Pediatric Tactical Emergency Casualty Care (TECC) Guidelines

Developed by:

The Committee for Tactical Emergency Casualty Care

Revised January 2023

Disclaimer:

These are guidelines only intended primarily for the high-threat environment where traditional resources may not be available, and there are competing safety, operational, and patient care priorities. They do not supersede or substitute for departmental/agency operational protocols being delivered by qualified providers under the guidance of direct or indirect medical oversight.

Why did C-TECC develop these guidelines?

Children under 18 years old comprise about 25% of the population and are at a disproportionate disadvantage when they become injured in the prehospital environment. This is especially true when their injuries involve hemorrhage, hypothermia, head injury, and severe emotional trauma. Tactical responders need to recognize and mitigate these conditions proactively to optimize patient outcomes and ensure that pediatric patients are directed to the most appropriate definitive health care receiving facilities. These guidelines are complementary to the general *C-TECC Guidelines* and the generally accepted principles of pediatric resuscitation. They are intended to be used as a tool for departments and agencies to prepare to respond to the needs for pediatric patient in the unique high-threat environment.

Defining the pediatric patient:

There is no consensus and a high degree of variability on the definition of a pediatric patient across prehospital healthcare systems in the United States[1]. For operational simplicity for the purposes of these guidelines, *a pediatric patient is one who by observation does not appear to have reached puberty*.

Organization of these guidelines:

These pediatric guidelines follow the same conceptual format as the *C-TECC Guidelines*, which emphasize three phases of the tactical/operational environment, each which requires a unique approach towards patient care:

1. Direct Threat

2. Indirect Threat

3. Evacuation

Section I: Direct Threat Care

Goal:

- Accomplish the mission objectives while mitigating the risk to the injured, to responders, and to the public

Key Principles:

- Threats and hazards in this environment are dynamic and require ongoing assessment and mitigation
- Minimal patient care interventions are warranted in this phase. CPR and other advanced interventions should not be performed in the Direct Threat environment.
- Accessing and removing the injured from the threat should be a priority
- Mitigate the psychosocial impact to the pediatric victim by using simple, calm language (e.g., "I'm a police officer and I'm going to help you").

Guidelines:

1. **Execute a rescue plan to reduce the risk to the injured from ongoing direct threat by using one or more of these strategies**:
    a. Direct the pediatric patient to self-extricate to a safer position using simple, age-appropriate commands. Use simple phrases that are understandable by a child and which are actionable (e.g., "look at my face and crawl to me right now")
    b. Mitigate the threat to the patient and providers
    c. Direct another person to assist with extricating the pediatric patient to a safer position
    d. Physically remove the patient
    e. Consider a rescue plan for a patient that is unable to be extricated by other means (e.g., unresponsive, inaccessible, or otherwise unable to move)
2. **Stop life threatening external hemorrhage**
    a. Apply immediate, purposeful, focused manual pressure to the bleeding source
    b. Apply junctional pressure if needed to supplement
    c. Apply a tourniquet to the patient with uncontrolled severe extremity bleeding or an amputation
        i. Apply the tourniquet as high (proximal) on the limb as possible
        ii. Apply to bare skin if possible
        iii. Apply a second tourniquet to an extremity that continues to bleed if necessary

1. Apply proximal to the existing tourniquet if able
2. Apply to bare skin if possible

iv. Most commercial tourniquets will be adequate for most pediatric patients[2]

1. Some tourniquets may not function as intended on small limbs- know your equipment limitations and be prepared to use another method to obtain hemostasis if necessary, such as an elastic bandage

d. Continue to apply manual pressure to the source or to a junctional location as needed

3. **Support the airway**
   a. Place, or direct the patient to be placed, into the best position to protect the airway (e.g., recovery position or sitting up)
   b. Consider rapid, high-yield airway interventions if needed
      i. Manual positioning
      ii. Placement of an airway adjunct

Section II: Indirect Threat Care

Goals:

- Leverage this phase of *relative* safety to rapidly stabilize additional time-sensitive life-threatening injuries to the patient to permit safe extraction to more definitive treatment and evacuation
- The threat remains at this point and as such, so does the need for heightened awareness to the safety and security of the responders and the patients

Key Principles:

- Conduct a rapid patient assessment and initiate life-saving interventions
- Do not delay patient extraction for non-life-saving interventions
- Consider establishing a casualty (patient) collection point(s)
- Do not unnecessarily delay the movement of the patient towards definitive care
- Prepare for patient evacuation
- Be prepared to document any care rendered
- Anticipate for the possibility of extended/prolonged care under the phase of Indirect Threat

Guidelines:

