C. S. Mott Children's Hospital

Division of Pediatric Surgery

ACS VERIFIED LEVEL I TRAUMA HANDBOOK 2022

C.S. MOTT
CHILDREN'S HOSPITAL
UNIVERSITY OF MICHIGAN HEALTH

Entirety of Handbook last reviewed 1/20/2022

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CRITICAL PHONE NUMBERS

- **Patient Transfer:** **1-800-822-2233**
- **Survival Flight** 734-93**6-6035**
- **Pediatric Emergency Department:** 734-93**6-4230**
- **Adult Emergency Department:** 734-93**6-6666**
- **Mott OR:** 734-76**3-2430**
- **Mott PACU:** 734-76**3-2513**
- **Pediatric ICU:** 734-76**3-2401**
- **Inpatient Units:**
  - **10E (PICU)** 734-76**3-2401**
  - **10W** 734-23**2-7000**
  - **11W** 734-76**3-3146**
  - **12E** 734-76**4-7102**
  - **12W** 734-23**2-7200**
- **Lab/Blood Bank:** 734-93**6-6888**
- **Anesthesia:** pager: **1534**
- **Gift of Life:** **1-800-482-4881**
- **Child Protection Team:** 734-76**3-0215**
- **Medical Examiner (Washtenaw Co):** **734-232-1127**
- **Poison Control:** **1-800-222-1222**
- **Buckle Up Car Seat Program:** 734-76**3-2251**
- **Mott Bed Coordination Center:** 734-93**6-6039**

PEDIATRIC ASSESSMENT RESOURCES

Normal Heart Rates in Children

Age	Awake Heart Rate (bpm)	Sleeping Heart Rate (bpm)
Neonate	100-190	80-160
Infant	100-180	75-160
Toddler	80-140	60-90
Preschooler	70-120	60-90
School-age	65-110	60-90
Adolescent	60-100	50-90

Normal Blood Pressures in Children

Age	Systolic Pressure (mmHg)	Diastolic Pressure (mmHg)
Neonate	50-70	25-45
Infant	70-100	50-70
Toddler	80-110	50-80
Preschooler	80-115	50-80
School-age	80-120	55-80
Adolescent	90-130	60-88

Normal Respiratory Rates in Children

Age	Rate (breaths per minute)
Neonate	30-60
Infant	30-60
Toddler	24-40
Preschooler	22-34
School-age	18-30
Adolescent	12-16

Glasgow Coma Scale:

	Infant	Child	Score
Eye Opening	Spontaneous	Spontaneous	4
	To speech	To speech	3
	To pain only	To pain only	2
	No response	No response	1
Best Verbal Response	Coos and babbles	Oriented, appropriate	5
	Irritable cries	Confused	4
	Cries to pain	Inappropriate words	3
	Moans to pain	Incomprehensible sounds	2
	No response	No response	1
Best Motor Response	Moves spontaneously and purposefully	Obeys commands	6
	Withdraws to touch	Localizes to painful stimulus	5
	Withdraws in response to pain	Withdraws in response to pain	4
	Abnormal flexion posture to pain	Flexion in response to pain	3
	Abnormal extension posture to pain	Extension in response to pain	2
	No response	No response	1

FLUIDS/ELECTROLYTES/NUTRITION

Intravenous Fluids:
Newborn (<5 kg):
Maintenance IV fluid D10 in 1st 24 hours, otherwise D10 NS /- 10 mEq KCl
Infants (5-20 kg):
Maintenance IV fluid = D5 0.25NS w/ 20 mEq KCl
Resuscitative IV fluid = D5 0.5NS w/ 20 mEq KCl (at up to 1.5-2x mlVF)
Children (> 20 kg):
Maintenance IV fluid = D5 0.25NS w/ 20 mEq KCl
Resuscitative IV fluid = DNS or NS (at up to 1.5-2x mlVF)

Calculating Maintenance Rate
4 mL/kg/hr for 1st 10 kg
2 mL/kg/hr for 2nd 10 kg
1 mL/kg/hr for everything after that

Calculating Maintenance Fluid Requirements in Children (4/2/1 Rule):

Weight	Rate
0-10 kg	4 ml/kg/hr
11-20 kg	40 mL/hr for 1st 10 kg + 2 mL/kg/hr for kg 11-20
> 21 kg	60 mL/hr for 1st 20 kg + 1 mL/kg/hr for kg > 21

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

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

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

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

Calculation of Circulating Blood Volume in Children:

Age	Blood Volume (ml/kg)
Neonate	85-90
Infant	75-80
Child	70-75
Adult	65-70

Blood volume ≈ 8% body weight (80 mL/kg)
PRBC transfusion (Hgb goal - Hgb current) x kg x 3 (or change in Hct x kg)

Mission Statement

C. S. Mott is an American College of Surgeons Level I verified Pediatric Trauma Center. This means that each traumatically injured child that receives care at Mott will receive a multi-disciplianry, coordinated care approach that will optimize patient outcome and rehabilitation.

Philosophy of Care

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

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



LEVEL/CLASS OF TRAUMA:

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

Level I Criteria (<15 minutes response)

- Hypotensive
- Respiratory compromise, obstruction, and intubation
- Transfer of patients from other hospitals receiving blood to maintain vitals
- Penetrating wounds to the abdomen, neck, and chest
- GCS < 8 with trauma mechanism
- ED department physician discretion

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

Level/Class III – Trauma consult

See APPENDIX 1 for full activation criteria

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

Consults:

Spine
- Ortho if no neurological involvement
- NSGY if neurological involvement or already involved in patient's care

Peripheral Nerve Injuries (not involving spine)
- Ortho

"Face"
- Rotating call by plastics, ENT, or OMFS

"Hand" (below elbow)
- Covered by plastics or ortho

Procedures:
Emergent/urgent procedures should be done in trauma bay, otherwise try to perform all other procedures (facial laceration repairs, ventriculostomies, etc.) in the PICU to free up the trauma bay. If patient is going to general unit, then all procedures should be done expeditiously in the ED.

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

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

Admissions:
Traumas are admitted to the pediatric surgery service. Exceptions are isolated injuries with low concurrent injury concerns (eg. isolated fracture with minor MOI) and patients going to PICU. Non-accidental traumas are admitted to pediatric surgery service. If stable after 24 hours, patient may transfer to general pediatrics. Burns are admitted to Trauma Burn service.

Tertiary Survey:
Must be completed 12-36 hours after any trauma patient is admitted
It is a complete head to toe exam to ensure no injuries were missed with the primary or secondary survey

It is possible that an extremity abnormality or other minor injury may be missed if there is a more prominent injury (i.e. pt needs ex lap)

- Please find the otoscope and examine pt ears
- Need to roll patients and examine back if they still have T/L spine precautions
- It is very important to **READ all FINAL radiology reports** to ensure no new findings after pediatric radiology staff reviews. This final reads need to be listed on trauma tertiary survey note
- If we have imaging results from an outside hospital, need to have images read at Mott by pediatric radiologists
- The tertiary survey note can count as daily note as long as you include a subjective update and detail a care plan for both the tertiary exam and for the day

Appendix 1

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

C.S. MOTT CHILDREN'S HOSPITAL

Traumatic Injury with Unstable Vital Signs (determined by age parameters below) OR:

- Gunshot wounds, impaled objects or penetrating wounds to the head, neck, chest or abdomen
- High voltage electric injury/lightning strike
- Threatened limb to include: amputation, near amputation, degloving, significant crush injury (i.e. lawnmower) or pulseless extremity (any of these present in more than just fingers and toes)
- Any burn with unstable vital signs or inhalation injury with threat of airway compromise
- GCS < 8 with mechanism attributed to trauma
- Documented decline in neuro status
- Paralysis following traumatic injury
- Focal neurologic deficit
- Subdural/Epidural (> 1cm thickness or w/midline shift) in patient transferred from another facility
- Respiratory compromise/obstruction
- Intubated trauma patients
- Rescue airway in place
- Transfer patients from other hospital receiving blood or fluids to maintain vital signs
- **Physician discretion**

Age	Respiratory Rate		Systolic BP
0 to 1 years	< 35 or > 50/minute	Or	< 60 mmHg
2 to 5 years	< 25 or > 40/minute	Or	< 70 mmHg
6 to 12 years	< 15 or > 35/minute	Or	< 80 mmHg
>12 years	< 10 or > 30/minute	Or	< 90 mmHg

→ **Class I Trauma**

Physician consideration of Class I activation based on MOI:

- Auto vs. pedestrian/cyclist thrown, run over, or with significant (> 20 mph) impact
- Motorcycle crash > 20 mph
- High-energy dissipation or rapid decelerating incidents such as:
  - Ejection from vehicle, motorcycle, ATV, animal
  - Striking fixed object with mechanism
  - Blast or explosion

Traumatic Injury with Stable Vital Signs (determined by age parameters below) with:

- Multi-system injuries
- Open long bone fractures
- Burns >20% (full- or partial-thickness)
- Full-thickness circumferential burns
- ALL solid organ injury
- Depressed or open skull fracture
- GCS 9-13 (not related to medication administration)
- No change in GCS from initial evaluation
- No focal finding
- Stable respiratory status
- No respiratory distress or need for emergent invasive airway
- No signs or symptoms of shock (SBP within range below)
- No ongoing fluid infusion to maintain
- **Physician discretion**

Age	Respiratory Rate		Systolic BP
0 to 1 years	35 - 50/minute	Or	< 60 mmHg
2 to 5 years	25 - 40/minute	Or	< 70 mmHg
6 to 12 years	15 - 35/minute	Or	< 80 mmHg
>12 years	10 - 30/minute	Or	< 90 mmHg

→ **Class II Trauma**

Physician consideration of Class II activation based on MOI:

- Falls: Child > 10 ft or 5 x height of child
- Blunt abdominal injury with firm or distended abdomen or injury evidence (seatbelt sign, handlebar sign)
- High risk auto crash with:
  - Intrusion of vehicle > 12" in occupant compartment; >18" in other site
  - Death in same passenger compartment

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

→ **Class III Trauma Consult**

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

Updated 5/2017

Pediatric Trauma Team Core

All Trauma Team Members

Respond to Level I and Level II page by reporting to the CES trauma bay promptly

Introduce self to other team members (ensure "check in" with recording RN)

Follow universal precautions

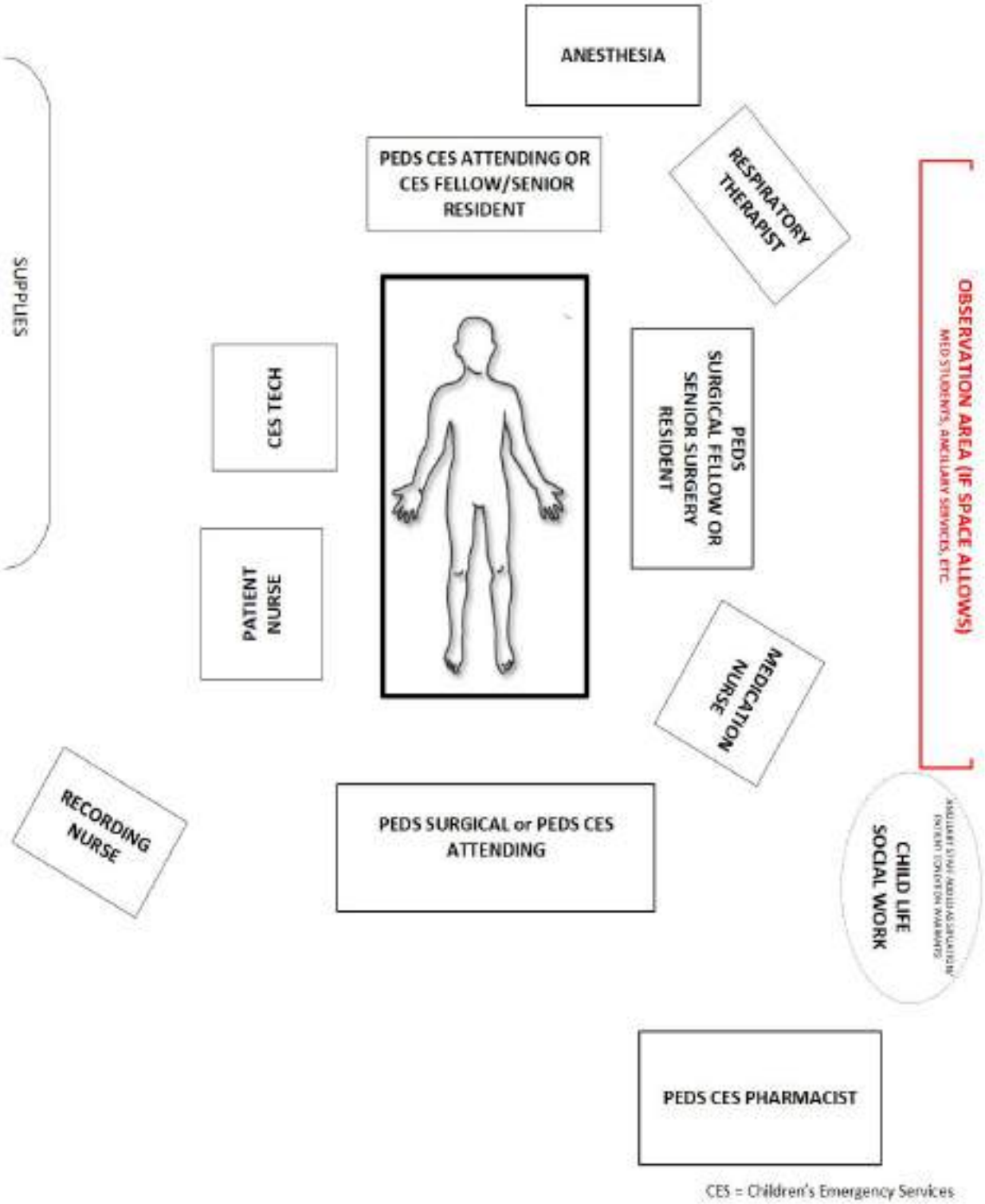
Listen carefully when pre-hospital provider gives injury history

Follow ATLS protocols

Attend Morbidity and Mortality Conference

Level I Trauma Activation

C.S. MOTT CHILDREN'S HOSPITAL
MICHIGAN MEDICINE



CES = Children's Emergency Services

GOAL = Patient disposition decided in under 30 minutes. Leave ED in ≤ 1 hour

ROLES AND RESPONSIBILITIES - LEVEL I

Who is in charge = Pediatric Surgical Attending – LEVEL I

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

Pediatric ED Attending – LEVEL I

The Pediatric ED attending is in charge of level I until surgical attending arrival. Responsible for the assessment of and securing of the airway and cervical spine. The Pediatric ED attending will delegate airway and cervical spine responsibility to the Pediatric ED fellow/senior resident when appropriate. The airway will be delegated to anesthesia after two unsuccessful attempts if necessary. The Pediatric ED attending should facilitate communication between the Pediatric Surgical Fellow and Pediatric ED Fellow for decision making and education purposes and can delegate care to Pediatric ED fellow.

