Southern Minnesota Regional Trauma Advisory Committee (SMRTAC)

Regional Practice Management Guideline

Initial Management of Major Pediatric Trauma Patients

Pediatric **Practice Management Guideline**	**Effective Since: 12/2013**
Contact: SMRTAC Coordinator	**Last Reviewed: 11/2020, Approved May 2021**

Purpose

To provide a consistent approach to the care of injured children including age appropriate initial assessment, intervention, and early identification of children that would benefit from an early transfer to a verified pediatric trauma center.

Definitions

1. Pediatric trauma patient – any patient age < 15 suffering an injury.
2. Major trauma patient – any patient who sustains injuries significant enough to cause a threat to life or limb.
3. Initial assessment – a systematic process of assessment, recognition of life threatening injuries and provision of timely and appropriate interventions and consists of primary and secondary survey utilizing the principles of Advanced Trauma Life Support (ATLS) or Comprehensive Advanced Life Support (CALS).

Policy Statements

Consideration of age-related differences in anatomy and physiology in children is paramount in providing pediatric trauma care. Basic principles to consider when caring for injured children include:

1. Children have narrow airways which can occlude easily with edema. Close monitoring and frequent re-evaluation of airway status is important. Keep a low threshold for initiating endotracheal intubation as provider comfort allows.
2. Infants and toddlers have large occiputs so to avoid airway compromise and inappropriate C-spine alignment, when supine place padding under the child's back to compensate. (See appendix 1)
3. Children will not become hypotensive until 25-30% of the blood volume is lost. Persistent tachycardia and delayed capillary refill are early indicators of shock.
4. All medications and most interventions are weight based in children so a weight should be established early in the trauma resuscitation.
5. Use of a length-based resuscitation tape (Broselow™) – (LBRT) - can be used to estimate a weight and expedite care by providing appropriate sized equipment and medication dosages for the

child.

6. Children are very susceptible to heat loss so measures to avoid hypothermia must be instituted.
7. Hypoglycemia is common in children; therefore it is important to monitor blood glucose levels closely.
8. Consider early transfer of significantly injured children to the nearest Pediatric Trauma Center utilizing the most appropriate mode of transport.
9. A reference guide including normal pediatric vital signs for all age groups can be found on the SMRTAC website. (See appendix 2)
10. A list of suggested pediatric equipment can be found on the SMRTAC website https://smrtac.org/committees/pediatrics/

Procedure Statements

1. Primary Survey - **Airway**
    a. Assess airway patency while simultaneously providing cervical spine stabilization
    b. Consider endotracheal intubation for definitive airway control as indicated.
    c. ETT size per LBRT or 16 + age in years/ 4 (example- child age four: 16+4 (age) /4= 20/4= ETT size 5.0)
        i. The initial securing depth should be 3 times the ETT size
    d. If unable to establish definitive airway consider use of size appropriate rescue airway or continued bagging
2. Primary Survey – **Breathing**
    a. Assess breathing adequacy by evaluating respiratory rate, depth and symmetry, skin color, work of breathing, breath sounds, and chest wall integrity.
    b. Assess for evidence of tension pneumothorax, flail chest, other pneumothoracies, pulmonary contusion, or rib fracture.
    c. Administer oxygen.
3. Primary Survey – **Circulation**
    a. Assess for signs of shock as evidenced by:
        i. Persistent tachycardia for age
        ii. Capillary refill > 2 seconds
        iii. Cool, mottled extremities
        iv. Pallor
        v. Narrowed pulse pressure
        vi. Decreased level of consciousness
        vii. Sunken fontanelle in infants
    b. Control any uncontrolled external bleeding.
    c. Initiate fluid resuscitation to replace volume lost
        i. Establish 2 IV's using the largest bore the vessel can accommodate.
        ii. Obtain IO access if peripheral access cannot be rapidly achieved.
        iii. Administer fluid bolus of 20 cc/ kg of crystalloid
        iv. If signs of shock persist, administer 10 cc/kg warmed packed cells (type specific or O-negative).