1. **Assess patient using the Pediatric Assessment Triangle (Appendix 1) to identify major deficits**
    a. General appearance
    b. Work of Breathing
    c. Circulation to Skin
2. **Expose, assess and control ongoing severe bleeding**
    a. Apply aggressive direct manual pressure to the source of the bleeding immediately
    b. Apply a tourniquet if necessary
    c. Utilize trauma dressings to control bleeding at the source
        i. Hemostatic trauma dressings are appropriate to use in pediatric patients if available
        ii. Apply using deep wound packing technique
        iii. Apply a pressure dressing over the packed wound
    d. Re-assess any tourniquets that were already applied to the patient
        i. Assess for distal pulses on extremities with tourniquets applied and tighten device if present

ii. Expose skin and apply a tourniquet 2-3 inches above wound for ongoing severe extremity bleeding if not already done (see Section I)

e. Expose and clearly mark tourniquet site with the time of application if possible

f. For prolonged care under Indirect Threat, consider a tourniquet conversion

i. If the delay to definitive care will be longer than 2 hours and

1. The patient is not in hemorrhagic shock
2. The bleeding wound can be visualized and accessed
3. The tourniquet is not controlling bleeding from a partial or complete amputation
4. The patient has not already had a tourniquet downgrade attempted

ii. Apply a new tourniquet proximal to the existing device and be prepared to tighten if necessary

iii. Expose and pack the previously bleeding wound site

1. Use a hemostatic trauma dressing if available

iv. Apply a pressure dressing to the wound site

v. Slowly remove the first tourniquet and continuously assess for bleeding

1. If bleeding recurs, tighten the new tourniquet until hemostasis is obtained

g. Consider the use of tranexamic acid (TXA) in patients with suspected or actual massive hemorrhage

i. TXA use should only be undertaken in a pediatric trauma system-of-care setting where pre-event coordination with local medical infrastructure has taken place

ii. Suggested dose: 15 mg/kg loading dose followed by 2 mg/kg/hour for 8 hours

iii. Only initiate if less than 3 hours from time of injury, but ideally within the first 30 minutes from time of injury

iv. Consider administering TXA after resuscitation with whole blood has occurred

3. Support airway and breathing

a. Assess patient for adequacy of airway and respiratory effort

i. Look, listen, and feel

ii. Consider pulse oximetry if available with a goal of over 94% on room air

b. If necessary, intervene to open and maintain a patent airway. Consider these interventions:

i. Manually position airway

1. Head-tilt/chin-lift, or
2. Manual jaw thrust (open mouth first)

ii. Suction airway (avoid putting fingers in mouth, and use caution for vaso-vagal response from aggressively suctioning hypopharynx)
iii. Allow patient to assume most comfortable position, which may be lateral recumbent or sitting up. For recumbent infants and younger children, elevate the shoulders with gentle support (e.g., folded towel) to optimize airway positioning
iv. Maintain a high index of suspicion for potential airway worsening in a patient with inhalational burns or other injuries

c. Support ventilations as needed
   i. basic airway adjunct (NP or OP airway) and effective bag-valve-mask ventilation are the initial intervention
   ii. If unable to ventilate, consider more advanced airway support
      1. Extraglottic (supraglottic) airway
      2. If a surgical airway is indicated, needle cricothyroidotomy is recommended over surgical approach for pediatric patients
      3. Intubation if unable to manage airway with extraglottic airway or if there is ongoing airway damage (e.g. airway burns)
   iii. Consider administering oxygen
   iv. Avoid hyperventilation with assisted ventilations
d. Consider the need to prevent or treat a tension pneumothorax in an unstable patient with poor or rapidly deteriorating respiratory effort
   i. Apply a seal to any open chest, back, or neck wounds
      1. Ideally this is a vented commercial chest seal
      2. Monitor patient for possible development of tension pneumothorax, especially if a non-vented chest seal is applied
   ii. Perform needle decompression on the side of the injury
      1. Infants and smaller children require a smaller needle than adults for decompression. Consider a standard 1.5 inch/3.8 cm needle[3].
      2. Landmarks for insertion:
         a. 2nd intercostal space at the mid-clavicular line
         b. 4th intercostal space at the anterior-axillary line
      3. Consider bilateral needle decompression in the peri-cardiac arrest and traumatic arrest patient

4. Assess circulatory status

a. For a patient in suspected shock
   i. Ensure that external hemorrhage is being aggressively controlled
   ii. Obtain IV/IO access promptly
   iii. Warm fluids are preferred

iv. Consider blood products for a patient in suspected hemorrhagic shock:
    1. Transfuse with low-titer O-negative whole blood (LTOWB) 10 mL/kg in children one year or older
    2. Transfuse a 1:1 ratio of packed red blood cells (PRBC) and plasma at 10 mL/kg each
v. If blood not available, or suspected shock of non-hemorrhagic etiology, consider a bolus of 20 mL/kg normal saline or lactated Ringer's solution
vi. Consider repeat bolus up to a maximum of 60 mL/kg if still demonstrating signs/symptoms of shock
vii. Continually assess patient and slow the rate of IV fluid administration if patient improves or recovers to minimal blood pressure range for age or recovers a strong peripheral pulse
    1. Systolic BP goal: 60 mmHg <1 month of age, 70 mmHg + [2 x age in years] in children 1 month to 10 years of age, 90 mmHg in children 10 years of age or older

b. Cardiopulmonary resuscitation (CPR) and defibrillation are typically not successful in patients of any age who have suffered traumatic cardiac arrest or blast injuries. In certain circumstances (e.g., electrical injuries, drowning, suffocation, etc.), CPR may be of benefit and should be considered in the context of available resources.
c. Oral intake of fluids may be encouraged if the patient is conscious and the airway is patent