Pediatric Surgical Fellow – LEVEL I

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

Pediatric ED Fellow (or Senior Resident)- LEVEL I

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

Pediatric Anesthesia Provider (Attending, Fellow, CRNA, resident) – LEVEL I

The Pediatric Anesthesiologist (Attending or Pediatric Fellow) and/or Credentialed Certified Registered Nurse Anesthetist (CRNA) or Anesthesia Resident will provide airway support. Intubation attempts by non-anesthesia providers will be limited to 2 in pediatric trauma patients; after which, the pediatric anesthesia team will assume responsibility for the airway. All endeavors to minimize number of intubation attempts shall be employed including consideration for escalation to a surgical airway, if indicated. One Anesthesia Provider is allowed in the trauma bay for patients in whom the airway has not been secured; if the anesthesia team will be securing the airway, 2 anesthesia providers will be allowed in the trauma bay at that time. Once the airway is secured, one anesthesia provider may remain in the trauma bay until a determination is made regarding patient disposition to the operating room. Anesthesia may also be resources for peripheral intravenous line placement, central venous line placement, arterial line placement, blood sample procurement, and utilization of the Belmont Rapid Infuser ***at the discretion of the team leader and nurse leader.*** All anesthesia interventions will be relayed to the recording RN utilizing closed loop communication.

Communication with the anesthesia team either in person or via phone (ext 8-5553) MUST occur prior to transport of any patient directly to the OR.

Nursing – LEVEL I & LEVEL II

Prior to patient arrival:

Assist in room preparation

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

After patient arrival:

Assess patency of pre-hospital IVs: label as such

Place large bore IVs if needed

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

Monitor temperature of patient

- Blankets
- Bair hugger
- IV fluid warmer

Administer medications, fluids as ordered

Communicate medications and I&O to recording nurse

Consider need for:

- NGT/OGT as appropriate
- Foley

Assist with log rolling patient

Prepare/plan for patient transport

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

ED Tech – LEVEL I & LEVEL II

Prior to patient arrival:

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

- Set up suction
  - Ensure suction is functioning
  - Yankauer in place
  - Suction tubing in place

- Ensure full oxygen tank under cart

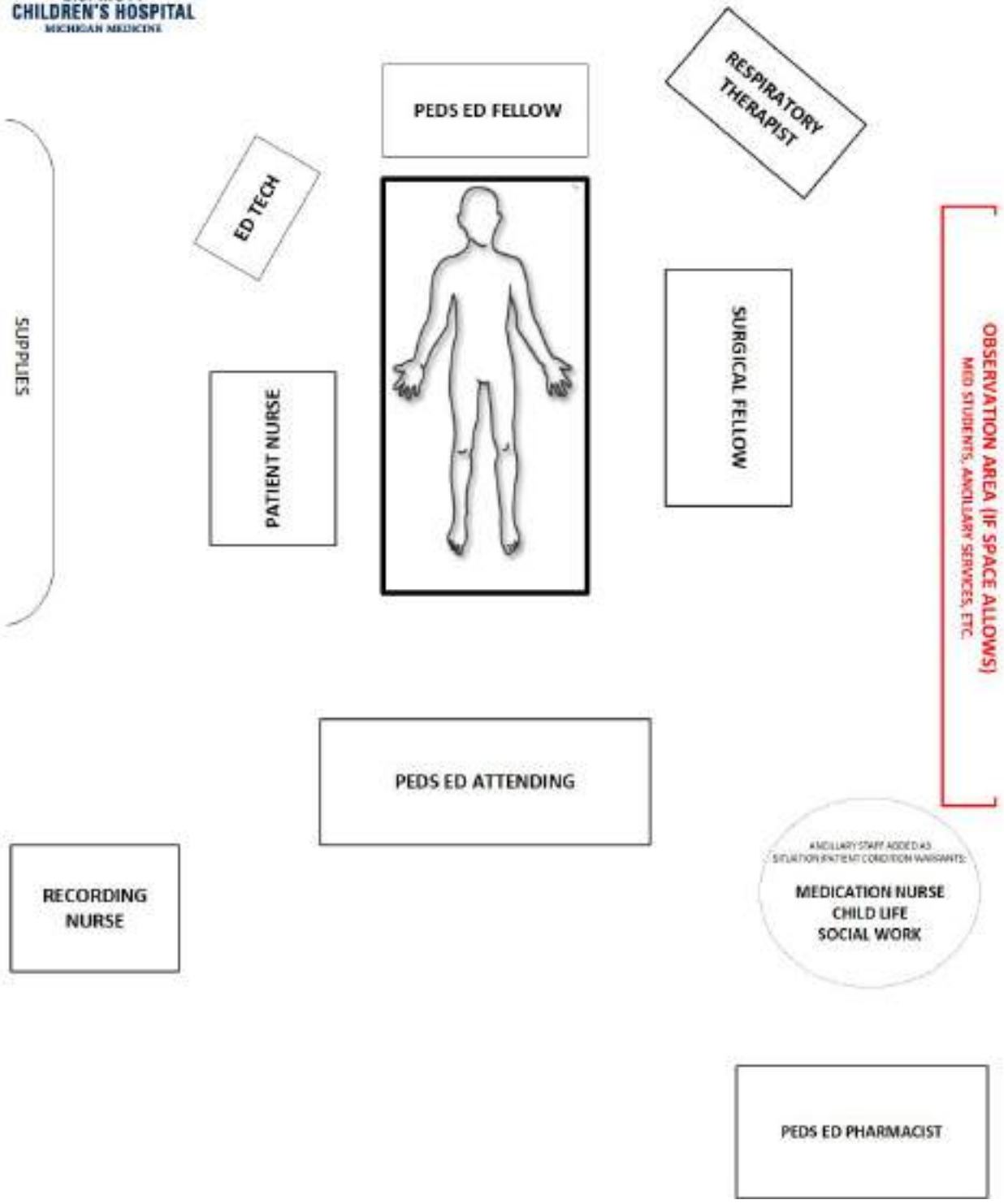
After patient arrival:

- Place patient on monitor
  - EKG
  - Pulse ox
  - BP cuff-appropriate size
  - Manual BP for each arm prior to NTBP

- Obtain temperature on patient
- Assess patency of pre-hospital IVs
- Start large bore IVs as needed
- Obtain blood via IV start or peripheral stick as appropriate for trauma classification
- Remove clothing and jewelry (document who received items)
- Apply warm blanket / Bair hugger
- Assist with procedures as needed
- Assist with log rolling as needed
- Retrieve blood as needed
- Assist with fracture immobilization
- Assist with preparing patient for travel:
  - Place patient on monitor
  - Full O2 tank under cart

Level II Trauma Activation

C.S. MOTT CHILDREN'S HOSPITAL
MICHIGAN MEDICINE



GOAL = Patient disposition decided within 60 minutes. Leave ED in ≤ 2 hours

ROLES AND RESPONSIBILITIES – LEVEL II

Who is in Charge = Pediatric ED Attending – LEVEL II

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

Surgical Fellow – LEVEL II

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

Pediatric ED Fellow – LEVEL II

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

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

Responsibilities for Nursing and ED Tech same for Level I & II activations

POLICY - 1: GUIDELINES FOR THE INITIAL MANAGEMENT OF PEDIATRIC INJURED PATIENTS PRESENTING TO C. S. MOTT CHILDRENS HOSPITAL EMERGENCY DEPARTMENT

Title:	Guidelines for the Initial Management of Pediatric Injured Patients Presenting to the C. S. Mott Children's Hospital Emergency Department		
Keywords:	Pediatric patients, initial management, Pediatric trauma, policies, procedures, guidelines,		
Authors:	Pediatric Trauma Surgery		
Applies To:			
Last Reviewed:	1/20/2022	**Last Revised:**	1/20/2022
Policy	**Patient Care** Policy - 1		

I. Policy

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

II. Purpose

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

III. Policy Statement

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

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

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

Approved:		**Title:**	Medical Director, Pediatric Trauma
Approved:		**Title:**	
Approved:		**Title:**	
Approved:		**Title:**	Chairman, Department of Emergency Medicine

POLICY - 2: GUIDELINES FOR THE INITIAL MANAGEMENT OF CLASS I PEDIATRIC PATIENTS PRESENTING TO THE C. S. MOTT CHILDREN'S HOSPITAL EMERGENCY DEPARTMENT

Title:	Guidelines for the Initial Management of Class I Adult Patients		
Keywords:	Pediatric Trauma, Class I Pediatric patients, policies, procedures, guidelines,		
Authors:	Pediatric Trauma Surgery		
Applies To:			
Last Reviewed:	1/20/2022	**Last Revised:**	1/20/2022
Policy	Patient Care Policy - 2		

I. Policy

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

II. Purpose

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

III. Policy Statement

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

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

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

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

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

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

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

Approved:		**Title:**	Medical Director, Pediatric Trauma
Approved:		**Title:**	
Approved:		**Title:**	
Approved:		**Title:**	Chairman, Department of Emergency Medicine

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

Title:	Guidelines for the Initial Management of Class II Pediatric Patients Presenting to the C. S. Mott Children's Hospital Emergency Department		
Keywords:	Pediatric Trauma Surgery, Class II Pediatric patients, policies, procedures, guidelines,		
Authors:	Pediatric Trauma Surgery		
Applies To:			
Last Reviewed:	1/20/2022	**Last Revised:**	1/20/2022
Policy	Patient Care Policy - 3		

I. Policy

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

II. Purpose

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

III. Policy Statement

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

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

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

a. These patients may require further radiological evaluation following surgical intervention. The radiological evaluation can follow operative intervention or stabilization of the patient in the OR, floor or in the Pediatric Intensive Care Unit (PICU). If radiological evaluation follows operative intervention, the Anesthesiology Service and an PICU nurse, or appropriate healthcare professional, will accompany the trauma patient to the Radiology department. These patients will then be admitted to the PICU or the unit.

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

Approved:		**Title:**	Medical Director, Pediatric Trauma
Approved:		**Title:**	
Approved:		**Title:**	
Approved:		**Title:**	Chairman, Department of Emergency Medicine

POLICY - 4: GUIDELINES FOR THE INITIAL MANAGEMENT OF CLASS III PEDIATRIC PATIENTS PRESENTING TO THE C. S. MOTT CHILDREN'S HOSPITAL EMERGENCY DEPARTMENT

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

I. Policy

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

II. Purpose

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

III. Policy Statement

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

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

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

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

Approved:		**Title:**	Medical Director, Pediatric Trauma
Approved:		**Title:**	
Approved:		**Title:**	Chairman, Department of Emergency Medicine

C.S. MOTT CHILDREN'S HOSPITAL
MICHIGAN MEDICINE

Purpose: To define the management of patient who arrive to the incorrect emergency department based on age.

Guideline: In order to provide the safest trauma care in the appropriate location, we want to remind everyone that **patient location** guides which trauma team responds.
The adult trauma team responds to AES and the pediatric trauma team responds to CES regardless of age. We will continue to follow trauma classification for placement of patients coming by EMS based on activation criteria. There has been some confusion regarding trauma patients who are 18-20 years old. To clarify:

- < 18 yo goes to CES (Class 1, Class 2, non-classed)
- ≥ 18 yo and Class 1 or Class 2 goes to AES
- 18-20 yo and non-classed goes to CES
- ≥ 21 yo goes to AES (Class 1, Class 2, non-classed)

If a patient < 18 yo arrives in AES

- Adult Trauma responds and manages for workup and resuscitation. After trauma evaluation and stabilization Pediatric Trauma is called for consultation about disposition.

If a patient ≥ 18 yo arrives in CES

- Pediatric Trauma responds and manages for workup and resuscitation. After trauma evaluation and stabilization Adult Trauma is called for consultation about disposition.

The location of the patient dictates the surgical service responding.

