages of healing
- Poor hygiene or poor caretaker-child interaction
- Patterned injuries: hand imprint, cigarette burns, grill marks, or loop marks

“Red Flag” Radiographic Findings

- Metaphyseal fractures (Bucket handle or corner)
- Rib fractures (especially posterior) in infants
- Any fracture in a non-ambulating infant
- An undiagnosed healing fracture
- SDH and/or SAH on neuro-imaging in young children, particularly in the absence of skull fracture < 1 year
- Scapular and spinous process fractures
- Sternal fractures
- Multiple “eggshell”, Occipital impression Fractures and fractures crossing sutures

Recommended evaluation in cases of suspected physical abuse

Note: If patient presents at any UMC Freestanding Emergency department, with “Red Flag” findings, please initiate trauma transfer for complete NAT workup.



NON ACCIDENTAL TRAUMA MANAGEMENT

Laboratory

General for most patients:

- CBC & platelets; PT/PTT/INR (if concern of low/falling Hgb, repeat in am with retic) CMP
- Urinalysis – Dip, send for microscopic

If altered mental status or seizure activity

- Urine toxicology screen (if suspicion of substance abuse)

If fractures are present:

- Phos
- PTH
- Vit D 25-OH

If Suspected Abdominal injury:

- LFT
- Amylase
- Lipase
- Stool occult blood



Radiology

- Skeletal imaging for < 2 years old
 - Ordered AFTER admission to EPCH
- Head CT (non-contrast with 3D reconstruction) if
 - < 6 months of age and other findings of abuse
 - Bruising to face or head AND < 12 months of age
 - Neurologic symptoms < 12 months of age (including soft symptoms such as vomiting, fussiness)
- Ocular Examination
 - Children <2, Obtain clearance for pupil dilation from Neurosurgery
- MRI neck
 - Consider cervical, thoracic and lumbar MRI if intracranial injuries were found
 - Consider CTA/MRA neck if C1-C3 fractures are diagnosed
- Thoracic Imaging
 - Routine CT of the chest is not recommended
 - Chest CT with IV contrast may be indicated if the following are suspected hemopericardium, cardiac contusion, and cardiac laceration.
- Abdominal CT if (Refer to Policy TR-P-39 Pediatric Diagnostic Imaging Guideline)
 - Signs and/or symptoms of abdominal trauma
 - ALT or AST if twice normal



NON ACCIDENTAL TRAUMA MANAGEMENT

Consults

- Social Work
- C.A.R.E.S. Clinic
- Child Life Specialist
- Report to Child Protective Services (CYFD if New Mexico)
- Call 911 to report suspicion of abuse
- Sexual Assault Nurse Exam if suspicion of sexual abuse
- Consult orthopedic surgery, otolaryngology, plastic surgery, urology, dental and oromaxillofacial surgery are consulted as needed
- If Head CT abnormal and abuse is being considered, call
 - Neurosurgery
 - Ophthalmology for retinal exam*

*An Ophthalmology consult for a dilated eye exam is not necessary as part of the evaluation for physical abuse IF ALL OF THE FOLLOWING CRITERIA ARE MET:

- NORMAL head CT or CT with only a single, simple non-occipital skull fracture
- NORMAL mental status/neurologic exam
- No Facial Bruising



Disposition

- If any suspicion of NAT has been raised during the ED encounter, a face-to-face care team “huddle” must take place prior to ED discharge. All members involved in the patient’s care should participate including (at a minimum) the ED physician, ED RN and Social Worker.
- Prior to hospital discharge clearance must be obtained from Trauma Attending and Child Protective Agency as documented by Social Worker/ Case Manager
- Outpatient follow-up made with C.A.R.E.S. Clinic



Communication

- Clearly state your role as an advocate for the child or adolescent.
- Be direct and objective as you proceed through the screening process.
- Use a neutral tone and avoid accusatory statements to present the appearance of being nonjudgmental.
- Notify parents that physical abuse is a consideration in the trauma work up of their child and that abuse can occur without obvious physical examination findings.

NON ACCIDENTAL TRAUMA MANAGEMENT

ATTACHMENT B: SKELETAL SURVEY

KEY NOTES:

- Perform skeletal surveys on all children under 2 years of age with clinical suspicion of abuse.
- Between 2 to 5 years of age, use specific clinical indicators of abuse to determine the use of imaging.
- Skeletal surveys are of little use in children after the age of 5 years.
- A full body “babygram” is not an acceptable substitute for non-accidental trauma. .