5. Prevent and treat hypothermia

a. Reduce heat loss from conduction with the ground
b. Remove wet clothing and dry the patient
c. Cover the patient with warm, dry insulating material covered with a barrier to keep it dry

6. Prevent and treat hypoglycemia

a. Check fingerstick blood glucose if able-- low blood sugar is a common co-pathology in injured children. Consider using 70 mg/dL as a conservative threshold for hypoglycemia in infants and children[4].
b. Treatment could involve oral intake of high-carbohydrate food or IV administration of dextrose at 2 mg/kg. D10 or D25 is the preferred formulation for pediatric dosing.

7. Provide analgesia as needed

a. Assess the pain level
b. Consider acetaminophen PO (15 mg/kg) every four hours for mild to moderate pain

c. In patients over 3 months old, consider ketamine for analgesia for moderate to severe pain as it has a favorable risk profile[5 6 7]. Use weight-based dosing and administer slowly to mitigate possible side effects.
    i. Suggested oral dose is 0.2-0.5 mg/kg every 8 hours
    ii. Suggested IM dose is 0.2-0.5 mg/kg slow push
    iii. Suggested IV dose is 0.1-0.2 mg/kg slow push
d. In an infant, sugar is a proven analgesic. If the airway is patient and the child is awake, dip a pacifier or gloved finger into a sugary solution (not honey) and offer as often as needed[8]
e. Narcotic pain medications are also appropriate for use in the pediatric population under local protocol guidance, with IV, IM, and intranasal (IN) options available. Use weight-based dosing and ensure that there is immediate access to the reversal agent naloxone. Suggested dosages:
    i. Fentanyl IM/IN: 1 mcg/kg (not to exceed 100mcg)
    ii. Fentanyl IV/IO: 1 mcg/kg titrate to effect at rate of 50 mcg/min slow IVP (not to exceed 100mcg)
    iii. Morphine IM: 0.1 mg/kg
    iv. Morphine IV/IO: 0.1 mg/kg titrate to effect at rate of 2 mg/min slow IVP (not to exceed 20 mg)
f. Consider the use of ondansetron if nausea or vomiting occurs in a child over 8kg.
    i. Suggested dose: 0.1 mg/kg IV for patients 1 month-12 years
    ii. Suggested dose: 4 mg IV for patients over 12 years
    iii. Suggested dose: 4 mg PO children 4-12 years
    iv. Suggested dose: 8 mg PO children over 12 years

8. Head injury

a. The Pediatric Glasgow Coma Scale (Peds GCS) (Appendix 2) has been widely used for decades as a clinical measure of the level of consciousness following traumatic brain injury in infants and children and remains a reasonable but limited tool for prehospital use[9].
    i. Peds GCS ≤ 12 suggests non-mild traumatic brain injury
    ii. Peds GCS ≤ 8 suggests need for airway support
    iii. Peds GCS ≤ 6 suggests need for surgical management of TBI
b. Restrict cervical spine motion if indicated based on mechanism of injury
    i. In the absence of commercial immobilization devices, consider manual stabilization, a towel roll, or other improvised technique
c. Avoid hypoxia (see above)
d. Avoid hyper- or hypoventilation- the goal is normocarbia ($ETCO_2$ of 35-40 mmHg)

e. Consider elevating the head to about 30°
f. Treat aggressively for shock if present. Hypotension can double the mortality associated with traumatic brain injury.
g. Avoid hypothermia

9. Package for Movement

a. Utilize a movement assistive device if possible (basket, portable stretcher, wheeled litter, etc.)
b. Minimize unnecessary movement
c. Ensure patient is well secured and is ready for the anticipated mode of extraction
d. Prevent hypothermia

10. Mitigate the psychosocial impact

a. As detailed above, plus
b. With all ages of children it is important to express empathy-- tell them the truth about what to expect, warn them if something will hurt, and describe what you are doing to help them
c. Talk to the child directly if possible
d. Keep the patient with the caregiver to the extent possible

Section III: Evacuation Care

Goals:

- Now that the patient and providers are removed from the probability of ongoing injuries from the threat, the top priority is the maintenance and improvement of the lifesaving interventions initiated during the Direct and Indirect Threat phases of care
- Additionally, a more comprehensive patient management approach can be taken to identify and treat any remaining threats to the patient's health
- The focus continues toward moving the patient to definitive care with minimal delays

Key Principles:

- Closely monitor the patient for changes in condition
- The medical management goals for this section overlap significantly with those from Indirect Threat

Guidelines:

1. **Assess patient using the Pediatric Assessment Triangle (Appendix 1) to identify major deficits**
    a. General appearance
    b. Work of Breathing
    c. Circulation to Skin
2. **Reassess and control any ongoing severe bleeding**
    a. Apply aggressive direct manual pressure to the source of the bleeding immediately
    b. Apply a tourniquet if necessary
    c. Utilize trauma dressings to control bleeding at the source
        i. Hemostatic trauma dressings are appropriate to use in pediatric patients if available
        ii. Apply using deep wound packing technique
        iii. Apply a pressure dressing over the packed wound
    d. Re-assess any tourniquets that were already applied to the patient
        i. Assess for distal pulses on extremities with tourniquets applied and tighten device if present
        ii. Expose skin and apply a tourniquet 2-3 inches above wound for severe extremity bleeding if not already done
    e. Expose and clearly mark tourniquet site with the time of application if possible
    f. For patients that face delays before receiving definitive care, consider a tourniquet conversion

i. If the delay will be longer than 2 hours and
    1. The patient is not in hemorrhagic shock
    2. The bleeding wound can be visualized and accessed
    3. The tourniquet is not controlling bleeding from a partial or complete amputation
    4. The patient has not already had a tourniquet downgrade attempted
ii. Apply a new tourniquet proximal to the existing device and be prepared to tighten if necessary
iii. Expose and pack the previously bleeding wound site
    1. Use a hemostatic trauma dressing if available
iv. Apply a pressure dressing to the wound site
v. Slowly remove the first tourniquet and continuously assess for bleeding
    1. If bleeding recurs, tighten the new tourniquet until hemostasis is obtained

g. Consider the use of tranexamic acid (TXA) in patients with suspected or actual massive hemorrhage[10 11 12]
    i. TXA use should only be undertaken in a pediatric trauma system-of-care setting where pre-event coordination with local medical infrastructure has taken place
    ii. Suggested dose: 15 mg/kg loading dose followed by 2 mg/kg/hour for 8 hours
    iii. Only initiate if less than 3 hours from time of injury, but ideally within the first 30 minutes from time of injury
    iv. Consider administering TXA after resuscitation with whole blood has occurred

3. Reassess and support airway and breathing

a. Assess patient for adequacy of airway and respiratory effort
    i. Look, listen, and feel
    ii. Consider pulse oximetry if available with a goal of over 94% on room air
b. If necessary, intervene to open and maintain a patent airway. Consider these interventions:
    i. Manually position airway
        1. Head-tilt/chin-lift, or
        2. Manual jaw thrust (open mouth first)
    ii. Suction airway (avoid putting fingers in mouth, and use caution for vaso-vagal response from aggressively suctioning hypopharynx)
    iii. Allow patient to assume most comfortable position, which may be lateral recumbent or sitting up. For recumbent infants and younger children,

elevate the shoulders with gentle support (e.g., folded towel) to optimize airway positioning

c. Support ventilations as needed
    i. basic airway adjunct (NP or OP airway) and effective bag-valve-mask ventilation are the initial intervention
    ii. If unable to ventilate, consider more advanced airway support
        1. Extraglottic (supraglottic) airway
        2. If a surgical airway is indicated, needle cricothyroidotomy is recommended over surgical approach for pediatric patients
        3. Intubation if unable to manage airway with extraglottic airway
    iii. Consider administering oxygen
    iv. Avoid hyperventilation with assisted ventilations
d. Consider the need to prevent or treat a tension pneumothorax in unstable patients with poor or rapidly deteriorating respiratory effort
    i. Apply a seal to any open chest, back, or neck wounds
        1. Ideally this is a vented commercial chest seal
        2. Monitor patient for possible development of tension pneumothorax, especially if a non-vented chest seal is applied
    ii. Perform needle decompression on the side of the injury
        1. Infants and smaller children require a smaller needle than adults for decompression. Consider a standard 1.5 inch/3.8 cm needle[13].
        2. Landmarks for insertion:
            a. 2nd intercostal space at the mid-clavicular line
            b. 4th intercostal space at the anterior-axillary line
        3. Consider bilateral needle decompression in the peri-cardiac arrest and traumatic arrest patient

4. Reassess circulatory status

a. For a patient in suspected shock
    i. Ensure that external hemorrhage is being aggressively controlled
    ii. Obtain IV/IO access promptly
    iii. Warm fluids are preferred
    iv. Consider blood products for a patient in suspected hemorrhagic shock:
        1. Transfuse with low-titer O-negative whole blood (LTOWB) 10 mL/kg in children one year or older
        2. Transfuse a 1:1 ratio of packed red blood cells (PRBC) and plasma at 10 mL/kg each
    v. If blood not available, or suspected shock of non-hemorrhagic etiology, consider a bolus of 20 mL/kg normal saline or lactated Ringer's solution

vi. Consider repeat bolus up to a maximum of 60 mL/kg if still demonstrating signs/symptoms of shock
vii. Continually assess patient and slow the rate of IV fluid administration if patient improves or recovers to minimal blood pressure range for age or recovers a strong peripheral pulse
1. Systolic BP goal: 60 mmHg <1 month of age, 70 mmHg + [2 x age in years] in children 1 month to 10 years of age, 90 mmHg in children 10 years of age or older

b. Cardiopulmonary resuscitation (CPR) and defibrillation are typically not successful in patients who have suffered from traumatic cardiac arrest or blast injuries. In certain circumstances (e.g., electrical injuries, drowning, suffocation, etc.) CPR may be of benefit and should be considered in the context of available resources.
c. Oral intake of fluids may be encouraged if the patient is conscious and the airway is patent