- Non-classed patients can be triaged to different ED on arrival when appropriate criteria are met, but should not be transferred from one ED to the other for additional care once evaluated.
- Transfer of a patient from CES to UH (Adult Trauma Service) and AES to Mott (Pediatric Trauma Tafter evaluation, resuscitation, and if necessary emergent intervention
- Patients requiring hospitalization should go to their ultimate disposition and not the other ED

Example 1: 19 yo in CES, no trauma activation prior to arrival.
19 yo female who was kicked in abdomen during martial arts practice. SBP 110 mmHg, HR 110 on arrival. Complaining of intense abdominal pain. 20 minutes after arrival by car to CES the patient has a decline in SBP to 80 mmHg and rise in HR to 140. A FAST exam is positive in the LUQ for fluid.

- Meets criteria for Class 1 activation and already in CES
- **Class out as pediatric trauma in CES**.

Example 2: 17 yo in AES, no trauma activation prior to arrival.
17 yo male in MVA who arrived in AES via ambulance as combined transport (Mother on gurney, patient sitting in ambulance). Mother was severely injured and met Class 1 activation criteria. Mother goes to resus A in AES and 17 yo male goes to AES triage. SBP 110 mmHg, HR 110 on arrival. Complaining of intense abdominal pain. On recheck of BP, a few minutes later in triage, patient has a decline in SBP to 80 mmHg and rise in HR to 140. Patient is moved to resus B.

- Meets criteria for Class 1 activation and already in AES
- **Class out as adult trauma in AES**.

Last Reviewed August 16, 2021 Dr. Mark Hemilla and Dr. Peter Ehrlich, Adult & Pediatric Medical Directors

Survival Flight Dispatch Policy for Trauma Activation AFTER Patient Arrival or Routed to Incorrect ED

Every effort will be made to ensure that trauma patients will be routed to the appropriate Emergency Department based on mechanism and age. On the rare occasion that a patient requires trauma activation after arrival, or the age is determined to be different than predicted, the trauma page will be directed to the trauma team associated with the Emergency Department where the patient is located regardless of patient age.

Simply put, any trauma activation for a patient already in CES will go to the pediatric trauma team and all trauma activations for patients admitted to AES will go to the adult team.

- As an example, if a 19-year-old patient is in Children's Emergency Services (CES) and requires trauma activation the trauma page will go to the PEDIATRIC Trauma Team.
- Similarly, if a 16-year-old is in the Adult ED the trauma activation will be directed to the ADULT Trauma Team.

Once the patient has been appropriately evaluated by the trauma team responding to the activation, admission disposition (if required) will be determined by a discussion between the adult and pediatric trauma attending (per existing policy).

Please note that this does not impact burned children in CES where both the pediatric trauma team AND the burn service will be notified for patient evaluation.

Adjusted radio and alphanumeric communication for above scenarios

For pediatric trauma team response to CES for patients 18 and older

"Pediatric trauma team response to CES for Class (1/2) patient age (18-21) (details of trauma activation as normal)"

For adult trauma team response to AES for patients younger than 18

"Adult trauma team response to AES for Class (1/2) patient age (details of trauma activation as normal)"

Current Status: *Active* **PolicyStat ID:** *6866783*

MICHIGAN MEDICINE
UNIVERSITY OF MICHIGAN

Origination: *11/2004*
Last Approved: *10/2019*
Last Revised: *10/2019*
Next Review: *08/2022*
Owner: *Amy Randall: Trauma Manager*
Area: *Patient Care Management*
References: *MM/UMHS Policy, Policy & Procedure*
Applicability: *UMHS Clinical*

UMHS Safe Movement of Pediatric Patient with Spinal Precautions Policy & Procedure, 02-02-008

I. POLICY STATEMENT, PURPOSE AND SCOPE

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

The purpose of the policy is to provide guidelines for the safe movement and transport of pediatric patients who have been placed on spinal precautions.

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II. DEFINITIONS

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

Rigid Collar/Stiff Neck (Cervical Collar) - A collar, often manufactured from a rigid plastic (with or without padding), that provides immobilization of the cervical spine.

Cervical Spine -Vertebrae that include C1 through C7 located in the neck.

Log Roll - A technique that is used to move the patient as one unit, maintaining spinal alignment to protect the patient from injury.

Padded Rigid Collar - A padded collar in various sizes used in-hospital that provides immobilization of the cervical spine (example: Miami J cervical collar).

Pediatric Patient - Patient under 18 years of age.

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

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

TLS Spine - Thoracic, lumbar and sacral vertebrae.

III. POLICY STANDARDS/GUIDELINE

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

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

IV. PROCEDURE ACTIONS

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

B. Pediatric patients with known or suspected cervical spinal injuries will be placed (or remain if previously applied) in a cervical collar. This cervical collar shall remain in place until there is a written order stating that the collar may be removed. Rigid unpadded collars, if previously applied, should be replaced with a padded rigid cervical collar (Miami J). An infant too small for a standard cervical collar shall be maintained with rolled towels on either side of the head and tape across the forehead until an appropriate orthosis can be customized for them.

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

   1. Those pediatric patients whose TLS spine films have been cleared and have a physician order stating so may not require logrolling. Spine precautions may only be discontinued if there is a physician order stating so.
   2. The physician may discontinue logroll maneuvers while maintaining cervical collar use if the pediatric patient's TLS spine has been cleared and the cervical spine films are not cleared or cervical spine injury is identified.

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

   1. The leader is positioned at the head of the patient. The leader's role is to maintain the alignment of the patient's head and to direct logrolling the patient.
   2. Assistant 1 is positioned near the patient's head and upper body, and places hands on the patient's shoulder and hip.
   3. Assistant 2 is positioned beside Assistant 1, near the patient's hips and legs, and places hands on the patient's hips and legs.
   4. Assistant 3 is positioned on the opposite side of the patient and is in charge of positioning the slideboard behind the patient.
   5. Leader uses mnemonic "Ready, Steady, Roll", or "1, 2, 3" to guide the procedure. On "Roll" or the count of "3" the leader directs Assistants 1 and 2 to gently roll the patient as a unit, allowing the slideboard to be placed behind the patient by Assistant 3. Leader maintains stabilization of head during movement.

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

E. Slideboad should not be utilized during patient transport. Slideboards should be cleansed with hospital-approved disinfectant between transfers.

F. Ceiling lifts cannot be used to lift patients to the slideboard. Ceiling or floor lifts and a repositioning sheet only may be used to assist with turns in addition to utilizing the logroll maneuver.

G. If unable to use the slideboard safely, patients may be placed on a backboard for transfers and transport.

H. Documentation

1. All pediatric patients requiring spine precautions shall have this documented in the electronic health record (EHR) in the appropriate area.
2. Pediatric patients shall be identified as having spine precautions during hand-off communication and transport.
3. Pediatric patients being transported shall have documentation indicating that spine precautions were maintained throughout the transport and procedure.
4. A neurological exam including motor and sensory shall be completed prior to and after the transport is complete. Any changes should be reported to the physician.
5. The use of spine precautions should be noted in nursing handoff.

V. EXHIBITS

None

VI. REFERENCES

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Emergency Nurses Association, (2004). Textbook of Emergency Nurse Pediatric Course Provider Manual, (3rd ed).

American Heart Association (AHA), (2006). Textbook of Pediatric Advanced Life Support.

Proehl, J.A., (2004). Emergency Nursing Procedures, (3rd ed). Saunders.

Hyldmo, P.K., et. al. (2015). Does turning trauma patients with an unstable spinal injury from the supine to a lateral position increase the risk of neurological deterioration? A systematic review. *Scandinavian Journal of Trauma, Resuscitation and Emergency Medicine, 23:65.*DOI 10.1186/s13049-015-0143-x

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Approved by:

Integrated Nursing Council - February 2008

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Hugh Garton, MD, Pediatric Neurosurgery
Director and CEO - UMHHC - February 18, 2008

Reviewed and substantive revisions made by Amy Randall MSN RN - July 2016

July 2016 revisions approved by:

EBS - April 27, 2016, August 28, 2019
NEC - July 25, 2016
Executive Vice Dean of Clinical Affairs; President, University of Michigan Health System - August 8, 2008

Reviewed and substantive revisions made by Amy Randall MSN, RN - May 2019
Reviewed by Hugh Garton, MD - May 17, 2019
Approved by:
EBS - August 28, 2019
NEC - September 27, 2019
ECCA- October 22, 2019

Attachments

No Attachments

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Approval Signatures

Step Description	Approver	Date
	Amy Randall: Trauma Manager	08/2019

Applicability

UMHS Clinical

Cervical Spine Clearance

C.S. MOTT CHILDREN'S HOSPITAL
MICHIGAN MEDICINE

Blunt Trauma Level I & II Activations

Spine Precautions
(Place pediatric rigid c-collar)
Primary and Secondary Survey

Nexus (age ≥ 8 years)
1. GCS < 15
2. Focal neurological deficit
3. Intoxication
4. Distracting injury
5. C-spine tenderness\

Nexus + (age < 8 years)
1. GCS < 15
2. Focal neurological deficit
3. Intoxication/Medication
4. Distracting injury
5. C-spine tenderness
6. LOC
7. Severe mechanism [a]
8. Severe injury [b]
9. Neck pain
10. Torticollis

NO → **Clear Collar** [cd]

YES → **CT C-Spine**

CT C-Spine → ABNORMAL → **Keep Collar** Ortho/Neuro Consultation [f]

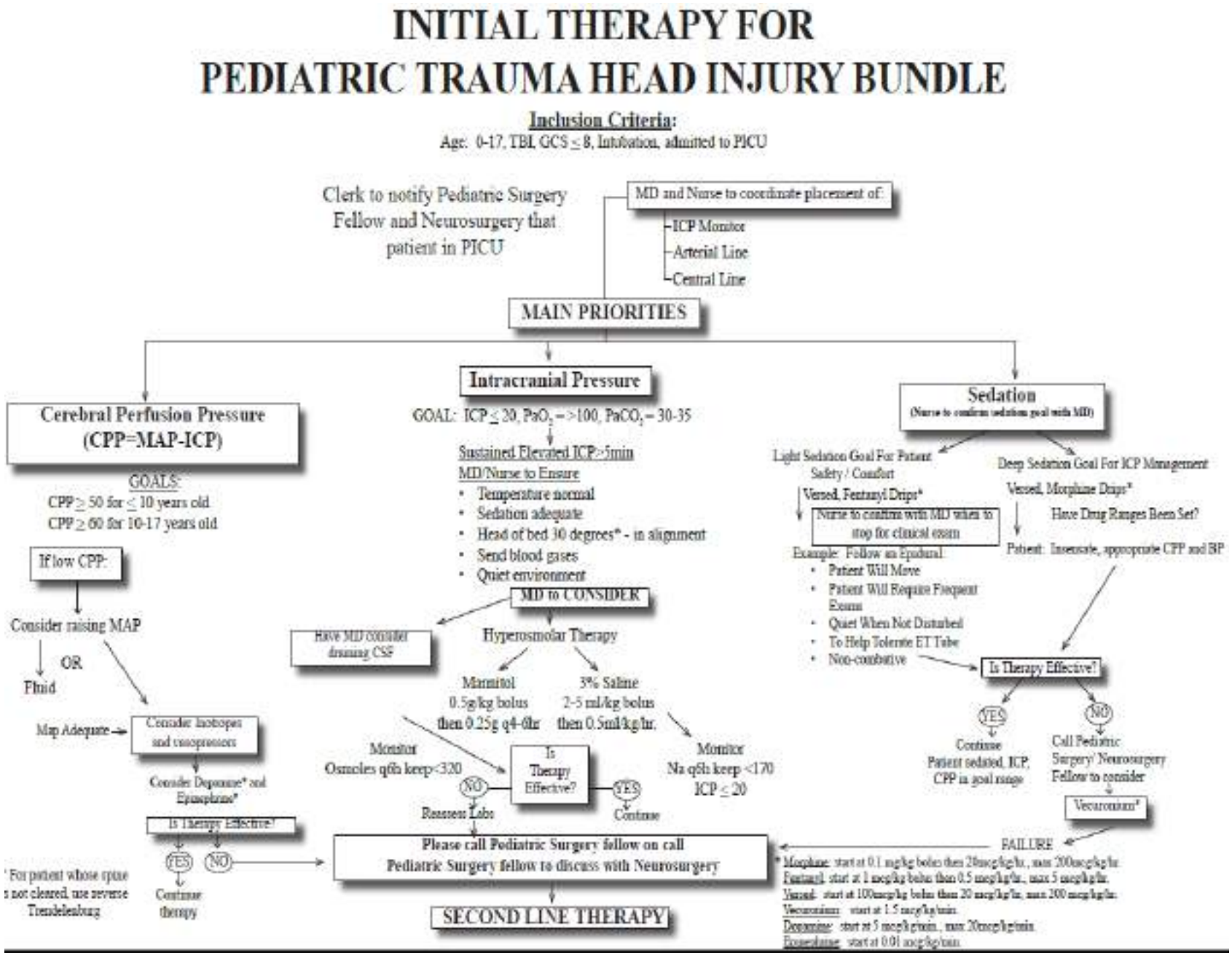
CT C-Spine → NORMAL → **Re-examine C-Spine**

Re-examine C-Spine → Pain with passive flexion, extension, lateral rotation or palpation → **Keep Collar** Ortho/Neuro Consultation Intubated [e] [f]

Re-examine C-Spine → **No** pain with passive flexion, extension, lateral rotation or palpation → **Clear Collar** [cd]

a MVC with ejection, death of passenger in same compartment, car vs. pedestrian or bicyclist without helmet, falls > 5 feet
b Palpable skull fracture, Battle sign, Raccoon eyes, CSF otorrhea or hemotympanium
c Collar should be cleared within 24 hours by PGY3+ or PA
d Collar can be cleared by pediatric surgery or emergency department physician
e Patients with expected intubation > 48 hours should get MRI of the cervical spine within 48 hours of trauma
f Neuro consult if neurologic deficits present, otherwise orthopedic consult

INITIAL THERAPY FOR PEDIATRIC TRAUMA HEAD INJURY BUNDLE



Blunt Thoracic Aortic Injury

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

Start Antihypertension regimen:

1. Infuse esmolol bolus then maintenance rate for a goal BP (syst) 100-120 mmHg, heart rate <100

2. Add second agent such as Nitroprusside if BP (syst) still elevated despite esmolol

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

C. Treat coagulopathy if present.

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

Reasons for delayed repair:

1. Pa02/Fi02 ratio less than 150
2. CNS injuries which should be delayed:

   a. massive contusion
   b. evidence of shift on Head CT
   c. large areas of intracerebral blood
   d. high ICP (consistently >20)
   e. need for systemic heparinization for full bypass felt to be contraindicated by Neurosurgery.

