Just In Time Handbook:

A Quick Pediatric Reference Guide for Adult Healthcare Providers

Final Draft October 2021

WRAP-EM
Western Regional Alliance for Pediatric Emergency Management
AZ CA NV OR WA UT

DISCLAIMER AND ACKNOWLEDGMENTS

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The document presents an evidenced-based approach that is appropriate for most patients, but it should not replace clinical judgement. Clinical management should be adapted to meet the needs of individual patients and situations. This document contains some links to additional informative websites, it is also intended to function as a pdf for an environment with limited or no web access.

Authors:

Kenshata Watkins, MD, Pediatric Emergency Medicine Fellow, UCSF Benioff Children's Hospitals
Rez Ghasemzadeh, MD, Pediatrics, UCSF Benioff Children's Hospital-Oakland
Shiree Fatch, DO, Pediatrics, UCSF Benioff Children's Hospital-Oakland

Contributing Editors/Reviewers representing the Western Regional Alliance for Pediatric Emergency Management (WRAP-EM):

Candy Schoenheit, RN
Quality Assurance Specialist, Trauma, EMSC
Emergency Medical Services
San Diego County Health and Human Services Agency

Greg Nelsen, PharmD
ED/OR Clinical Pharmacist
Primary Children's Hospital
Intermountain Healthcare
Salt Lake City, Utah

Merritt D. Schreiber, PhD
Lundquist Institute, Harbor-UCLA Medical Center
Los Angeles, California

Evette Perez
WRAP-EM Project Coordinator
UCSF Benioff Children's Hospital-Oakland

Irene L. Navis, AICP
Navis Strategic Services LLC
Las Vegas, Nevada
Nevada WRAP-EM Coordinator

Anna Lin, MD
Pediatric Hospitalist
Lucile Packard Children's Hospital
Stanford University
Palo Alto, California

Dustin Smith MD, FACEP
Medical Director, Simulation Center
Loma Linda University Health
Loma Linda, California

Tona McGuire, Ph.D
University of Washington School of Medicine
Seattle, Washington

Theodore Cieslak, M.D.
University of Nebraska Medical Center (Retired)
Omaha, Nebraska

Milissa Chanice
WRAP-EM Regional Operations Director
UCSF Benioff Children's Hospital-Oakland

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Table of Contents

Part I: Assessing The Pediatric Patient	
Title	Page Number
Useful Pediatric Apps	4
Pediatric Vital Signs	5
Multi-Victim Triage Methods	8
Physical Examination	11
Developmental Milestones	18
Features of a Vulnerable Population	29
Special Populations within Pediatrics	30

Part II: Managing the Pediatric Patient	
Title	Page Number
Procedures in Pediatrics	42
Respiratory Management	43
Vascular Cannulation	51
Pediatric Fluid Management	52
Management of Anxiety and Acute Pain in Pediatric Patients	55
Pediatric Pain Management	56

Pharmacologic Analgesia and Anxiolysis in the Acute Setting	57
Psychosocial Aspects of Pediatric Care	58
Palliative and End of Life Care	71
Provider Self-Care	75
Quick References	76
I. Weight-based Dosage Chart	77
II. Commonly Used Medications/ Dosages	78
III. Oral Airway Chart	80
IV. Medical Calculators	81
V. Manual Drip Primer	82

Part I: The Pediatric Patient

Useful Pediatric Apps

Free

PocketPem.com : web based phone app that provides “just in time” pearls for pediatric encounters including normal vital signs, resuscitation, cardiac, pulmonary, infant care, etc.

Pemplaybook.org : short podcasts created by pediatric emergency medicine experts on common pediatric encounters.

Thegurneyroom.com : collection of procedure “how to” videos.

Territorial Triage : phone app that walks you through START & JumpSTART triage criteria for each patient while totaling how many patients you have in each category

OPENPediatrics.org : collection of web based learning resources searchable by pediatric topic. Requires registration with site prior to having access.

eBroselow Safe Dose: free phone app medication reference tool

Paid

PediSTAT : phone app that utilizes either age, length, weight, or Broselow/Pediatape to provide medication dosing or equipment size.

Pediatric Vital Signs

Remember:

- **Vital signs in pediatric patients vary with age.**
- **Parents are a reliable source for pediatric weights.**
- **The minimum systolic BP can be calculated using the formula:**

70 + 2 x (age in years)

Heart Rate and Respiratory Rates

Age	**Heart Rate**		**Respiratory Rate (breaths/minute)**
	Awake	Sleeping	
Neonate (<1 mo old)	100-205	90-160	30-50
Infant (1mo-1 yr)	100-180	90-160	30-50
Toddler (1-2 yrs)	98-140	80-120	22-35
Preschooler (3-5 yrs)	80-120	65-100	20-25
School Aged (6-9 yrs)	75-118	58-90	18-25
Preadolescent (10-12 yrs)	70-110	50-90	16-20
Adolescent (12yr and older)	60-100	50-90	12-20

Blood Pressure

A quick way to calculate the ***minimum*** blood pressure for a pediatric patient is:

70 + 2 x (age in years)

*Refer to the table below for ranges.

A blood pressure cuff fits properly with at least two-thirds of the bladder surrounding the patient's arm. Taking blood pressure on pediatric legs (no matter how small) can give you an erroneous reading.