TABLE-1 COMPLETE SKELETAL SURVEY

Skeletal Portions	Views to Obtain
APPENDICULAR SKELETON (individual bilateral views)	Humerus (AP) Forearm (AP) Hand (PA) Femur (AP) Lower leg (AP) Foot (AP or PA)
APPENDICULAR SKELETON (individual bilateral views)	Thorax (AP, lateral, right and left obliques), to include sternum, ribs, thoracic and upper lumbar spine Pelvis (AP), to include the mid lumbar spine Lumbosacral spine (lateral) Cervical spine (AP and lateral) Skull (frontal and lateral)

NON ACCIDENTAL TRAUMA MANAGEMENT

**ATTACHMENT C: DIAGNOSIS CODED FOR DEFINING FATAL ABUSE HEAD
TRAUMA IN CHILDREN**

**ICD-10 Codes for Defining Fatal Abusive Head Trauma in Children under the Age of 5
Years**

	Clinical Diagnosis Code		Injury Code
	ICD-10 Narrow Definition	ICD-10 Broad Definition	ICD-10 External Cause of Injury or Abuse Code
Definite or Presumptive Abusive Head Trauma	S06.0-S06.9, S09.7-S09.8, T90.5	S02.0-S02.1, S02.7-S02.9, S04.0, S06.0-S06.9, S07.1, S07.8-S07.9, S09.7-S09.8, T90.2, T90.5, T90.8-T90.9	Y00, Y01, Y04, Y07.0-Y07.3, Y07.8-Y07.9, Y08, Y09, Y87.1, T74.1, T74.8-T74.9
Probable Abusive Head Trauma	All of those above	All of those above	Y29, Y30, Y33, Y34, Y87.2

NON ACCIDENTAL TRAUMA MANAGEMENT

ICD 10 Codes for defining fatal abusive head trauma in children under the age of 5

Code	Meaning
S02	Fracture of skull and facial bones
S02.0	Fracture of vault of skull
S02.1	Fracture of base of skull
S02.7	Multiple fractures involving skull and facial bones
S02.8	Fractures of other skull and facial bones
S02.9	Fracture of skull and facial bones, part unspecified
S04.0	Injury of optic nerve and pathways
S06.0	Concussion
S06.1	Traumatic cerebral edema
S06.2	Diffuse brain injury
S06.3	Focal brain injury
S06.4	Epidural hemorrhage
S06.5	Traumatic subdural hemorrhage
S06.6	Traumatic subarachnoid hemorrhage
S06.7	Intracranial injury with prolonged coma
S06.8	Other intracranial injuries
S06.9	Intracranial injury, unspecified
S07.1	Crushing injury of skull
S07.8	Crushing injury of other parts of head
S07.9	Crushing injury of head, part unspecified
S09.7	Multiple injuries of head
S09.8	Other specified injuries of head
T74.1	Physical abuse
T74.8	Other maltreatment syndromes
T74.9	Maltreatment syndrome, unspecified
T90.2	Sequelae of fracture of skull and facial bones
T90.5	Sequelae of intracranial injury
T90.8	Sequelae of other specified injuries of head
T90.9	Sequelae of unspecified injury of head
Y00	Assault by blunt object
Y01	Assault by pushing from high place
Y04	Assault by bodily force
Y07	Other maltreatment syndromes
Y07.0	By spouse or partner
Y07.1	By parent
Y07.2	By acquaintance or friend
Y07.3	By official authorities

NON ACCIDENTAL TRAUMA MANAGEMENT

Y07.8	By other specified persons
Y07.9	By unspecified person
Y08	Assault by other specified means
Y09	Assault by unspecified means
Y29	Contact with blunt object, undetermined intent
Y30	Falling, lying or running before or into moving object, undetermined intent
Y33	Other specified events, undetermined intent
Y34	Unspecified event, undetermined intent
Y87.1	Sequelae of assault
Y87.2	Sequelae of events of undetermined intent

NON ACCIDENTAL TRAUMA MANAGEMENT

**ATTACHMENT D:
SPECIAL CONSIDERATIONS**

Bite Marks

Physical and sexual abuse should be considered when bite marks are present on a child. They will appear as an ovoid or elliptical bruise, or abrasion. There may be a central area of ecchymosis from closing of the teeth by suctioning or tongue thrusting. Although bite marks from an adult are concerning for abuse, other children or animals can cause bite marks that will result in different injury patterns. Human bites usually are superficial, while bites from animals tend to be deeper. It is more difficult to see individual tooth marks from a human bite, whereas animal bites have more distinguishable teeth markings. If tooth markings are seen from a human bite, the spacing between teeth marks can help differentiate between an adult and a child. The typical distance between the mandibular canines in adults is usually greater than 3.0 cm, while in children, the space tends to be smaller at approximately 2.5 cm. Given the small variability in distance between canine teeth in adults and children, forensic dentistry can be helpful in evaluating the pattern of the bite injury in more detail.