3. Ongoing major transfusion requirement or coagulopathy

4. Massive, open, contaminated wounds or burn where likelihood of wound sepsis is high.

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

1. Continue beta-blocker therapy, convert to long-acting agent (labetalol or atenolol)

2. Add secondary long acting antihypertensives as necessary

3. BP (syst) may be liberalized at 7 days to 150-160 mmHg

4. Physical therapy may begin at day 5

F. Any additional concerns or problems should be discussed at the attending level between the TB and Cardiac surgeons.

SOLID ORGAN INJURY CLINICAL PATHWAY GUIDELINE

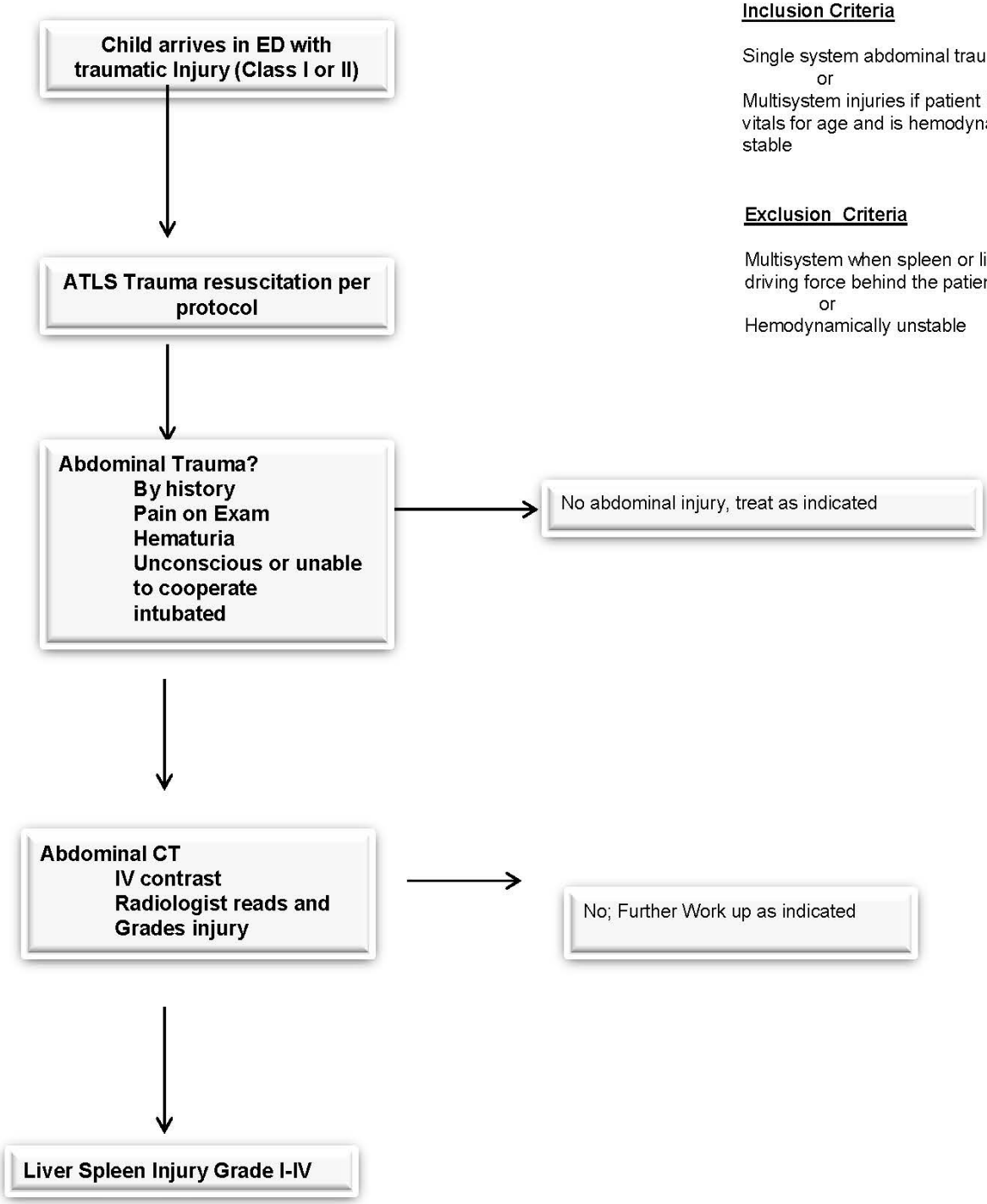
CT Grade	I	II	III	IV
ICU LOS	None	None	None	24hours +
CBC	Q 6 hours until stable*	Q 6 hours until stable*	Q 6 hours until stable*	Q 2-4 hours until stable*
Vitals	Q4 hours x24 On monitor	Q4 hours x24 On monitor	Q2 hours x 8 then q4 on monitor	Per ICU
Bedrest	Until CBC is stable	Until CBC is stable	Until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

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

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

Hospital LOS / Minimum Stay = Grade of Injury

ISOLATED Spleen (Liver) Injury Clinical Pathway Guideline



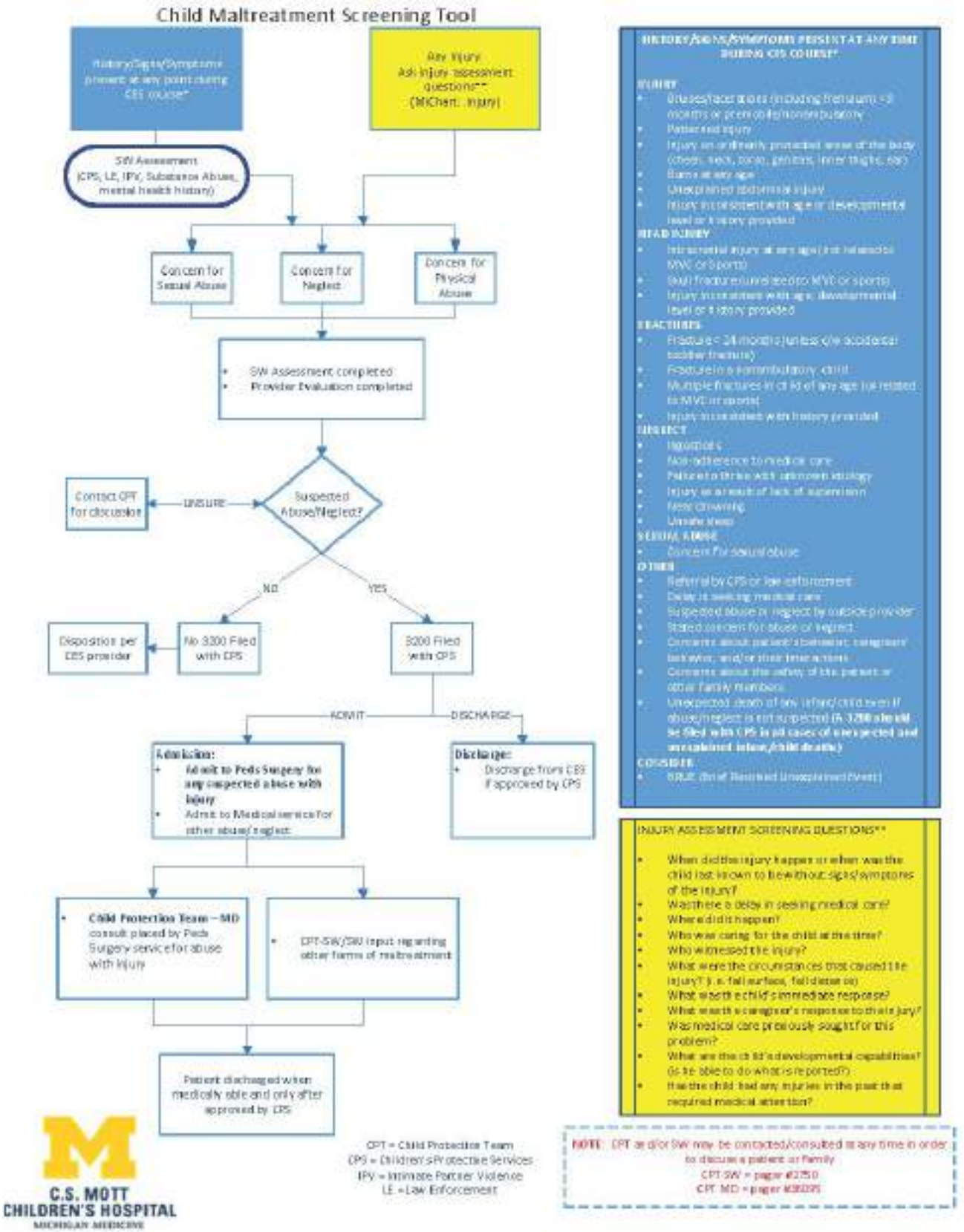
Inclusion Criteria

Single system abdominal trauma
or
Multisystem injuries if patient has normal vitals for age and is hemodynamically stable

Exclusion Criteria

Multisystem when spleen or liver is not the driving force behind the patient's plan of care
or
Hemodynamically unstable

*If patient is hemodynamically unstable consider operating room or embolization


Child Maltreatment Screening Tool
History/Signs/Symptoms present at any point during CPS course*
Any Injury
Ask injury assessment questions**
(MiChart: Injury)
SW Assessment
(CPS, LE, IPV, Substance Abuse, mental health history)
Concern for Sexual Abuse
Concern for Neglect
Concern for Physical Abuse
SW Assessment completed
Provider Evaluation completed
Contact CPT for discussion
UNSURE
Suspected Abuse/Neglect?
NO
YES
Disposition per CPS provider
No 3200 Filed with CPS
3200 Filed with CPS
ADMIT
DISCHARGE
Admission:
Admit to Peds Surgery for any suspected abuse with injury
Admit to Medical service for other abuse/neglect
Discharge:
Discharge from CPS if approved by CPS
Child Protection Team – MD consult placed by Peds Surgery service for abuse with injury
CPT-SW/SW input regarding other forms of maltreatment
Patient discharged when medically able and only after approved by CPS
HISTORY/SIGNS/SYMPTOMS PRESENT AT ANY TIME DURING ICS COURSE*
INJURY
Unexplained/accidental (including fractures) < 3 months or presenting non-ambulatory
Patterned injury
Injury on ordinarily protected areas of the body (cheek, neck, torso, genitals, inner thighs, ear)
Burns at any age
Unexplained abdominal injury
Injury inconsistent with age or developmental level or history provided
HEAD INJURY
Intracranial injury at any age (not related to MVC or Sports)
Skull fracture (unrelated to MVC or sports)
Injury inconsistent with age, developmental level or history provided
FRACTURES
Fracture < 24 months (unless clear accidental toddler fracture)
Fracture in a non-ambulatory child
Multiple fractures in child of any age (not related to MVC or sports)
Injury inconsistent with history provided
NEGLECT
Neglect
Non-adherence to medical care
Failure to thrive with unknown etiology
Injury as a result of lack of supervision
Feed chewing
Unsafe sleep
SEXUAL ABUSE
Concern for sexual abuse
OTHER
Referral by CPS or law enforcement
Delay in seeking medical care
Suspected abuse or neglect by outside provider
Stated concern for abuse or neglect
Concerns about patient's behavior, caregivers' behavior, and/or child interactions
Concerns about the safety of the patient or other family members
Unexpected death of any infant/child even if abuse/neglect is not suspected (A 3200 should be filed with CPS in all cases of unexpected and unexplained infant/child death.)
CONSIDER
SBIRT (Brief Resilient Unexplained Event)
INJURY ASSESSMENT SCREENING QUESTIONS**
When did the injury happen or when was the child last known to be without signs/symptoms of the injury?
Was there a delay in seeking medical care?
Where did it happen?
Who was caring for the child at the time?
Who witnessed the injury?
What were the circumstances that caused the injury? (i.e. fall surface, fall distance etc)
What was the child's immediate response?
What was a caregiver's response to their injury?
Was medical care previously sought for this problem?
What are the ch ld's developmental capabilities? (is he able to do what is reported?)
Has the child had any injuries in the past that required medical attention?
CPT = Child Protection Team
CPS = Children's Protective Services
IPV = Intimate Partner Violence
LE = Law Enforcement
NOTE: CPT or d/or SW may be contacted/consulted at any time in order to discuss a patient or family
CPT-SW = pager #2750
CPT-MD = pager #38035
C.S. MOTT CHILDREN'S HOSPITAL
MICHIGAN MEDICINE