5. Prevent and treat hypothermia

a. Reduce heat loss from conduction with the ground
b. Remove wet clothing and dry the patient
c. Cover the patient with warm, dry insulating material covered with a barrier to keep it dry

6. Prevent and treat hypoglycemia

a. Check fingerstick blood glucose if able-- low blood sugar is a common co-pathology in injured children
b. Treatment could involve oral intake of high-carbohydrate food or IV administration of dextrose at 2 mg/kg. D10 is the preferred formulation for pediatric dosing.

7. Reassess for pain and provide analgesia as needed

a. Assess the pain level
b. Consider acetaminophen (15 mg/kg) every four hours for mild to moderate pain
c. In patients over 3 months old, consider ketamine for analgesia for moderate to severe pain as it has a favorable risk profile[14]. Use weight-based dosing and administer slowly to mitigate possible side effects.
i. Suggested oral dose is 0.2-0.5 mg/kg every 8 hours
ii. Suggested IM dose is 0.2-0.5 mg/kg slow push
iii. Suggested IV dose is 0.1-0.2 mg/kg slow push
d. In an infant, sugar is a proven analgesic. If the airway is patient and the child is awake, dip a pacifier or gloved finger into a sugary solution (not honey) and offer as often as needed

e. Narcotic pain medications are also appropriate for use in the pediatric population under local protocol guidance, with IV, IM, and intranasal (IN) options available. Use weight-based dosing and ensure that there is immediate access to the reversal agent naloxone. Suggested dosages:
   i. Fentanyl IM/IN: 1 mcg/kg (not to exceed 100mcg)
   ii. Fentanyl IV/IO: 1 mcg/kg titrate to effect at rate of 50 mcg/min slow IVP (not to exceed 100mcg)
   iii. Morphine IM: 0.1 mg/kg
   iv. Morphine IV/IO: 0.1 mg/kg titrate to effect at rate of 2 mg/min slow IVP (not to exceed 20 mg)

f. Consider the use of ondansetron if nausea or vomiting occurs in a child over 8kg.
   i. Suggested dose: 0.1 mg/kg IV for patients 1 month-12 years
   ii. Suggested dose: 4 mg IV for patients over 12 years
   iii. Suggested dose: 4 mg PO children 4-12 years
   iv. Suggested dose: 8 mg PO children over 12 years

8. Consider the use of antibiotics for patients with penetrating trauma, including eye injuries[15]

a. For situation where extraction will be delayed beyond several hours, consider the one-time administration of an antibiotic under local protocol guidance to reduce to risk of infectious complications
   i. Cefazolin 30 mg/kg IV (up to 2g) for open extremity or thoracic injuries
   ii. Levofloxacin 16 mg/kg IV/PO (up to 750mg) for penetrating eye injuries
   iii. Cefazolin (as above) plus metronidazole 15 mg/kg IV loading dose for maxillofacial trauma or involvement of the esophagus, stomach, or gut

9. Head injury

a. The Pediatric Glasgow Coma Scale (Peds GCS) has been widely used for decades as a clinical measure of the level of consciousness following traumatic brain injury in infants and children and remains a reasonable but limited tool for prehospital use[16].
   i. Peds GCS ≤ 12 suggests non-mild traumatic brain injury
   ii. Peds GCS ≤ 8 suggests need for airway support
   iii. Peds GCS ≤ 6 suggests need for surgical management of TBI

b. Restrict cervical spine motion if indicated based on mechanism of injury
   i. In the absence of commercial immobilization devices, consider manual stabilization, a towel roll, or other improvised technique

c. Prevent hypoxia[17] (see above)

d. Avoid hyper- or hypoventilation- the goal is normocarbia ($ETCO_2$ of 35-40 mmHg)[18]

e. Treat aggressively for shock if present[19]. Hypotension can double the mortality associated with traumatic brain injury.
f. Consider elevating the head to about 30°
g. Avoid hypothermia[20]