Medical Child Abuse

Medical child abuse (also known as Munchausen syndrome by proxy or factitious disorder imposed on another), is a form of child abuse due to fabricated ailments that are caused by the primary caregiver. This condition will lead to physical harm due to unnecessary testing prompted by the caregiver. There is an association between children who have complex medical needs and medical child abuse. Caregivers often are female and in the medical field. Red flags that should prompt suspicion for medical child abuse include multiple visits, objective data inconsistent with the history, request for invasive testing, caregiver is resistant to obtaining records, and unexplained symptoms only witnessed by the caregiver.

Medical-Legal Consideration

If child abuse is suspected, then a child protective services report is mandated, even if it is a suspicion and not a certainty. All state laws offer some form of protection for good-faith reporting. All cases of suspected abuse should be documented in a careful, thoughtful, and complete manner. Although difficult, it is in the best interest of the investigation to involve parents from the beginning. This means notifying them that a report has been filed. Early law enforcement involvement is important. The Health Insurance Portability and Accountability Act of 1996 allows for disclosure of protected health information without parental permission when physicians have made a child protective services report. It is helpful to involve social workers because they can help explain the process and the next steps to the family and child. A child may need to be admitted, whether it is for his or her own safety, or for further evaluation by subspecialists.

**PEDIATRIC BLUNT ABDOMINAL INJURY AND MANAGEMENT OF SOLID
ORGAN INJURY GUIDELINE**

POLICY PURPOSE:

Provider guideline to assess, identify and guide pediatric patient with blunt abdominal injuries.

RESPONSIBLE

Trauma Medical Director
Associate Trauma Medical Director
Assistant Trauma Medical Director
Trauma Program Director
Physicians, Residents, Allied Health Professionals (AHPs)
Diagnostic Imaging Department Associates
Trauma Service Coordinators

LITERATURE REFERENCES

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**PEDIATRIC BLUNT ABDOMINAL INJURY AND MANAGEMENT OF SOLID
ORGAN INJURY GUIDELINE**

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PI TRIGGERS FOR REVIEW

- Lack of documentation of injury grade.
- Unplanned admission to ICU
- Interventional Radiology response team timeliness
- Vaccinations not ordered/not administered
- In-house consult response greater than (>)10 minutes

KEY NOTES:

- Management of blunt abdominal trauma should be guided by hemodynamic status, rather than the injury grade on imaging.
- Patients that exhibit external signs of abdominal trauma warrant abdominal imaging. Refer to TR-P-39 Pediatric Diagnostic Imaging Guideline.
- Obtain appropriate laboratory studies for suspected abdominal trauma.
- Patients that are hemodynamically stable may undergo non-operative management (NOM).
- Transfusion is recommended in patients with unstable vital signs after 20 cc/kg bolus of isotonic intravenous fluids, hemoglobin < 7, and signs of ongoing or recent bleeding.
- Failure of non-operative management (NOM) include signs of ongoing bleeding or persistent unstable vital signs despite ongoing transfusion. Further interventions are determined by the trauma surgeon.

PROCEDURE

A. ASSESSMENT

- a. Initial evaluation:

**PEDIATRIC BLUNT ABDOMINAL INJURY AND MANAGEMENT OF SOLID
ORGAN INJURY GUIDELINE**

12. Perform the primary and secondary surveys.
 13. Obtain necessary diagnostic imaging as indicated. Refer to TR-P-39 Pediatric Diagnostic Imaging.
- b. The following are considered to be at higher risk for abdominal trauma:
8. Motor vehicle collision: high speed (≥ 40 mph), ejection, or rollover.
 9. Automobile vs. pedestrian/bicycle: moderate speed (≥ 5 mph).
 10. Drivers or riders of motorcycles and ATVs.
 11. Unconscious patients.
 12. Patients presenting with crush injury to the torso.
 13. Physical assault to torso and abdomen.
 14. Patients sustaining falls ≥ 20 ft (Level 2 Trauma).
- c. Obtain abdominal laboratory series on patients with suspected abdominal injury.
6. Complete Blood Count (CBC).
 7. Basic metabolic panel.
 8. Amylase Level.
 9. Lipase Level.
 10. Liver Function Test (LFTs).
 11. Complete Urinalysis with micro (UA).

C. ADMISSION

1. Admission

i. ICU Admission Indicators

1. Abnormal vital signs after initial volume resuscitation
2. Activity -Bedrest until vitals normal
3. Labs –Every 6 hour CBC until vitals normal
4. Diet –NPO until vital signs normal and hemoglobin stable

ii. Floor

1. Activity -No restrictions
2. Labs -CBC on admission and/or 6 hours after injury
3. Diet –Regular diet

Note: If the patient is hemodynamically stable with a stable hemoglobin, the patient can be started on prophylactic enoxaparin within 24-48 hours after approval by Trauma attending (15 years of age or greater) Refer to TR-P-.18 Protocol for the Prevention of Thromboembolic Complications in Trauma Patients.