Entirety of Handbook last reviewed 1/20/2022

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Massive Transfusion Protocol (MTP) – Pediatric < 50 KG

University of Michigan 7/5/16 Rev 7

Appropriate Initial Interventions:

Intravenous access – by weight (kg):

- 1-5 kg: 22-24 gauge
- 6-10 kg: 20-24 gauge
- 11-25 kg 18-22 gauge
- 25-50 kg 16-20 gauge

Admission weight (kg)

Admission labs:

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

Other considerations:

- **Anticipate hypocalcemia with CaGluconate or CaCl**
- 25units/kg, INR>4-6, 35 units/kg, INR>6, 50 units/kg; repeat doing not recommended
- Antifibrinoytic therapy:
  Amicar 100 mg/kg bolus then 33.3 mg/kg/hour
- Cell salvage: Anes Tech via Mott OR Front Desk 76-32430
- ***Additional help:***
- Anesthesia: pager 1534
- Pediatric Surgical Fellow – pager via web or operator
- Rapid Response Team pager 90147 or call stat paging 141

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

Product	Consider For	Dose
RBCs (360 ml/unit	N/A	30 ml/kg
FFP (250 ml/unit)	INR > 1.5	20 ml/kg
Platelets (50 ml/bag)	< 100,000	20 ml/kg
Cryoprecipitate (15 ml/unit)	Fibrinogen < 100	0.2 units/kg

Identify and Manage Bleeding

(Surgery, Angiographic Embolization, Endoscopy)

≥ 30 mls/kg and ongoing uncontrolled bleeding

Clinical Team Activates MTP & Designates Clinical Contact

Clinical Contact phones Blood Bank (BB) at 936-6888 and:

- Provides name of clinical contact person to BB
- Provides MR#, sex, name, location and weight of patient
- Records name of BB contact, calls if location/contact information changes
- Sends person with patient name and MRN to pick up the cooler
- Ensures that MTP protocol electronic order is entered in CareLink

BB Prepares MTP Pack

MTP Pack: 5U RBCs; 5U FFP; 5 Random Platelets or one apheresis platelet

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

Hemostasis & resolution of coagulopathy?

YES

Stop MTP

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

NO

Repeat Labs

- CBC, Platelets
- INR/PT, PTT
- Fibrinogen
- ABG (Ionized Calcium, Potassium, Lactate, Hematocrit)

With Orange Card

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

**** MD can adjust pack based on labs PRN**

If persistent coagulopathy consider :

rFVIIa 90 µ/kg dose

Entirety of Handbook last reviewed 1/20/2022

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Massive Transfusion Protocol (MTP) – ADULT

University of Michigan 7/5/16 Rev 7

➢ 50 KG

Appropriate Initial Interventions:

- Intravenous access – 2 large bore IVs and Central Venous Cath
- Labs: T&S, CBC, Plts, INR, PT, PTT, Fibrinogen, Electrolytes, BUN/Creatinine, ionized calcium, ROTEM
- Continual monitoring: VS, UIO, Acid-base status
- Aggressive re-warming
- Prevent / Reverse acidosis
- Correct hypocalcemia: CaGluconate or CaCl
- Target goal ionized calcium 1.2 – 1.3
- If use CaCl 1 gm give slowly IV
- Repeat lab testing to evaluate coagulopathy
- Stop crystalloid - avoid dilutional coagulopathy

Other considerations:

- **Anticipate hypocalcemia and infuse 1g calcium gluconate per 1-2 units PRBC's transfused**
- Cell salvage: Anes Tech via front desk 93-64270 (Main & CVCOR)
- Heparin reversal: Protamine 1mg IV/100 U heparin
- Warfarin reversal: Vitamin K 10 mg IV; Consider Prothiomin Comp 4 Factor PCC Koentra INR 2-4 25units/kg, INR>4-6, 35 units/kg, INR>6, 50 units/kg; repeat dosing not recommended

Chronic Renal Failure + VW Factor; DDAVP 0.3 µg/kg IV x 1 dose

- Consider antifibrinolytics
  - Tranexemic acid 1 gm bolus plus infusion 1 gm over 8 hrs
  - Amicar 5 gm IV bolus then 1 gm/hr IV infusion

Additional help

- Anesthesia: Page 8003; Trauma Chief (via web or operator)
- Rapid Response Team pager 90911 or call stat page 141

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

Product	Consider for	Dose
RBCs	N/A	MD discretion
FFP	INR > 1.5	4 units FFP
Platelets	< 100,000	One 5-pack Plts
Cryoprecipitate	Fibrinogen < 100	Two 5-packs Cryo

Identify and Manage Bleeding

(Surgery, Angiographic Embolization, Endoscopy)

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

Clinical Team Activates MTP & Designates Clinical Contact

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- Provides MR#, sex, name, location of patient
- Records name of BB contact, calls if location/contact information changes
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- Ensures that MTP protocol electronic order is entered in CareLink

BB Prepares MTP Pack

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

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

Hemostasis & resolution of coagulopathy?

YES

Stop MTP

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

NO

Repeat Labs

- CBC, Platelets
- INR/PT, PTT
- Fibrinogen
- ABG (Ionized Calcium, Potassium, Lactate, Hematocrit

WITH Orange Card

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

** MD can adjust pack based on labs PRN

If persistent coagulopathy

consider:

rFVIIa: 90 µ/kg dose

4 Factor PCC: Koentra INR 2-4 25units/kg, INR>4-6, 35 units/kg, INR>6, 50 units/kg; repeat dosing not recommended

POLICY - : GUIDELINES FOR THE SUBSTANCE MISUSE/ ABUSE AND ALCOHOL SCREENING, BRIEF INTERVENTION AND REFERRAL TO TREATMENT OF PEDIATRIC TRAUMA PATIENT PRESENTING TO C. S. MOTT CHILDREN'S HOSPITAL

Title:	Guidelines for the Initial Management of Pediatric Injured Patients Presenting to the C. S. Mott Children's Hospital Emergency Department		
Keywords:	Pediatric patients, Substance Misuse Abuse, Pediatric trauma, policies, procedures, guidelines		
Authors:	Pediatric Trauma Surgery		
Applies To:			
Last Reviewed:	1/20/2022	**Last Revised:**	1/20/2022
Policy #	**Patient Care**		

I. Policy

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

II. Purpose

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

III. Policy Statement

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

IV. Definitions

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

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

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

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

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

V. Procedure

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

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

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

   i. Patients with full admission status and at least an 24-hour in-patient stay will receive a CRAFFT screening by an assigned Social Worker. Interventions will be carried out based on the outcome of the screening and at the discretion of the Social Worker in conjunction with the patient's care team.
   ii. Patients with an observation admission status or admission to the operating room only, every effort will be made to initiate CRAFFT screening by the department's Social Work team member. If the length of stay is counterproductive to completion of the screening, the Social Work team will mail the Social Work Admission Follow Up Letter to the patient's home, providing information and resources related to substance use and abuse.
   iii. Patients that are evaluated by the surgical team and discharged from the Emergency Department, every effort will be made to initiate CRAFFT screening by the department's Social Work team member. If the length of stay is counterproductive to completion of the screening, the Social Work team will mail the Social Work Admission Follow Up Letter to the patient's home, providing information and resources related to substance use and abuse

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

   i. Drivers of a vehicle, with or without passengers
   ii. Passengers of an impaired driver
   iii. Victims of violent trauma
   iv. Inappropriate use of motorized vehicles (ie. car surfing)
   v. Any other scenario deemed concerning for substance abuse by the trauma team

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

   i. CRAFFT Screening will be completed as soon as medically appropriate
   ii. Completion of the interview will be documented as a Plan of Care note in MiChart.

CII. A positive screen for substance misuse/abuse, either through BAC or UDS, or a CRAFFT score of 1 or higher will necessitate the patient receives a brief intervention prior to discharge.

i. A score of 1 or higher on the CRAFFT questionnaire or a positive BAC or UDS will generate notification of the unit assigned social worker as identified by the MiChart Inpatient Careteam.
ii. The unit based social worker will provide the brief intervention and referral to treatment as needed.
iii. Pediatric Psychiatry or Psychology may be consulted for further assessment/intervention if needed.
iv. Patient confidentiality. Information regarding substance use or abuse is to be treated as confidential medical information. Results of alcohol and drug testing can be shared with parents or guardians of minor patients without their consent unless the patient is actively seeking treatment and articulates that he/she does not want the information shared. In this case, the information can still be shared with the parents/guardian when:
    1. Testing was done for medical purposes
    2. Patient is extremely young and/or lacks the capacity for rational choice
    3. Situation poses a substantial threat to life or physical well-being

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

Approved:		**Title:**	Medical Director, Pediatric Trauma
Approved:		**Title:**	
Approved:		**Title:**	
Approved:		**Title:**	Chairman, Department of Emergency Medicine

VTE Prophylaxis Criteria

C.S. MOTT CHILDREN'S HOSPITAL
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Criteria and Treatment for VTE Prophylaxis

Assess risk within 24 hours of admission

Exclusion Criteria

- LOW RISK or NO RISK patients
- Physician discretion

Exceptions to Initial Prophylaxis Guidelines

- CNS Bleed* (head or spine) – do not start for at least 48 hours
- Solid organ injury* – do not start until stable for at least 24 hours
- Planned operative intervention*- hold for 12 hours before & after
- Surgeon concern for risk of bleeding with prophylaxis*
- Physician discretion

*Eligible for delayed start of chemical VTE prophylaxis

High Risk Criteria

Any patient age > 8 years not expected to ambulate within 48 hours post-injury with one of the following OR < 8 years not expected to ambulate within 48 hours post-injury with 2 or more of the following:

- CVL
- Spinal cord injury
- Moderate-severe TBI
- Vascular injury (particularly venous)
- Expected ICU stay > 48 hours
- History of shock (including need for transfusions, CPR, inotropes)
- Major thoracoabdominal operation
- History of VTE
- History of chronic inflammatory diseases (IBD, vasculitis, nephrotic syndrome)
- Current use of estrogen
- Family history of VTE (1st degree relative)
- Morbid obesity

Patient Meets High Risk Criteria

High Risk Treatment

Mechanical prophylaxis for all ICU patients started on admission unless fracture/wounds preclude

Chemical prophylaxis started within 24 hours of admission

LMWH (0.5 mg/kg SQ bid up to max 30 mg bid)

The treating physician will ultimately have the decision to use chemical prophylaxis or not

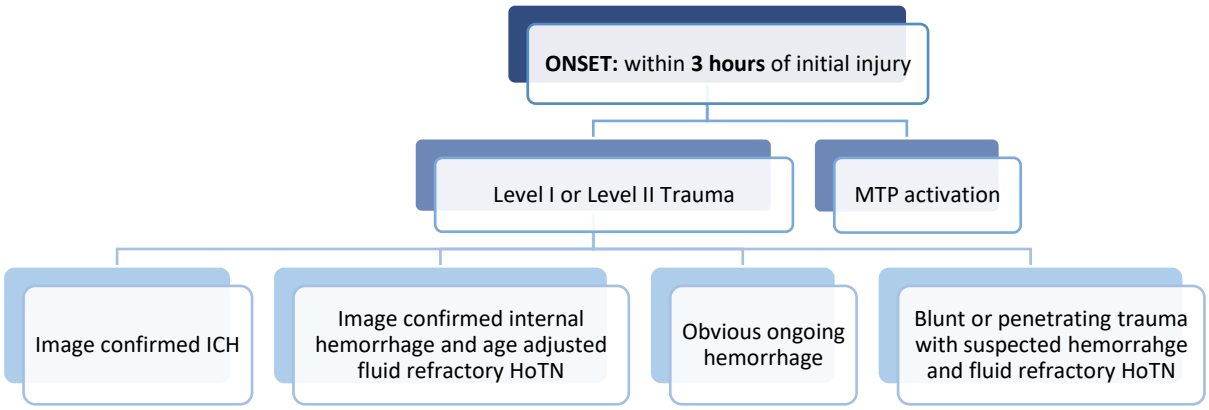
Tranexamic Acid (TXA) for Pediatric Trauma

BACKGROUND

Background: Unintentional injury is a leading cause of morbidity and mortality in pediatrics, with bleeding being a preventable cause of trauma associated death. Tranexamic acid should be given as soon as possible to limit life threatening hemorrhage.

Mechanism of Action: inhibition of fibrinolysis – stabilizes clot and decreases bleeding

Indications: Consider for use in pediatric traumas for the following situations:



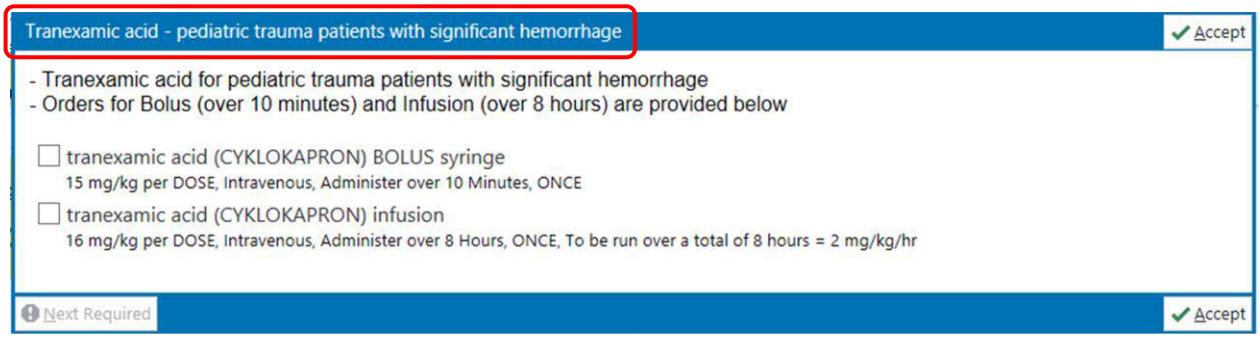
DOSING & ORDERING

Load: 15 mg/kg (max 1 g) IV **over 10 min**

Infusion: 16 mg/kg (max 1 g) IV **over 8 hours** (2 mg/kg/hr)

TXA Dose Form
All doses except for 1gm = syringe

Use "Tranexamic acid – pediatric trauma patients with significant hemorrhage" order set in MiChart. See screenshot below.