10. Burn and Smoke Inhalation

a. Aggressively monitor airway and respiratory status
b. Have a low threshold for intubation if airway burns are suspected
c. Apply high-flow oxygen via non-rebreather mask if carbon monoxide toxicity is suspected
d. Have a low threshold for suspecting cyanide toxicity
    i. Symptoms are non-specific and may be similar to CO toxicity
    ii. Patients may have a "cherry red" appearance to their skin
    iii. Treatment includes oxygen and the use of an antidote:
        1. Cyanide Antidote Kit- in pediatric patients consider using only the sodium thiosulfate component of the kit at 1.5 mL/kg up to 50 mL IV. The other components of the kit contain nitrates which can cause complications in children with smoke inhalation.
        2. Hydroxocobalmin is frequently and effectively used off-label in children at a dose of 70 mg/kg up to 5 g IV over 15 minutes
e. Manage burns
    i. Use the "rule of 9's" in infants and children (Appendix 3) or estimate burned surface area using the surface area of the palm of the patient which represents approximately 1% of the body surface area
    ii. Cover burned areas with dry, clean dressings (sterile if possible)
    iii. Aggressively mitigate hypothermia (see above)
    iv. For burns >20% TBSA begin fluid resuscitation. A suggested strategy is:
        3. If patient suffering from hemorrhagic shock as well, this condition takes priority for fluid resuscitation strategy (see above)
        4. For TBSA ≥ 20% and Weight < 30 kg
            a. Calculate estimated intravenous fluid needs
                i. >10 kg use LR, < 10kg use D5LR
                ii. 3 ml x weight in kg x %TBSA
                iii. Include previously administered fluids in total fluid amount
                iv. Administer half of calculated amount over the first 8 hours post burn (from time of injury)
                v. Administer remaining amount over the next 16 hours

vi. In addition to burn resuscitation fluid requirements, also infuse maintenance IVF of D5LR
1. 4ml/kg/hr for the first 10 Kg of body weight, then 2ml/kg/hr for the next 10 Kg of body weight, then 1ml/kg/hr for the remaining Kg of body weight
5. Proactively monitor and maintain normal blood sugars
6. For children >30kg use adult strategy for burn resuscitation

v. Provide analgesia (see above)

11. Transfer safely

a. Ensure that proper restraints are fully applied to the victim before initiating air or ground transport:
i. Including forward/deceleration restraints over the shoulders
ii. Infants and very young children should be transported in a car safety seat if stable
iii. Providers should be restrained as well
iv. Equipment must be secured
b. Arrive safely- be judicious with the use of lights and sirens as they are a significant cause of patient and provider injuries and fatalities
c. When considering atypical transport platforms:
i. Address preventable causes of death prior to initiating transport
ii. If possible, patient should remain under care by a rescuer or responder (other than the vehicle operator) during transport. Maintain any lifesaving intervention initiated during prior phases.
iii. Ideally, patient transport platform is enclosed and optimizes safety and minimizes environmental threats to the patient
iv. Patient should be safely restrained to the extent possible
d. Consider the most appropriate receiving facility and notify them

12. Mitigate the psychosocial impact

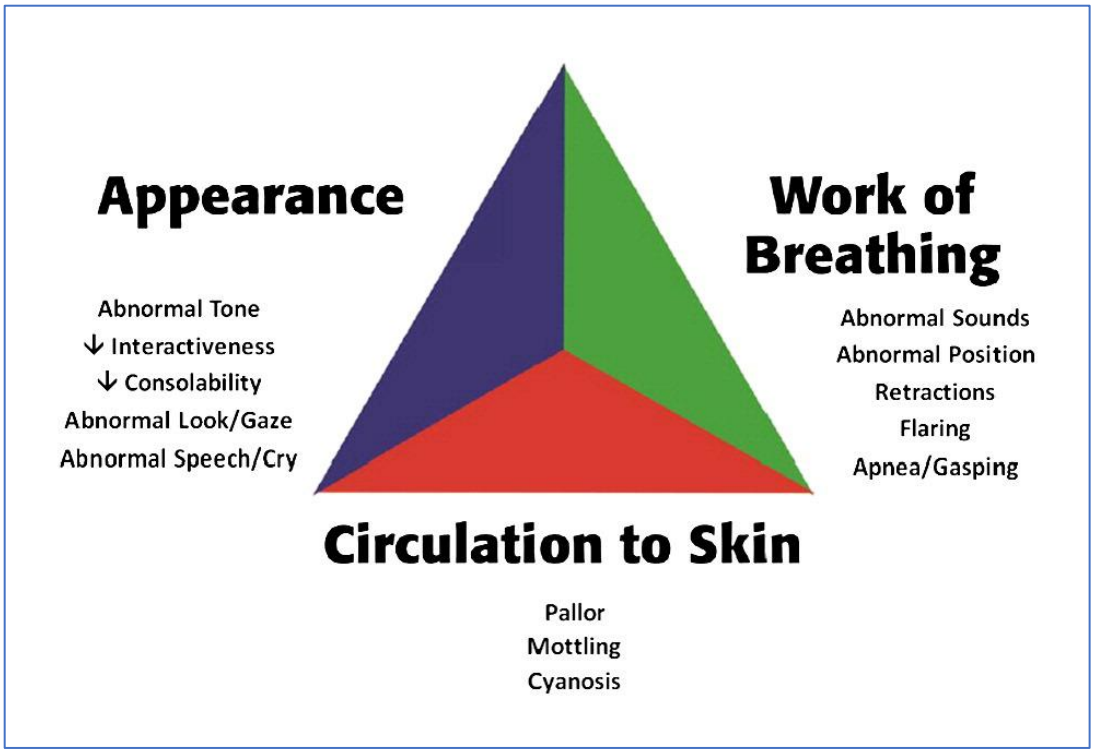
a. With all ages of children it is important to express empathy-- tell them the truth about what to expect, warn them if something will hurt, and describe what you are doing to help them
b. Talk to the child directly if possible
c. Keep the patient with the caregiver to the extent possible
d. Use techniques of distraction as needed
i. For infants- keys, a penlight, a pacifier or blanket
ii. For older children- conversation, a toy, jokes, electronic device
e. Contact the caregiver if they are not with the child
f. Don’t make promises you can’t keep