**PEDIATRIC BLUNT ABDOMINAL INJURY AND MANAGEMENT OF SOLID
ORGAN INJURY GUIDELINE**

B. PROCEDURES

a. Transfusion

- i. Unstable vitals after 20 cc/kg bolus of isotonic intravenous fluids
- ii. Hemoglobin < 7 g/dL
- iii. Signs of ongoing or recent bleeding

b. Imaging

- i. Refer to TR-P-39 Pediatric Diagnostic Imaging Guideline for guidance on CT scan.
- ii. If CT scan is obtained, the splenic/liver injury should be graded per the AAST scale and must be documented. Refer to Attachment A Guiding principles and Injury Scale.
- iii. Liver and splenic injuries. Refer to Refer to Attachment B ATOMAC Algorithm.
- iv. Patients requiring splenic embolization or splenectomies require administration of the following three (3) vaccinations: pneumococcal conjugate, haemophilus b conjugate, and meningococcal conjugate.
 1. For patients greater than or equal to two (2) months of age: haemophilus b conjugate (PRP-T) vaccine
 2. For patients 2 months - 24 months of age: pneumococcal 13-valent conjugate vaccine
 3. For patients greater than 24 months of age: pneumococcal 23-polyvalent vaccine
 4. Administer vaccinations 14 days post splenectomy/ embolization, or prior to discharge.

c. Angioembolization

- i. Signs of ongoing bleeding despite blood transfusion
- ii. Not indicated for contrast blush on admission CT without unstable vitals

d. Operative Management

- i. Unstable vitals despite blood transfusion
- ii. Consider massive transfusion protocol. Refer to TR-S-19 Mass Transfusion for Trauma Patients at UMC and BB-041 Blood Products for Mass Transfusion at EPCH.

C. DISCHARGE

**PEDIATRIC BLUNT ABDOMINAL INJURY AND MANAGEMENT OF SOLID
ORGAN INJURY GUIDELINE**

- a. Based on clinical condition **NOT** injury severity grade
- b. Tolerating a diet
- c. Minimal abdominal pain
- d. Normal vital signs

D. PATIENT ACTIVITY RESTRICTION:

- a. Restricting activity to grade plus 2 weeks is safe
- b. Children may return to school when comfortable and able.
- c. May consider repeat imaging for symptomatic patients with prior high grade injuries.
- d. Contact sports should be evaluated

E. POTENTIAL NON-OPERATIVE SPLENIC COMPLICATIONS:

1. OPSI (Overwhelming Post-Splenectomy Infection)
2. Splenic cysts

F. POTENTIAL NON-OPERATIVE HEPATIC COMPLICATIONS:

1. Elevated bilirubin or alkaline phosphates or jaundice may indicate a biloma
2. Delayed hemorrhage from a hepatic artery pseudoaneurysm may present as an upper GI hemorrhage due to hemobilia.
3. Fever and/or leukocytosis may indicate a hepatic abscess

**PEDIATRIC BLUNT ABDOMINAL INJURY AND MANAGEMENT OF SOLID
ORGAN INJURY GUIDELINE**

Trauma Program Director

Date

Assistant Trauma Medical Director

Date

Trauma Medical Director

Date

Review/Revision Date
10/2020

**PEDIATRIC BLUNT ABDOMINAL INJURY AND MANAGEMENT OF SOLID
ORGAN INJURY GUIDELINE**

ATTACHMENT A: KEY POINTS AND INJURY DESCRIPTION

KEY POINTS

- NOM is the treatment of choice for blunt hepatic and splenic injuries in hemodynamically stable patients. Non-operative management is the standard of care in hemodynamically stable children with isolated blunt and splenic injuries, irrespective of the grade of injury.
- Abdominal/Pelvic Computed Tomography (CT) scan with intravenous contrast is the most reliable test to identify and assess the severity of blunt hepatic and splenic injuries.
- Injury grade, degree of hemoperitoneum, neurologic status and/or the presence of associated injuries are not contraindications to non-operative management.
- Hemodynamic status is the most reliable criteria for non-operative management.
- Angiographic embolization is an adjunct to non-operative management of stable patients with evidence of ongoing hemorrhage or the presence of a contrast blush.
- There is no evidence that routine serial CT scans without clinical indications influences either the outcome or the management of the patient. Clinical status of the patient should dictate the frequency of subsequent CT scans.
- Medical clearance to resume normal activity should be based on evidence of healing and typically not by a follow-up CT scan.

**PEDIATRIC BLUNT ABDOMINAL INJURY AND MANAGEMENT OF SOLID
ORGAN INJURY GUIDELINE
AMERICAN ASSOCIATION FOR THE SURGERY OF TRAUMA (AAST)
GRADING INJURY:**

SPLEEN		
Grade	Injury	Description
1	Hematoma	Subcapsular: <10% of surface area.
	Laceration	Capsular tear: parenchymal laceration <1cm depth.
2	Hematoma	Subcapsular: 10-50% surface area, <5cm in diameter Intraparenchymal: <5cm in diameter.
	Laceration	1-3cm parenchymal depth & does not involve a vessel.
3	Hematoma	Subcapsular: >50% surface area or expanding, Intraparenchymal: >5cm.
	Laceration	>3cm parenchymal depth or involving a vessel.
4	Hematoma	Ruptured intraparenchymal hematomas with bleeding.
	Laceration	Involving segmental or hilar vessels with >25% splenic devascularization.
5	Hematoma	Completely shattered spleen.
	Laceration	Hilar vascular injury with devascularized spleen.