ADVERSE EFFECTS & MONITORING



- **Overall well tolerated with minimal adverse effects**
- **Common:** hypotension with rapid injection (IVP!)
- **Serious:** hypersensitivity, thromboembolism, seizures

Medication	TXA Compatibility
Penicillin	X
Ampicillin	X
Pipercillin-Tazobactam	X
Blood products	X
Dextrose 5%	✓
Normal Saline	✓
Lactated Ringers	✓

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Pediatric patient presents to CES with open long bone fracture

↓

Page pediatric orthopedic resident with injury details
Response expectation within 30 minutes

↓

Wound assessment & bedside irrigation
Normal saline -> Sterile dressing ->Splinted to minimize soft tissue injury/pain

↓

Minimize repeat wound inspections as much as possible

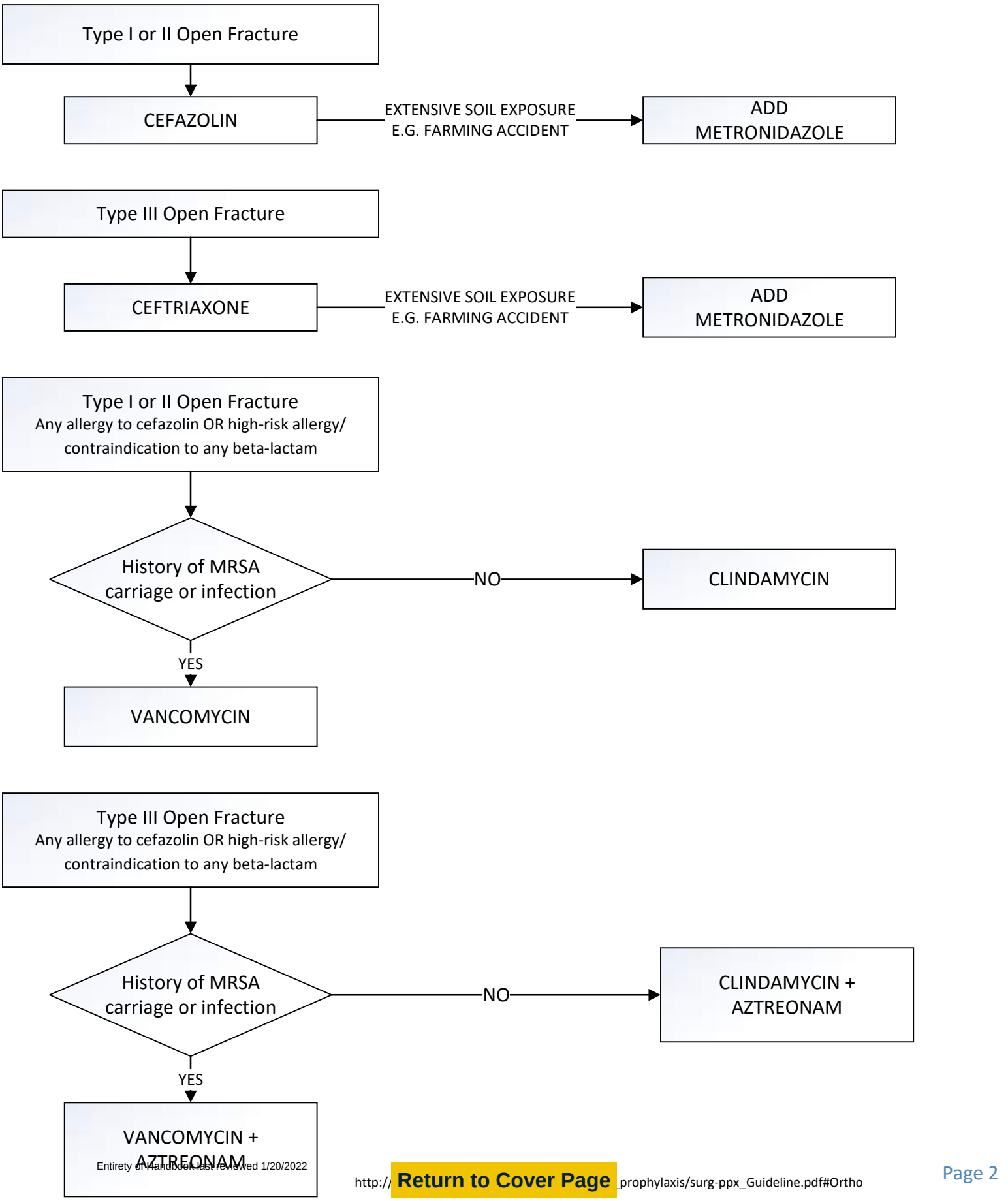
↓

All patients will be evaluated for updated Tetanus prophylaxis

Open Fracture Type	Characteristics of Gustilo Grade Open Fracture
Type I	A type I open fracture is a low-energy puncture wound less than 1 cm in length, with minimal soft tissue injury, fracture comminution, or contamination
Type II	Type II open fractures have wounds measuring 1 to 10 cm, without significant periosteal stripping or comminution, and have soft tissue quality adequate for wound coverage
Type III	An open segmental fracture or a single fracture with extensive soft tissue injury. Type III injuries are subdivided into three types:
Type III A	Type IIIA open fracture has adequate soft tissue coverage despite having a heavily contaminated wound measuring greater than 10 cm, and segmental or comminuted fractures
Type III B	Type IIIB fractures have extensive soft tissue damage requiring coverage procedures typically associated with periosteal stripping, exposed bone, and significant contamination
Type III C	Type IIIC open fractures have an associated vascular injury requiring immediate repair.

Reference: Arianna Trionfo MD, Priscilla K. Cavanaugh MD and Martin J. Herman MD. Orthopedic Clinics of North America, The, 2016-07-01, Volume 47, Issue 3, Pages 565-578

C.S. MOTT CHILDREN'S HOSPITAL
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Trauma Burn Center (TBC) Pediatric Admission Policy

Close all

Admission Criteria

A. TBC beds must be allocated to:
   a. All pediatric patients requiring hospitalization for a burn injury (including patients with extensive skin injury secondary to non-burn injury)
   b. Accommodation for non-ACS service pediatric patients, can be made on a bed-availability basis

B. Priority for TBC Admission:
   a. Priority for admission to a TBC Intensive Care Unit (TBICU) bed will be as follows:
      i. All burn-injured patients requiring intensive care will take precedence for admission to the TBICU. Burn-injured patients who require intensive care are the following:
         1. Pediatric patients with a TBSA greater than or equal to 20% (including patients with frostbite, TENS, SJS, necrotizing fasciitis)
         2. Patients who sustained an electrical burn injury
         3. Patients with a known or suspected isolated inhalation injury
         4. Any burn injured patient requiring mechanical ventilation, cardiac, pulmonary, or hemodynamic monitoring
   b. Patients recovering from acute or reconstructive burn surgery
      i. Acute or reconstructive burn surgery patients requiring intensive care are defined as patients requiring mechanical ventilation, cardiac, pulmonary, hemodynamic or neurological monitoring.
      Note: The Pediatric Critical Care Medicine Team will follow as a consulting service for all pediatric patients requiring intensive care while in the TBICU.

C. Priority for admission to a TBC acute care/floor status bed will be for the following patients:
   a. Pediatric patients with <20% TBSA burns who require hospitalization for acute burn injury, but do not require the acuity and intensity of the TBICU
   b. Patients receiving burn reconstructive surgery that does not require intensive care

Procedure for Admission

A. Patients presenting to the CS Mott Children's Emergency Department (ED)
    a. ED staff will notify the Acute Care Surgery (ACS) Trauma/Burn Service by the Trauma Radio and paging system for Class I and II burn patients and by the paging system for Class III patients.
    b. The ACS Service chief resident on-call, or his/her designate, in conjunction with the ACS Burn attending, will decide on the treatment plan for the patient, and the need for admission.
    c. The ACS chief resident, or his/her designee, will notify the TBC Charge Nurse of the admission including the patient's injuries and the estimated length of time prior to patient transport to the TBC.
    d. The TBC Charge Nurse will assess staffing assignments and adequacy, make staffing changes if indicated, and prepare a room for the patient.
    e. Transfer of the patient will be arranged collaboratively by the TBC Charge Nurse, the ED charge nurse, and/or the operating room charge nurse. At no time will a patient be transferred to the TBC prior to nursing report being called and a physician handoff form being completed. The patient will be transported to the TBC by ED staff or OR staff.
B. Patients Transferred from Referring Institutions
    a. All calls or requests for transfer from a referring hospital physician will be directed to the ACS chief resident on-call. If the referral call is fielded by the Charge Nurse, she/he will gather as much information about the patient's condition as possible (refer to Trauma Response policy #21) and notify the referring institution that a ACS physician will call them within 10 minutes. The Charge Nurse will immediately notify the chief trauma resident on-call, utilizing the Trauma Radio/Paging System.
    b. Upon notification of a potential admission, the ACS chief resident will notify the on-call Burn Attending and discuss the acceptance/admission and stabilization/transport of the patient.
    c. The ACS chief resident will call the referring physician to accept the patient, obtain an updated condition report, discuss stabilization of the patient, arrange transport (if necessary,) and determine the estimated time of arrival.
    d. If the referring institution/physician requests that Survival Flight transports the patient, the ACS resident will contact Survival Flight and provide patient information. Survival Flight will then be responsible for setting up the transport. For those patients requiring evaluation in the ED, the admission will proceed according to the procedure established for patients presenting directly to the ED.
    e. If the patient is to be a direct admission to the TBC and the referring institution or physician does not request transport by Survival Flight, the ACS resident will notify the ED and the TBC Charge Nurse of the admission, provide information on the patient's condition, and any treatment initiated at the referring institution. Upon arrival of the patient in the ED, ED staff will notify the on-call ECR and the TBC Charge Nurse. Those patients not requiring additional evaluation will have an initial set of vital signs taken by

the ED nursing staff to ensure patient stability. The patient will then be transported directly to the TBC.

C. Multiple Admissions
   a. Patients will be transferred to the TBC individually, beginning with the most critically ill patient.
   b. The timing of each successive transfer will be arranged collaboratively between the TBC Charge Nurse, the ED charge nurse, and/or the OR charge nurse.

D. Transfers from Other Services Within CS Mott Children's Hospital
   a. Requests for transfer will be initiated by a formal written consult to the ACS Service.
   b. The ACS chief resident, in collaboration with the on-call attending physician, will evaluate the patient to determine whether admission to the TBC is warranted.
   c. Upon acceptance of the patient transfer to the TBC, the chief resident will notify the TBC Charge Nurse of the desired day, estimated time of transfer, and give a brief report.
   d. The TBC Charge Nurse will proceed to prepare the unit for the transfer. The exact time of transfer will be arranged collaboratively between the TBC Charge Nurse and the transferring unit's charge nurse. The transferring unit shall call report prior to transporting the patient to the TBC.
   e. Upon arrival in the TBC, the patient will be taken to the patient room or hydrotherapy room, dependent upon the type of patient injury. The TBC nurses will proceed according to the accepted admission policy.

E. Admission from Trauma Burn Clinic
   a. Upon identification of a patient requiring admission to the TBC, the Trauma Burn Clinic secretary will notify the following departments/personnel:
      i. Admitting
      ii. TBICU Fellow or TBICU call resident +/- ACS chief resident on-call
      iii. TBC Charge Nurse
   b. The family member accompanying the patient will be sent to admitting to complete the necessary processing.
   c. If the patient is being admitted for burns, the wounds will be placed in a normal saline dressing.
   d. The actual time of transfer will be arranged collaboratively between the Trauma Burn Clinic staff and the TBC Charge Nurse.
   e. Once the patient arrives in TBC, the admission process will proceed according to the accepted procedures.

F. Scheduled Elective Admissions
   a. Patients will have their admission and surgery dates pre-scheduled from the Trauma Burn Clinic.
   b. On the day of admission, the patient will report to Admitting to complete the necessary processing.
   c. Upon patient arrival to the TBC, the admission process will proceed according to the accepted procedure

G. Bed Allocation in Times of High ACS Census

a. In the event that a TBICU bed is not available for an acutely burn injured or acutely traumatized patient, one of the following alternatives will be exercised:
    i. Transfer existing patient(s) from a TBICU bed to a TBC floor status/acute care bed, or to a medical/surgical/pediatric acute care unit as appropriate, with nursing consultation if indicated.
    ii. All acutely injured burn and traumatically injured patients have priority admission status to the TBICU at times of high census. When all patients in the TBICU are unable to meet criteria for acute care discharge, and require intensive care, then the most stable patient (judged by both the chief resident, attending staff, and the charge nurse) will be transferred another intensive care unit.
b. The acute care/floor status burn injured patient has admission priority at time of high census in the TBC. In the event that a TBC acute care/floor status bed is not available for an acute burn admission the following will occur:
    i. Transfer non-burned injured patients from the ACSC to a medical/surgical/pediatric acute care unit or to home, as appropriate.
    ii. Admit the patient to a TBICU bed (if available), until a TBC acute care/floor status bed becomes available. If this occurs, Admitting will be notified that the bed is "floor status."