553 g. Be calm around the patient

554

555 APPENDIX 1

556 Pediatric Assessment Triangle[21]



557

558

APPENDIX 2

Pediatric Glascow Coma Scale[22]

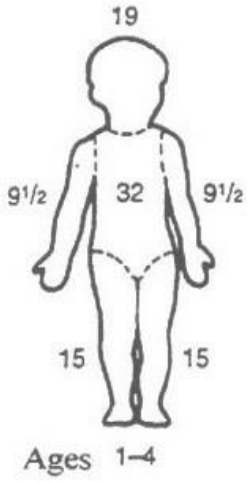
Glasgow Coma Scale		Pediatric Glasgow Coma Scale	
Eye opening		Eye opening	
- Spontaneous	4	- Spontaneous	4
- Speech	3	- Speech	3
- Pain	2	- Pain	2
- None	1	- None	1
Verbal response		Verbal response	
- Oriented	5	- Coos, babbles	5
- Confused	4	- Irritable cries	4
- Inappropriate	3	- Cries to pain	3
- Incomprehensible	2	- Moans to pain	2
- None	1	- None	1
Motor response		Motor response	
- Obey command	6	- Normal spontaneous movement.	6
- Localize pain	5	- Withdraws to touch	5
- Flexor withdrawal	4	- Withdraws to pain	4
- Flexor posturing	3	- Abnormal flexion	3
- Extensor posturing	2	- Abnormal extension	2
- None	1	- None	1

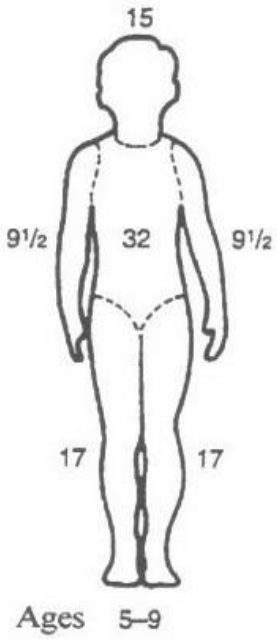
Abbreviations: GCS, Glasgow Coma Scale.

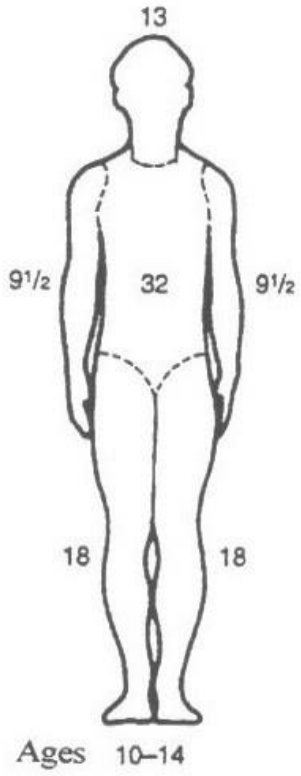
APPENDIX 3

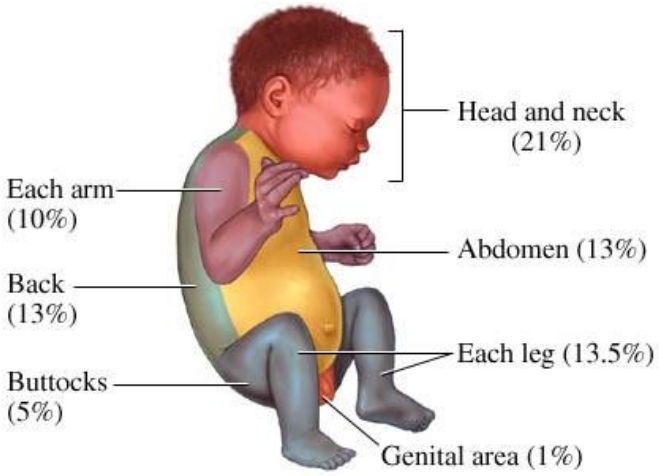
Estimating burns in the context of total body surface area (TBSA) for infant, younger child, older child, and adolescent

Courtesy of the American Burn Association









587 REFERENCES

[1] Garrett, A. and Perkins, M. What's in a number? Variability in the definition of pediatric patients in United States EMS. Poster presented at: National Association of City and County Health Officials. April 12, 2021. Virtual Conference.