LIVER		
Grade	Injury	Description
1	Hematoma	Subcapsular, nonexpanding <10cm surface area.
	Laceration	Capsular tear, <1cm parenchymal depth.
2	Hematoma	Subcapsular, non-expanding 10-50% surface area Intraparenchymal, <10cm in diameter.
	Laceration	Capsular tear, 1-3cm parenchymal depth, 10cm length, active bleeding.
3	Hematoma	Subcapsular, >50% surface area, ruptured subcapsular hematomas with active bleeding. Intraparenchymal hematoma, >10cm or expanding.
	Laceration	Capsular tear >3cm parenchymal depth. Vascular injury with active bleeding contained within liver parenchyma.
4	Hematoma	Ruptured intraparenchymal hematomas with bleeding.
	Laceration	Parenchymal disruption involving 25-75% of hepatic lobe or 1-3 Couinaud segments.
5	Hematoma	Parenchymal disruption involving >75% of hepatic lobe or >3 Couinaud segments.
	Laceration	Juxtahepatic venous injuries (i.e., retrohepatic venacava/central major hepatic veins).
6		Hepatic avulsion

**PHYSICIAN GUIDELINE FOR CONCUSSION MANAGEMENT IN PEDIATRIC
PATIENTS**

POLICY PURPOSE:

To outline concussion management process to maximize patient outcomes.

RESPONSIBLE

Trauma Medical Director
Associate Trauma Medical Director
Assistant Trauma Medical Director
Pediatric Trauma Medical Director
Trauma Program Director
Trauma Service Coordinators
Neurosurgeons
Surgery Faculty and Residents
Emergency Medicine Faculty and Residents
Allied Health Professionals (AHPs)
Nursing Associates

LITERATURE REFERENCES

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**PHYSICIAN GUIDELINE FOR CONCUSSION MANAGEMENT IN PEDIATRIC
PATIENTS**

modified acute concussion evaluation tools in the emergency department. Pediatrics.
133(4) pages 635-642.

PI TRIGGERS:

- On-Call Consult Response (Delay)
- Treatment Protocols not Followed

DEFINITION:

A mild traumatic brain injury (mTBI), or concussion is an injury to the brain resulting from a force or jolt applied directly or indirectly to the head. The injury may produce a range of possible symptoms and may or may not, involve a Loss of Consciousness (LOC). Disturbance of brain function is related to neurometabolic dysfunction, rather than structural injury and is typically associated with normal structural neuroimaging findings (i.e., computed tomography (CT) scan or magnetic resonance imaging (MRI)). Concussion results in a constellation of cognitive, somatic, emotional and sleep-related symptoms. Duration of symptoms are variable and may last for as short as several minutes and last as long as several days, weeks, months or even longer in some cases.

PROCEDURE:

- G. Determine mechanism of injury.
1. Rule out severe traumatic brain injury. (Refer to TR-P-7 Head Injury Guideline).
 2. Assess length of LOC (< 30 minutes, < one hour, < six hours, < 24 hours or > 24 hours for possible diffuse axonal injury).
- H. Determine need for imaging.
1. Use PECARN algorithm (refer to TR-P-39 Pediatric Imaging Guideline) to predict risk for more severe injury and to determine need for CT or MRI. Imaging may be needed if the following are present:
 - a. Age < 2 years old
 - b. Recurrent vomiting
 - c. LOC
 - d. Mechanism of injury severity

**PHYSICIAN GUIDELINE FOR CONCUSSION MANAGEMENT IN PEDIATRIC
PATIENTS**

- e. Severe or worsening headache
 - f. Amnesia
 - g. Non-frontal scalp hematoma
 - h. Glasgow Coma Score (GCS) < 15
 - i. Clinical suspicion for skull fracture
- I. Determine need for admission.
- 1. Consider admission if patient has one or more of the following symptoms:
 - 1. Moderate to severe prolonged headache
 - 2. Persistent nausea or vomiting
 - 3. Vertigo
 - 4. Ataxia
 - 5. Lethargy or somnolence
 - 6. Confusion
 - 7. Memory loss
 - 8. Ringing ears
 - 9. Difficulty concentrating
 - 10. Sensitivity to light
 - 11. Loss of smell or taste
 - 2. Patients requiring admission will be admitted to the trauma service with non-urgent neurosurgical consultation unless the findings on CT scan dictate otherwise.
 - 3. Patients with recent linear skull fractures may be admitted for observation if the CT is otherwise normal.
 - a. All pediatric trauma patients under the age of 15 require a Pediatric Hospitalist consult.
 - b. The Hospitalist will see the patient within 24 hours of admission (Refer to TR-P-4).