H. Patients on the ACS Service who are being cared for on other medical/surgical/pediatric units may be transferred to the TBC when warranted or indicated. Patients initially treated by other services may be transferred to the TBC if they meet the criteria for admission, and if the ACS Service accepts them for transfer.

I. If CS Mott Women & Children's Hospital is at maximum capacity or capability, and beds are available in the TBC, CS Mott patients may be transferred/admitted to the TBC.

Priority For Discharge

A. Patients who no longer require intensive care of their injuries or intensive monitoring, will be transferred from a TBICU bed to the TBACU upon meeting the following criteria:
    a. Cardiac
        i. Heart rate within normal limits for age
        ii. Systolic blood pressure within normal limits for age
    b. Pulmonary
        i. Stable airway
        ii. Extubated >than 24 hours
        iii. Respiratory rate and SaO2 within normal ranges for age
        iv. FIO2 requirements ?50%
        v. Pulmonary toilet requirement ?Q4 hours
    c. Neurological
        i. Stable spine
        ii. Able to maintain and clear airway

iii. No ongoing neurological changes

d. Wound Care

i. Children with < 20% TBSA wounds open

B. Floor status/acute care patients will be discharged from the TBC when ready for home care, placement in a rehabilitation institution, or skill nursing institution. Prior to discharge, all patients will receive discharge education/instructions, and a clinic follow-up appointment.

C. The decision to discharge a patient will be reached in conjunction with the physician team caring for the patient and the TBICU nursing staff. If there is lack of consensus on whether to discharge a patient, the Trauma or Burn Director, or in his absence his designate, will have final authority.

Administrative Responsibility

A. All beds within the TBC are under the direct supervision of the TBICU Medical Director, or in his absence, his designate.

B. All beds within the TBC are under the direct charge of the ACS Service. The ACS chief trauma resident is responsible for all bed accommodations.

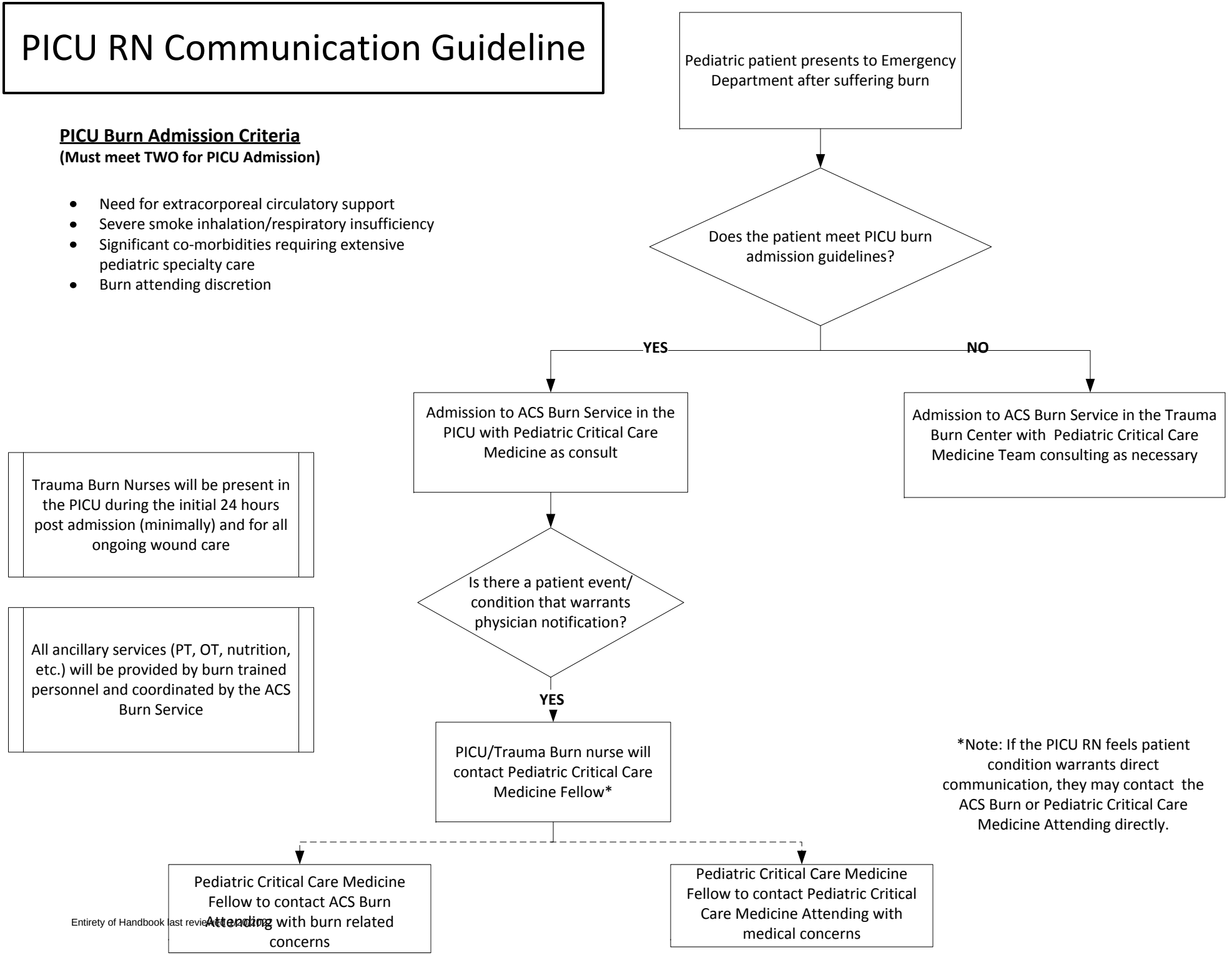
C. All admissions to and discharges from the TBC will be arranged through the on call ACS chief resident, in collaboration with the TBC Charge Nurse.

D. The TBICU Medical Director and the Burn Director, or his/her designate, final authority regarding bed allocation disputes.

PICU RN Communication Guideline

PICU Burn Admission Criteria
(Must meet TWO for PICU Admission)

- Need for extracorporeal circulatory support
- Severe smoke inhalation/respiratory insufficiency
- Significant co-morbidities requiring extensive pediatric specialty care
- Burn attending discretion



Pediatric (<30kg) Burn Patient

*** Age Specific Vital Sign Parameters:**

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

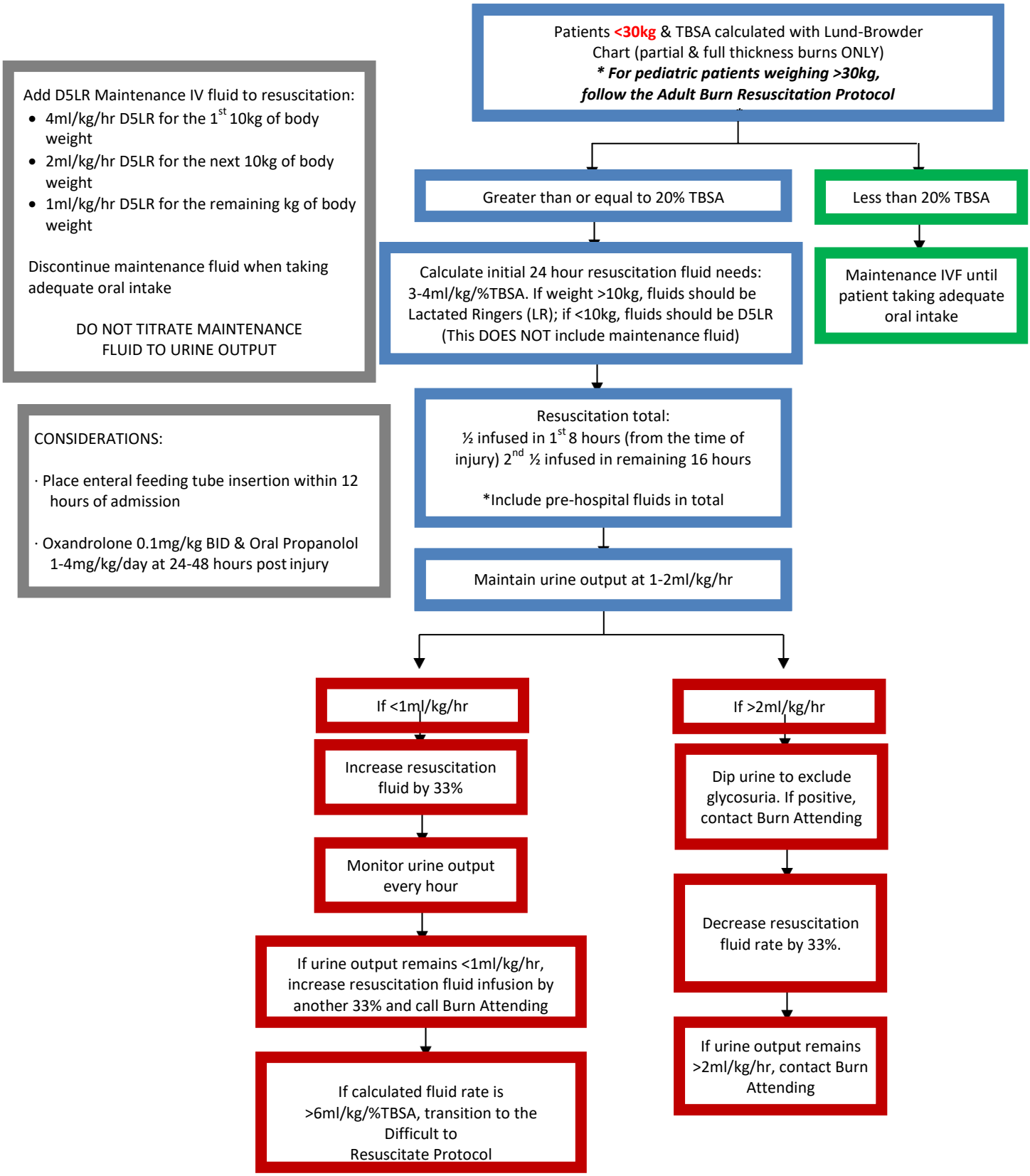
Patient hypotensive based on age specific parameters

Contact Burn Attending AND Pediatric Surgery Critical Care Fellow

Initiate CVP monitoring via central access

CVP ≥ 8mmHg	CVP <8mmHg
Epinephrine 0.05—1mcg/kg/min and Contact Burn Attending	Increase resuscitation fluid by 33%
Consider: · ECHO Missed injury/ongoing blood loss · Hydrocortisone 2mg/kg/dose q8hrs (max 100mg/dose) · Treat acidemia (pH <7.2) - consider bicarb/vent settings · Maintain ionized calcium >1.1 · Cultures/antibiotics · CRRT · ECMO	In addition to resuscitation fluid increase, consider fluid bolus 10-20ml/kg
	Check urine output (UOP) every 30min (Target UOP 1-2ml/kg/hr)
If patient remains hypotensive, add: Norephinephrine 0.02—2mcg/kg/min, titrate to age specific SBP above And/Or Vasopressin 0.003units/kg/min (DO NOT titrate vasopressin) Contact Burn Attending	Increase resuscitation fluid by 33% if UOP calculated to be <1ml/kg/hr at 30 min checks
	If patient remains hypotensive* or CVP remains <8mm Hg after 2 consecutive hours, contact Burn Attending

Guidelines for Pediatric (<30 kg) Burn Resuscitation




Pediatric Burn Patient (<30kg) with persistent oliguria or Calculated 24 hour resuscitation >6ml/kg/%TBSA
If patient's weight is >30kg, follow the Adult Difficult to Resuscitate Protocol
Contact Burn Attending
Replace resuscitation fluid with 5% albumin at current hourly resuscitation rate. *DO NOT titrate maintenance fluid rate
Initiate SvO2 and CVP monitoring via central access
Monitor bladder pressure every 4 hours. Contact Burn Attending for bladder pressures ≥20mmHg
TARGETS: Urine output (UOP) 1 – 2 ml/kg/hr CVP 8 – 10 mmHg Bladder Pressure < 20 mmHg SVO2 > 60%
If UOP is <1ml/kg/hr and the patient is normotensive after 1
If UOP is <1ml/kg/hr and the patient is hypotensive after 1 hr., follow hypotension guidelines and notify burn attending
If UOP is 1-2ml/kg/hr and the patient is normotensive after 1 hr.
If UOP is >2ml/kg/hr after 1hr., decrease the albumin infusion rate by 20%
CVP ≥8mmHg
CVP <8mmHg
Continue difficult to resuscitate protocol
After 48 hours of albumin infusion, IVF type and rate to be determined by burn
After 48 hours of albumin infusion, IVF type and rate to be determined by burn attending
Add milrinone 0.25 mcg/kg/min. Titrate to a max of 0.75 mcg/kg/min for UOP 1-2ml/kg/hr
Increase hourly Albumin rate by 33% DO NOT titrate maintenance fluid
Do not increase albumin infusion rate
Consider: Albumin bolus 10 – 20 ml/kg Check Hct/Hgb
If UOP remains < 1 ml/kg/hr after 1 additional hr., begin Epinephrine 0.1 - 0.25 mcg/kg/min and contact Burn Attending
Check urine output Q30 minutes
At Q30min checks, if UOP < 1 ml/hg/hr, increase Albumin infusion rate by 33%
Consider: ECHO and/or CRRT Consider Pediatric Burn Hypotension Protocol
If CVP remains <8 for 2 consecutive hours, contact Burn Attending. Consider Transfusion

Current Status: *Active* **PolicyStat ID:** *10487394*

MICHIGAN MEDICINE
UNIVERSITY OF MICHIGAN

Origination:	*12/1985*
Effective:	*10/2021*
Last Approved:	*10/2021*
Last Revised:	*10/2021*
Next Review:	*10/2024*
Owner:	*Douglas Gelb: Professor of Neurology, Medical School*
Area:	*Office of Clinical Affairs*
References:	*ECCA, MM/UMHS Policy, Policy, Procedure*
Applicability:	*UMHS Clinical*

UMH Brain Death, 03-01-020

A. POLICY STATEMENT, PURPOSE AND SCOPE

It shall be the policy of the University of Michigan Health (UMH) that the guidelines specified herein be utilized in the determination of patient brain death.