4. Primary Survey – **Disability**
    a. Determine level of consciousness
    b. Calculate Glasgow Coma Score noting any areas where points are lost
        i. For pre-verbal or non-verbal children use an age appropriate scale (see appendix 3)
    c. Assess pupils for size and reactivity to light
    d. Infants assess fontanelle
5. Primary Survey – **Exposure**
    a. Remove all clothing including diapers to ensure complete exposure and evaluation of entire body surface area.
    b. Prevent heat loss by increasing ambient room temperature, keeping patient covered, using convective heating blankets, and warming fluids and blood for administration.
6. Secondary Survey
    a. The secondary survey begins only upon completion of primary survey and initiation of all appropriate resuscitative interventions.
    b. The decision to transfer should be made early and any further assessment or diagnostic studies should not delay transfer to a higher level of care.
    c. Obtain a complete set of vital signs including central & peripheral pulses, manual blood pressure, and core temperature reading.
    d. Obtain a complete history from EMS, family, patient or others.
    e. Complete a head-to-toe physical assessment to identify all injuries.
    f. Institute ongoing cardiac and pulse oximetry monitoring.
    g. Chest x-ray and pelvis x-ray as indicated.
    h. On-going assessment should include vital signs including temperature, GCS, pupils, control of external bleeding, and urine output.
    i. Ensure adequate pain control.
    j. If decision has been made to transfer child to a higher level of care **no further diagnostic studies are required**. Rapid transport is critical to improved outcomes.
7. Special Pediatric Trauma Considerations
    a. Care providers need to be alert to possibility of suspected child physical abuse (see separate SMRTAC guideline). Physical/history findings suggestive of child abuse include:
        i. Discrepancy in the reported history and physical findings.
        ii. Bruising in infants /children unable to move on their own
        iii. Intra-cranial bleeding without history of trauma
        iv. Perioral injuries
        v. Trauma to genital or perianal area
        vi. Suspicious bruising patterns
        vii. Sharply demarcated burns in unusual areas
    b. Family centered care is paramount in the care of children
        i. Consider family presence during procedure and resuscitation.
        ii. Ensure the family is accompanied by a trained person able to provide support and answer questions.
8. Transfer to a Designated Pediatric Trauma Center is recommended if any of the following criteria are present:

a. If patients meets level red trauma activation criteria
b. Physiologic Criteria
    i. Decreased or deteriorating neurologic status (GCS < 14)
    ii. Respiratory distress or failure
    iii. Intubation, need for ventilatory support, or need for anesthesia
    iv. Shock of any type, compensated or uncompensated
    v. Requiring blood transfusion
    vi. Potential need for invasive monitoring, intracranial pressure monitoring, or vasoactive medications
    vii. Paralysis or focal neurologic deficit
c. Anatomic Criteria
    i. Penetrating injury to torso, neck, head, or proximal to elbow or knee
    ii. Fracture of two or more long bones (femur, humerus, tibia/fibula)
    iii. Factures that may be complicated by neurovascular and/or compartment syndrome or open fractures or fractures involving the growth plate
    iv. Suspected injury to the axial skeleton or spinal cord
    v. Traumatic amputation and crush injuries
    vi. Suspicion or documentation of a significant head injury (no need to validate with imaging prior to transfer)
        1. Hemotympanum or cerebrospinal fluid leak suggestive of basilar skull fracture
        2. Open or penetrating head injuries
        3. Depressed skull fractures
        4. GCS < 14
        5. Intracranial hemorrhage or contusion
    vii. Suspected concussive syndrome with persistent symptoms such as vomiting, confusion, and/or headache
    viii. Pelvic fracture
    ix. Blunt injury to the chest and/or abdomen
    x. Ocular injuries
    xi. Degloving injuries
d. If child meets Red Level Activation Criteria transfer should be initiated within 20 minutes and transfer should not be delayed for further diagnostic testing.
e. If injured child requires transfer to a pediatric trauma center contact to the receiving trauma surgeon or their designee should be made early.
f. Consultation with the receiving physician should be done prior to diagnostic imaging to evaluate the risk/benefit ratio of injury identification and exposure to radiation.
g. Questions regarding IV fluid rates, drug doses, and other therapeutic interventions may also be addressed with the receiving physician during the consultation.
h. Mode of transportation should be determined in a collaborative approach between transferring and receiving hospital.
i. Major burn patients should be transferred directly to a burn care facility.
j. Information to be shared with the receiving facility should include:

i. Age
ii. Mechanism and time of injury
iii. Injuries identified
iv. Vital signs including weight in kilograms
v. Interventions including volume and type of fluids given
vi. Diagnostics completed including lab results
vii. Radiology images if done

k. Per the MN State Trauma System requirement, all patients transferred to a higher level of care require a Performance Improvement review.