MANAGEMENT:

- A: Provide patient and/or caregiver with information regarding concussion:
- 6. Warning signs and symptoms that injury may be more serious.
 - 7. Recovery course.
 - 8. How to prevent further injury.

**PHYSICIAN GUIDELINE FOR CONCUSSION MANAGEMENT IN PEDIATRIC
PATIENTS**

9. Gradual re-introduction of activity that does not worsen symptoms.
 10. The need for social and emotional support.
- B:** Provide clear instructions on return to activity including work, school and/or sport activities that are customized to the patient's symptoms.
1. Indicate to patient and caregiver specifics related to contact sport activities.
 2. For example: No return to contact sport activity (football) until symptom-free without the use of analgesics with exertion.
- C:** Provide patient and/or caregiver with concussion education material as part of hospital depart process.

DISCHARGE FOLLOW UP REFERRAL:

- A.** Patients with a concussion and minor head injury discharged from the hospital should follow-up with their pediatrician, neurosurgeon or trauma surgery clinic.
- B.** Follow-up referrals incorporating neurology, psychiatry, cognitive therapy and/or psychological counseling will be ordered if indicated.
1. Consider neuroimaging for acutely worsening symptoms.
 2. Multi-disciplinary evaluation for chronic headache non-opioid analgesia use (monitor for overuse).
 3. Vestibular rehabilitation for vestibulo-ocular symptoms.
 4. Referral to sleep specialist for worsening sleep problem or need for sleep hygiene.
 5. Neuropsychological evaluation for cognitive impairment treatment directed at etiology.
 6. Psychological evaluation for emotional dysfunction and psychotherapeutic evaluation and treatment.

**PHYSICIAN GUIDELINE FOR CONCUSSION MANAGEMENT IN PEDIATRIC
PATIENTS**

Trauma Program Director

Date

Medical Director, Neurosurgery Division

Date

Assistant Trauma Medical Director/
Pediatric Trauma Medical Director

Date

Trauma Medical Director

Date

Reviewed/Revised
2/2021

**PEDIATRIC TRAUMATIC HEMORRHAGE: ANTIFIBRINOLYTIC CONTROL WITH
TRANEXAMIC ACID (TXA)**

POLICY PURPOSE

Guideline to treat pediatric trauma patients who have active or anticipated hemorrhage within three (3) hours of the initial traumatic injury. TXA administered as soon as possible from time of injury increases efficacy.

RESPONSIBLE

Trauma Faculty, Residents, and Advanced Healthcare Practitioners (AHPs)
Trauma Medical Director
Associate Trauma Medical Director
Pediatric Trauma Medical Director
Trauma Program Director
Trauma Service Coordinators
Licensed Nursing Associates
Pharmacists

LITERATURE REVIEW

Cornelius, B., Cummings, Q., Assercq, M., Rizzo, E., Gennuso, S. and Cornelius, A. (2021). Current practices in tranexamic acid administration for pediatric trauma patients in the United States. Society of Trauma Nurses. 28 (1): 21-25.

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PI TRIGGERS FOR REVIEW

- Trauma Death
- Treatment Protocols not Followed

Indications:

- Prophylactic/Treatment of trauma or surgery with major bleeding/hemorrhage expected
- Strong need to avoid transfusion or blood is not an option
- Preexisting anemia or coagulopathy
- Preexisting hypofibrinogenemia

**PEDIATRIC TRAUMATIC HEMORRHAGE: ANTIFIBRINOLYTIC CONTROL WITH
TRANEXAMIC ACID (TXA)**

- To control bleeding in patients treated with inhibitors of platelet function and new oral anticoagulants
- Difficult to cross-match because of antibodies

Contraindications:

- Hypersensitivity
- Active thromboembolic disease
- Fibrinolytic conditions with consumption coagulopathy

PROCEDURE

G. The Trauma Attending or designee is responsible for ordering TXA (trauma paper order set or Electronic Medical Record (EMR)).

H. The order must be written/entered as STAT:

I. Laboratory Orders include the following: Type and Cross-match (T&C), INR, ROTEM (Rotational thromboelastometry), Venous Blood Gas (VBG) or Arterial Blood Gas (ABG) with electrolytes and lactate.

J. TXA Loading Dose:

- Age less than twelve: 15mg/kg IV over 10 minutes. One gram IV added to 100 ml sodium chloride 0.9% and administer calculated weight dose.
- Age twelve and greater: One gram intravenous (IV) over 10 minutes. Add one gram IV to 100 ml sodium chloride 0.9%.
- Do not repeat loading dose if already administered by pre-hospital or at transferring facility. Based on patient's condition, it is the physician's discretion to proceed with maintenance dose when loading dose was administered prior to patient's arrival.