The purpose of this policy is to provide guidelines for the use of clinicians in the determination of patient brain death.

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B. DEFINITIONS

Brain Death - the IRREVERSIBLE cessation of ALL functions of the ENTIRE brain, including the brainstem. Decisions about prognosis and withdrawal of artificial life support do NOT usually require determination of brain death (see institutional guidelines for terminating treatment).

The determination of brain death is made by a physician based on accepted medical standards. Michigan State law does not set forth the standards, so each hospital must establish guidelines for brain death. The state Determination of Death law (Act 90 of 1992) is attached as the Exhibit A.

C. POLICY STANDARDS

A. **General Guidelines for Establishing Brain Death**

The cause of the condition should be established if at all possible. Brain death determination should not be made in the presence of potentially reversible conditions and conditions such as cardiovascular SHOCK, DRUG INTOXICATION, or HYPOTHERMIA (see section IV. C.2.), in which brain death cannot be determined reliably. The absence of potentially reversible conditions should be determined on clinical grounds (medical history, physical and neurological examinations), and documented by the appropriate laboratory tests. The diagnosis of brain death is BASED UPON CLINICAL CRITERIA. The staff physician determining brain death should determine the following:

1. There has been loss of ALL FUNCTIONS of the ENTIRE BRAIN, including the brainstem; and
2. The loss of all functions of the entire brain is IRREVERSIBLE.

B. **Clinical Criteria for Documenting Loss of All Functions of the Entire Brain**

1. **ABSENT CEREBRAL FUNCTION**

   The patient must be in deep coma. That is, there is no perception or response to external stimuli. Decerebrate and decorticate responses are absent.

2. **ABSENT BRAINSTEM FUNCTIONS**

   The following reflexes are absent:

   a. Pupillary light response
   b. Corneal reflex
   c. Vestibulo-ocular reflex, assessed by both:
      i. oculocephalic (doll's eyes) maneuver
      ii. ice-water caloric test
   d. Gag reflex
   e. Respiratory reflex

   The absence of spontaneous respiration, in the presence of hypercarbia ($PaCO_2$ greater than 60 mm Hg **AND** at least 20 mm Hg above the baseline $PaCO_2$) should be observed by a physician and carefully documented. An accepted method is to ventilate the patient with pure oxygen or an oxygen and carbon dioxide mixture for ten (10) minutes before withdrawal of the ventilator, followed by passive flow of oxygen. This procedure allows $PaCO_2$ to rise without hazardous hypoxia. Hypercarbia adequately stimulates respiratory effort within 30 seconds when the $PaCO_2$ is greater than 60 mmHg. A 10 minute period of apnea is usually sufficient to attain this level of hypercarbia. Testing of arterial blood gases should be used to confirm this level.
   For patients receiving extracorporeal membrane oxygenation (ECMO), in order to achieve sufficiently high levels of $PaCO_2$, the patient should be placed on continuous positive airway pressure (CPAP) while the sweep gas flow rate is set to a maximum of 1.0 liter/minute. If the $PaCO_2$ does not rise above 60 mmHg and change by 20 mmHg, the sweep flow can be incrementally lowered to as low as 0.1 liter/minute while still maintaining adequate oxygenation in most circumstances.

3. **OPTIONAL CONFIRMATORY TESTS**

   The determination of brain death may be made on the basis of clinical observations alone (over the appropriate time interval - see below). However, when it is necessary to make the determination of brain death as soon as possible, or when there is uncertainty about the interpretation of the clinical examination, the clinical diagnosis may be confirmed by one of the following diagnostic tests. Hypothermia and circulatory shock should be corrected before performing these tests. On rare occasions these tests may result in false negative or false positive outcomes. When circumstances suggest that a test result is unreliable, clinical judgement is required.

   a. Radionuclide cerebral angiogram. This test may be performed portably (Emergency Department or intensive care unit) and on an urgent basis. The expected result with brain death is absent brain perfusion, a result that is incompatible with survival of brain tissue under normothermic conditions.
   b. Four-vessel cerebral angiogram. This test must be performed in the angiography suite. The expected result with brain death is absent brain perfusion.

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c. Electroencephalogram. This test should be performed according to published Guidelines for performing EEGs in cases of suspected brain death (American Electroencephalographic Society). The EEG is used to verify irreversible loss of cerebral cortical functions. The expected result with brain death is no evidence of brain electrical activity.

C. **Clinical Criteria for Irreversibility**

Irreversibility is recognized when the evaluation discloses each of the following:

1. The cause of the coma is established and is sufficient to account for the loss of brain functions.

   In addition to careful medical history and clinical examination, MRI or CT brain scan, drug screening, EEG, 4-vessel or radionuclide angiography, lumbar puncture, or other diagnostic procedures may be needed to establish the cause of coma. In each case, the appropriate diagnostic procedures should be determined by the attending physician and neurological or neurosurgical consultant.

2. Reversible conditions that can prevent reliable interpretation of the physical examination have been excluded.

   The most important reversible conditions are sedation, hypothermia, neuromuscular blockade, and shock. The following guidelines are recommended:

   a. In the presence of exogenous intoxication, brain death cannot be declared until the intoxicant is metabolized to a level insufficient to account for the physical examination **and** intracranial circulation is tested and found to have ceased.

   b. Before irreversible cessation of brain functions can be determined, the following should also be corrected:

      i. Hypothermia: patient must be rewarmed to a core temperature of at least 35.0 degrees C (i.e., 95 degrees F) and ideally to 36.0 degrees C (i.e., 96.8 degrees F) or greater.

      ii. Circulatory shock.

   In cases of severe metabolic abnormalities, these abnormalities should be corrected, if possible, before determination of brain death is made.

3. The cessation of all brain functions continues to exist after an appropriate period of observation and/or trial of therapy. The appropriate period of observation required to confirm irreversibility will vary depending upon the patient's age and clinical conditions of the case. The following observation periods are recommended as a general guide:

   A. Adults and children of age greater than or equal to 31 days (excluding premature newborns who have not reached 31 days of age, calculated with respect to the equivalent full-term date rather than the actual date of birth):

      i. With confirmation by angiography or EEG, two clinical examinations at least one hour apart.

      ii. If confirmation by EEG or angiography is not done, yet an IRREVERSIBLE CAUSE is WELL ESTABLISHED, two clinical examinations at least 12 hours apart.

   NOTE: If the patient is a child less than 18 years of age who underwent cardiopulmonary resuscitation (CPR), there must be an interval of at least 24 hours between CPR and brain

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death determination, regardless of whether or not a confirmatory test was performed.

B. Term newborn (37 weeks gestation) up to 30 days of age and premature newborns older than 37 weeks gestational age up to 30 days of age (calculated with respect to the equivalent full-term date rather than actual date of birth):

   i. Two clinical examinations - MINIMUM 24 HOURS APART. Confirmatory tests cannot be used to shorten this interval.

C. Premature infants less than 37 weeks of gestation: BRAIN DEATH CANNOT BE DECLARED IN THIS GROUP

D. **Responsibility of Determining Brain Death**

1. Formal determination of brain death requires documentation of two clinical examinations, each with a note in the hospital record signed by an attending physician.

   a. For patients 18 years of age or older:

      i. The first of the two required examinations may be by a resident physician training in neurology, pediatric neurology, or neurosurgery or it may be by an attending physician who is a (pediatric or adult) neurologist or neurosurgeon.

      ii. The second examination must be performed by an attending physician who is a (pediatric or adult) neurologist or neurosurgeon. This physician must not be one of the primary physicians responsible for the patient's care.

      iii. The two required clinical examinations may be performed by different physicians or by the same physician (if that physician meets the requirements to perform the second examination).

      iv. Only one apnea test is required. It can be performed with either of the two required clinical examinations, or at any time in between. A physician must be present throughout the entire apnea test, and that physician must document the absence of spontaneous respirations and the maximum $PaCO_2$ measured. The physician witnessing the apnea test does not need to be an attending physician, and does not need to be a neurologist or neurosurgeon (or training to be one).

   b. For patients less than 18 years of age:

      i. At least one of the two required examinations must be performed by an attending physician who is a (pediatric or adult) neurologist or neurosurgeon.

      ii. The other required examination must be performed by an attending physician who is either a (pediatric or adult) neurologist or neurosurgeon or a specialist in pediatric critical care medicine.

      iii. The attending physician who performs the second clinical examination cannot be the same attending physician who performs the first clinical examination.

      iv. An apnea test must be performed with each of the two examinations. A physician must be present throughout the entire apnea test, and that physician must document the absence of spontaneous respirations and the maximum paCO2 measured. The physician witnessing the apnea test does not need to be an attending physician, and does not need to be a neurologist or neurosurgeon (or training to be one).

   c. For all patients, regardless of age:

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i. Each of the two notes should include careful description of neurological examination, observation periods, and the results of diagnostic and confirmatory tests, and should be signed by an attending physician.

ii. Brain death should be declared only after both examinations have been completed and the attending physician performing the second examination has documented in the hospital medical record that all criteria for brain death have been met.

E. **Determination of Death Prior to Removal of Life Support Systems**

Michigan law says that death occurs when ALL functions of the ENTIRE brain, including the brainstem cease. When it has been determined that a patient meets all criteria for brain death, death is to be pronounced before artificial means of supporting respiratory and circulatory functions are terminated. Once death has been declared, the patient can be removed from life support systems even over family objections. However, discretion should be used and the family counseled. It may be prudent to leave a brain dead patient on support systems for a short period for the family to adjust.

F. **Organ Donation Rules**

Michigan has adopted the Uniform Anatomical Gift Act. If assistance is required in facilitating organ donation, the appropriate contact phone numbers are: Transplant Society of Michigan - Gift of Life (TSM) (1-800-482-4881) or their local Ann Arbor number (973-1577). The Act states that time of death for the donor shall be determined by the physician who attends the donor at the death, or, if none, the physician who certifies the death. The attending or certifying physician shall not participate in the procedures for removing or transplanting a physical part. The process of requesting donations, in accordance with the Uniform Anatomical Gift Act, is outlined in UMHS policy 02-05-003 Organ, Tissue and Eye Donation.

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D. PROCEDURES/ACTIONS

As appropriate to the patient.

E. EXHIBITS

Exhibit A: Determination of Death Act, Public Act 90 of 1992
Exhibit B: Clinical Exam for Brain Death Determination
Exhibit C: Guidelines for Terminating Life Sustaining Treatment (Futility)

F. REFERENCES

UMHS Policy 02-05-003 Organ, Tissue and Eye Donation
UMHS Guidelines for Terminating Life Support
Determination of Death Act, Public Act 90 of 1992
Uniform Anatomical Gift Act, Public Act 186 of 1986 (effective October 7, 1986)

Nakagawa TA et al. Guidelines for the determination of brain death in infants and children: an update of the 1987 task force recommendations. Crit Care Med 2011;39:2139-2155

Wijdicks EFM et al. Evidence-based guideline update: determining brain death in adults. Neurology 2010;74:1911-1918

Author: Cerebral Death Determination Committee, Douglas Gelb, M.D., Chairman

Approved by:

Executive Committee on Clinical Affairs - July 24, 1990; June 10, 1997; June 12, 2001; February 13, 2007; February 10, 2009; September 25, 2012
Executive Director, UMHHC - October 31, 2001; June 21, 2007; March 20, 2009; October 1, 2012

Reviewed by the Office of Clinical Affairs with no changes required - September 8, 2004

Reviewed, Revised and Approved by:

Cerebral Death Committee on Clinical Affairs and Dr. Timothy Cornell, Pediatric Critical Care Medicine - October 28, 2015
Chief of Staff - November 10, 2015

Reviewed and non-substantive revisions made by the Cerebral Death Committee - December 7, 2018; Approved by Marie Lozon, Chief of Staff- January 3, 2019

Reviewed and non-substantive revisions made by the Cerebral Death Committee - September 2, 2021; Approved at ECCA on September 28, 2021

Attachments

A: Determination of Death Act
B: Clinical Exam

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Approval Signatures

Step Description	Approver	Date
Substance Review	Cathie Joynt: Project Senior Manager	10/2021
Reviewed and approved at ECCA	Adnan Ahmad: Staff Specialist Hlth	10/2021
Reviewed by Policy Owner/Workgroup/ Sub-Committee	Douglas Gelb: Professor of Neurology, Medical School	09/2021

Applicability

UMHS Clinical