Resources/Links

- American College of Surgeons Committee on Trauma Advanced Trauma Life Support: Program for Doctors, 10th Edition. Chicago: ACS, 2018.
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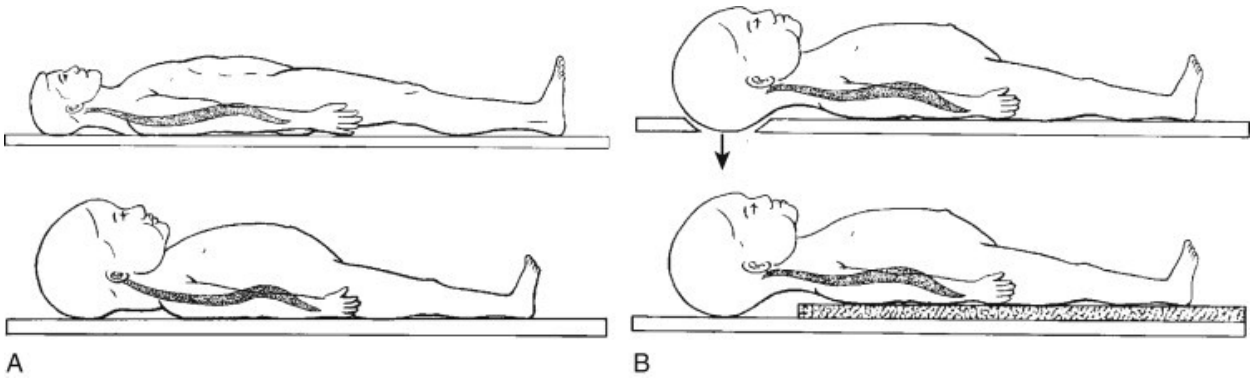
- Trauma Center Association of America Pediatric Trauma Transfer Guidelines 2011
- Rural Trauma Team Development Course Manual 2015

Appendices

Appendix 1:

C-Spine Alignment



Appendix 2:

Normal Pediatric Vital Sign Ranges

Age Group	Respiratory Rate	Heart Rate	Systolic BP
Infant 1 year or less	30-60	100-180	70-80
Toddler (1-2 years)	25-40	80-150	75-84
Preschooler (3-5 years)	20-35	70-120	80-110
School Aged (>= 6 years)	20-30	60-100	90-120

References: AHA/PALS

Appendix 3:

Pediatric Glasgow Coma Scale

Clinical Parameter	Infants (0-12 months)	Children (1-5 years)	Points
Eye Opening	Spontaneous	Spontaneous	4
	Response to speech	Response to speech	3
	Response to pain	Response to pain	2
	No response	No response	1
Verbal Response	Coos/babbles	Appropriate words	5
	Irritable	Inappropriate words	4
	Cries to pain	Persistent cry	3
	Moans to pain	Grunts	2
	No response	No response	1
Best Motor Response	Normal	Spontaneous	6
	Withdraws to touch	Localized pain	5
	Withdraws from pain	Withdraws from pain	4
	Flexor response	Flexor response	3
	Extensor response	Extensor response	2
	No response	No response	1

Prepared by: SMRTAC leadership/Pediatric Subcommittee
Approvals: SMRTAC 12/19/2013, 6/9/2016, 5/11/21

Disclaimer: This is a general guideline and is not intended as a substitute for clinical judgment or as a protocol for the management of all trauma patients.

Pediatric Trauma Assessment Algorithm

Patient meets Level Red criteria – consider early initiation of transfer to verified pediatric trauma center