K. TXA Maintenance Dose:

1. Age less than twelve: 2 mg/kg/hr over 8 hours. One gram IV added to 100 ml sodium chloride 0.9% and administer calculated weight dose.
2. Age twelve and greater: One gram IV added to 100 ml sodium chloride 0.9% and infuse over eight (8) hours (12.5ml/hr).

**PEDIATRIC TRAUMATIC HEMORRHAGE: ANTIFIBRINOLYTIC CONTROL WITH
TRANEXAMIC ACID (TXA)**

3. Do not:
 - a. Administer via Y-site injection
 - b. Infuse with blood or
 - c. Infuse with solutions containing Penicillin or Mannitol.

- L. All patients receiving TXA will undergo concurrent review by the trauma performance improvement process.

- M. See Attachment A for TXA dose guide.

**PEDIATRIC TRAUMATIC HEMORRHAGE: ANTIFIBRINOLYTIC CONTROL WITH
TRANEXAMIC ACID (TXA)**

Trauma Program Director

Date

Dir. Pharmaceutical Clinical Services

Date

Pediatric Trauma Medical Director

Date

Trauma Medical Director

Date

Review/Revision History:

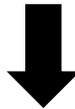
Trauma Department	Pharmacy & Therapeutics Committee
02/2021	

**PEDIATRIC TRAUMATIC HEMORRHAGE: ANTIFIBRINOLYTIC CONTROL WITH
TRANEXAMIC ACID (TXA)**

ATTACHMENT A:

Administration Criteria:

- Less than three (3) hours from time of injury
- Prophylactic/Treatment of trauma or surgery with major bleeding/hemorrhage expected
- Strong desire to avoid transfusion or blood is not an option
- Preexisting anemia or coagulopathy
- Preexisting hypofibrinogenemia
- To control bleeding in patients treated with inhibitors of platelet function and new oral anticoagulants
- Difficult to cross-match because of antibodies



Loading Dose IV over 10 minutes: Mix 1gm in 100ml NS		Maintenance Dose IVPB over 8 hours: Mix 1gm in 100ml NS	
Age	Dose	Age	Dose
12 years and greater	1gm	12 years and greater	1gm/100ml or 12.5ml/hr
Less than 12 years	15mg/kg	Less than 12 years	2mg/kg/hr

MANAGEMENT OF CROTALINE SNAKEBITE

POLICY

To provide management guideline for patients who sustain bite and subsequent envenomation by Crotaline snakes (rattlesnakes, copperheads, and cottonmouths/water moccasins) and minimize unnecessary interventions.

RESPONSIBLE

Emergency Medicine Faculty, Residents and Advance Practice Providers (APPs)
Medical Toxicology Faculty
West Texas Regional Poison Center (WTRPC) Staff
Trauma Medical Director
Associate Trauma Medical Director
Assistant Trauma Medical Director
Trauma Program Director
Surgery Faculty, Residents and APPs

REFERENCES

Lavonas, E. J., Ruha, A. M., Banner, W., Bebart, V., Bernstein, J. N., Bush, S. P., & Dart, R. C. (2011). Unified treatment algorithm for the management of crotaline snakebite in the United States: results of an evidence-informed consensus workshop. *BMC emergency medicine*, *11*(1), 1-16.

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Greene, S., Cheng, D., Vilke, G. M., & Winkler, G. (2021). How Should Native Crotalid Envenomation Be Managed in the Emergency Department?. *The Journal of Emergency Medicine*.

PI TRIGGERS

- Extremity Compartment Syndrome
- Treatment Protocol not followed (i.e. antibiotic administration or chemical thromboembolic prophylaxis)

MANAGEMENT OF CROTALINE SNAKEBITE

- Unplanned Surgical Procedure

GUIDING PRINCIPLES

- Patients with clinical or laboratory evidence of initial or worsening envenomation should receive antivenom as early as possible.
- There is no indication for prophylactic antibiotics or corticosteroids. Use of ASA/NSAIDs, ice, and anticoagulants including chemical DVT prophylaxis is contraindicated.
- Fasciotomy should not be performed without direct measurement of elevated intracompartmental pressures and it should only be considered after administration of additional doses of antivenom and in consultation with Attending Medical Toxicologist.