[2] Charlton NP, Goolsby CA, Zideman DA, et al. Appropriate tourniquet types in the pediatric population: a systematic review. *Cureus*. 2021;13(4): e14474. doi:10.7759/cureus.14474

[3] Mandt MJ, Hayes K, Severyn F, et al. Appropriate needle length for emergent pediatric needle thoracostomy utilizing computed tomography. *Prehosp Emerg Care*. 2019;23(5):663-671.

[4] Mathew P, Thoppil D. Hypoglycemia. StatPearls. Accessed May 1,2024. https://www.ncbi.nlm.nih.gov/books/NBK534841/

[5] Vadivelu N, Schermer E, Kodumudi V, et al. Role of ketamine for analgesia in adults and children. *J Anaesthesiol Clin Pharmacol*. 2016;32(3):298.

[6] Morgan MM, Perina DG, Acquisto NM, et al. Ketamine use in prehospital and hospital treatment of the acute trauma patient: A joint position statement. *Prehosp Emerg Care*. 2021;25(4):588-592. doi:10.1080/10903127.2020.1801920

[7] Frawley J, Goyal A, Gappy R, et al. A comparison of prehospital pediatric analgesic use of ketamine and opioids. *Prehosp Emerg Care*. 2023;27(7):915-919. doi:10.1080/10903127.2023.2183295

[8] Harrison D, Stevens B, Bueno M, et al. Efficacy of sweet solutions for analgesia in infants between 1 and 12 months of age: a systematic review. *Archives of Disease in Childhood*. 2010;95(6):406-413.

[9] Teasdale G, Jennett B. Assessment of coma and impaired consciousness. *The Lancet*. 1974;304(7872):81-84.

[10] Al-Jeabory M, Gasecka A, Wieczorek W, et al. Efficacy and safety of tranexamic acid in pediatric trauma patients: Evidence from meta-analysis. *Am J Emerg Med*. 2021; 49:404-405.

[11] Eckert MJ, Wertin TM, Tyner SD, et al. Tranexamic acid administration to pediatric trauma patients in a combat setting: the pediatric trauma and tranexamic acid study (PED-TRAX*). J Trauma Acute Care Surg*. 2014;77(6):852-858. doi:10.1097/TA.0000000000000443

[12] Nishijima DK, VanBuren JM, Linakis SW, et al. Traumatic injury clinical trial evaluating tranexamic acid in children (TIC-TOC): a pilot randomized trial. *Acad Emerg Med*. Published online March 10, 2022. doi:10.1111/acem.14481

[13] Mandt MJ, Hayes K, Severyn F, et al. Appropriate needle length for emergent pediatric needle thoracostomy utilizing computed tomography. *Prehosp Emerg Care*. 2019;23(5):663-671.

[14] Vadivelu N, Schermer E, Kodumudi V, et al. Role of ketamine for analgesia in adults and children. *J Anaesthesiol Clin Pharmacol.* 2016;32(3):298.

[15] Jones, TW, Brady, S., and Schafermeyer, R. infections and Prophylaxis in Pediatric Trauma Patients. *Pediatr Emerg Med Reports*. Accessed on January 1, 2023. https://www.reliasmedia.com/articles/146252-infections-and-prophylaxis-in-pediatric-trauma-patients

[16] Teasdale G, Jennett B. Assessment of coma and impaired consciousness. *The Lancet*. 1974;304(7872):81-84.

[17] Lulla, A., Lumba-Brown, A., Totten, A. M., et al. Prehospital Guidelines for the Management of Traumatic Brain Injury – 3rd Edition. *Prehosp Emerg Care*, *27*(5), 507–538.https://doi.org/10.1080/10903127.2023.2187905

[18] Lulla, A., Lumba-Brown, A., Totten, A. M., et al. Prehospital Guidelines for the Management of Traumatic Brain Injury – 3rd Edition. *Prehosp Emerg Care*, *27*(5), 507–538.https://doi.org/10.1080/10903127.2023.2187905

[19] Lulla, A., Lumba-Brown, A., Totten, A. M., et al. Prehospital Guidelines for the Management of Traumatic Brain Injury – 3rd Edition. *Prehosp Emerg Care*, *27*(5), 507–538.https://doi.org/10.1080/10903127.2023.2187905

[20] Lulla, A., Lumba-Brown, A., Totten, A. M., et al. Prehospital Guidelines for the Management of Traumatic Brain Injury – 3rd Edition. *Prehosp Emerg Care*, *27*(5), 507–538.https://doi.org/10.1080/10903127.2023.2187905

[21] Horeczko, T., Enriquez, B., McGrath, N. E., et al. The Pediatric Assessment Triangle: Accuracy of Its Application by Nurses in the Triage of Children. *Journal of Emergency Nursing*, 39(2), 182–189. https://doi.org/10.1016/j.jen.2011.12.020

[22] Lulla, A., Lumba-Brown, A., Totten, A. M., Maher, P. J., Badjatia, N., Bell, R., … Bobrow, B. J. (2023). Prehospital Guidelines for the Management of Traumatic Brain Injury – 3rd Edition. *Prehospital Emergency Care*, *27*(5), 507–538. https://doi.org/10.1080/10903127.2023.2187905