PROCEDURE

A. Determine if snakebite victim has been envenomated versus dry bite.

1. Evidence of envenomation is defined as one or more of the following:

- a. Tissue Toxicity:
 - i. Local tender induration at bite site progressing proximally (if extremity) or outward (if truncal) at rate > 2-3 cm/hour (no need to measure extremity circumferences).
- b. Hemotoxicity:
 - i. Platelets <150 k/uL OR Fibrinogen <150 mg/dL (usually PT/PTT will be prolonged in presence of hypofibrinogenemia).
- c. Systemic / Neurotoxicity:
 - i. Metallic taste, nausea, vomiting, diarrhea
 - ii. Dizziness, syncope, hypotension
 - iii. Angioedema

MANAGEMENT OF CROTALINE SNAKEBITE

B. Management of potential dry bite:

1. Obtain labs upon presentation to the Emergency Department (ED): CBC, Fibrinogen, PT, PTT.
2. Repeat labs after six to seven (6-7) hours of ED observation status.
3. Update Tdap PRN.
4. Pain control (no ASA/NSAIDs or ice until after second set of labs are normal and dry bite confirmed).
5. If no evidence of envenomation clinically or after two sets of labs, patient may be discharged from ED at end of an eight (8) hour observation period.

C. Management of the envenomated patient:

1. Obtain initial control:
 - a. Call West Texas Regional Poison Center 1-800-222-1222 as early as possible and speak directly with the Attending Medical Toxicologist.
 - b. No peripheral intravenous (PIV) catheter or infusions, tourniquets, jewelry, or blood pressure measurement to affected extremity.
 - c. Pain control (no ASA/NSAIDs; no ice).
 - d. Keep extremity elevated above the level of the heart.
 - e. Obtain labs on ED presentation: CBC, Fibrinogen, PT, aPTT.
 - f. Administer antivenom as below in consultation with Medical Toxicologist until Initial Control.
 - i. Definition of initial control:
 - a) Swelling no longer progressing at rate $>2-3$ cm/hour
 - b) Platelets $>150k/uL$ AND Fibrinogen >150 mg/dL

MANAGEMENT OF CROTALINE SNAKEBITE

- c) Hemodynamic stability with improvement of neurologic/systemic signs and symptoms.
 - ii. Antivenom (Formulary: Crotalidae Immune F(ab)2 [equine] [Anavip]) dosing
 - a) For tissue toxicity and hemotoxicity: administer 10 vials in 250 ml NS IV infused at 25 to 50 ml/hr for the first 10 minutes. If no allergic reaction, then increase rate to 250 ml/hr. Repeat every one (1) hour until initial control obtained.
 - b) For severe systemic toxicity: administer 20 vials in 250 ml NS IV infused at 25 to 50 ml/hr for the first 10 minutes. If no allergic reaction, then increase rate to 250ml/hr.
 - iii. Maintenance dosing is NOT indicated.
 - iv. If initial control is lost during 18 hour observation period, administer additional four (4) vials of antivenom in consultation with West Texas Regional Poison Center (WTRPC).
 - v. If patient is transferred from an outside hospital after receiving a different brand of antivenom (i.e. CroFab), administer Anavip only if clinically necessary and in consultation with WTRPC.
- 2. Observation period after initial control obtained:
 - a. Update Tdap PRN
 - b. Obtain radiograph of site to evaluate for retained fang
 - c. Admit to SICU under Trauma service for minimum 18-hour observation
 - d. Perform hourly assessments of extremity for progression of swelling (loss of initial control).
 - e. Pain control (no ASA/NSAIDs, no ice)
 - f. Keep extremity elevated above the level of the heart
 - g. Labs (CBC, Fibrinogen, PT, PTT) every six (6) hours times three (x3)

MANAGEMENT OF CROTALINE SNAKEBITE

- h. PT/OT consult
 - i. No DVT prophylaxis
 - j. No antibiotic prophylaxis
 - k. No need for orthopaedic, plastic surgery, or other surgical subspecialty consult(s) except on extremely rare occasions
 - l. If no loss of initial control during 18 hour observation period, patient's acuity status may be lowered to floor status (or discharge if pain controlled and seen by PT/OT).
 - m. If loss of initial control (proximal progression of tender induration greater than two to three (> 2-3) cm/hour **or** Platelets <150 k/uL **or** Fibrinogen <150 mg/dL):
 - i. Contact Medical Toxicologist to discuss administration of additional doses of antivenom.
3. Discharge Planning:
- a. Patient will need orders for outpatient labs (CBC, Fibrinogen, PT, PTT) at two to three (2-3) days and five to seven (5-7) days post discharge.
 - b. No ASA/NSAIDs, anticoagulants, activities that pose high risk for bleeding or elective procedures for two (2) weeks post snakebite.
 - i. Medications may be resumed earlier on a case-by-case basis. Consider consultation with Cardiology if patient has condition requiring ASA or anticoagulation.

MANAGEMENT OF CROTALINE SNAKEBITE

Emergency Department Director _____
Date

Assistant Administrator, Emergency Services _____
Date

Director of Clinical Services Medical Toxicology _____
Date
Medical Director West Texas Regional Poison Center

Trauma Program Director _____
Date

Trauma Medical Director _____
Date

Review/Revision History:

06/2021