Age	**Systolic Pressure (mm Hg)**	**Diastolic Pressure (mm Hg)**	**Mean Arterial Pressure (mm Hg)**
Birth (<12 h, <1000g)	40-59	15-35	30-40
Birth (12 h, 3kg)	60-75	30-45	45-60
Neonate (28 days)	65-85	35-50	45-60
Infant (1-12 mo)	70-105	35-55	50-60
Toddler (1-2 yr)	85-105	40-60	50-60
Preschooler (3-5 yr)	90-110	45-70	60-70
School Aged (6-9 yr)	95-115	55-75	65-70
Preadolescent (10-12 yr)	100-120	60-80	70-80
Adolescent (12-15 yr)	110-130	65-80	70-85

Weight:

A scale provides the most accurate weight. If no scale is available, use a color-coded length-based tape. Use of age based formulas may overestimate or underestimate weight. This has important implications for the dosing of medications in pediatrics. If no scale or color coded length-based tape is available, use age-based calculation with caution and only in emergency situations in which even a brief delay of care to get more accurate resources puts the patient at imminent risk.

Remember a scale weight is more accurate than a length based weight and a length based weight is more accurate than an estimated weight.

Remember: Measure by placing red end of the tape the top of the patient's head when using a color coded length based tape

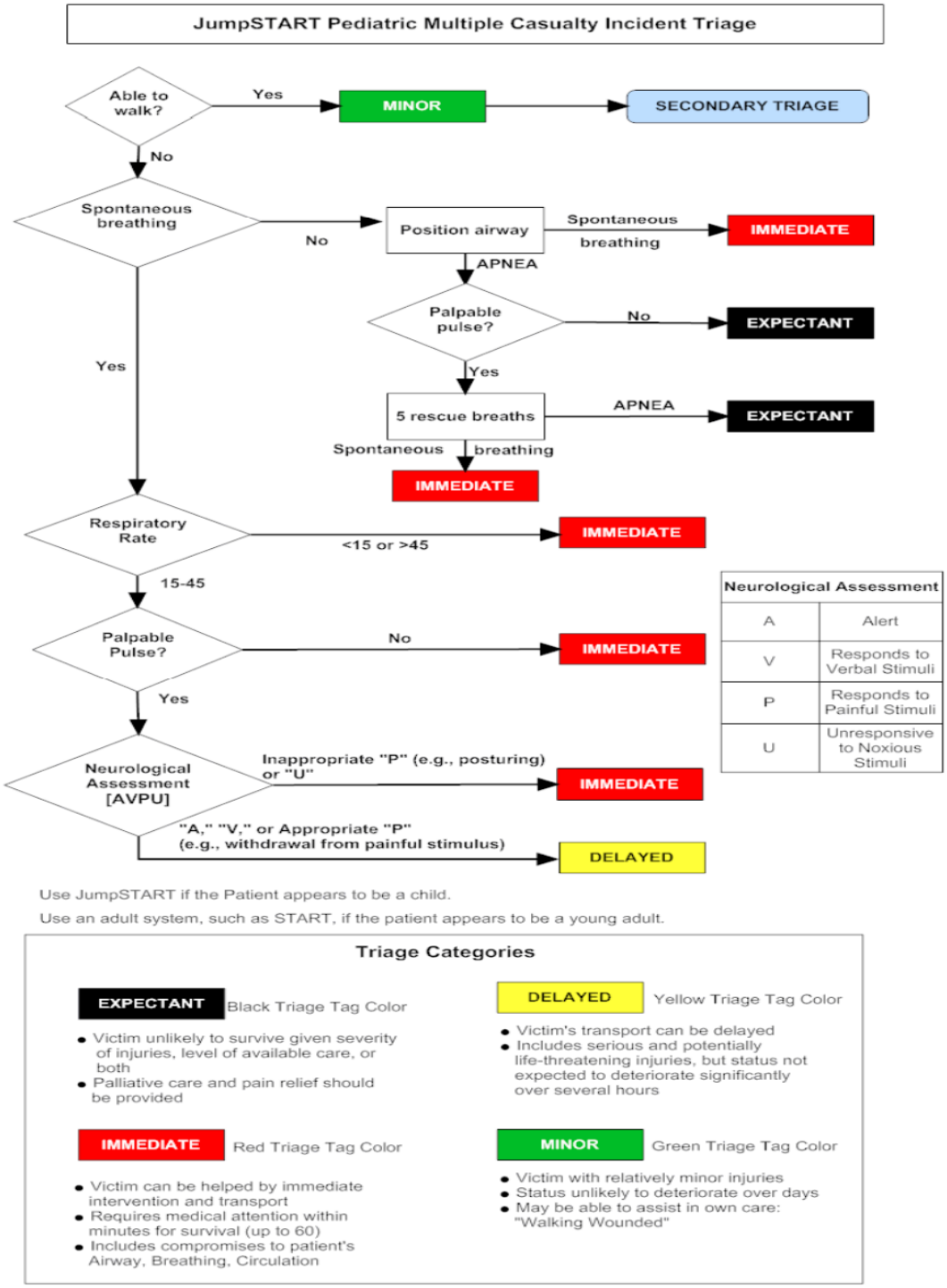
Courtesy of Pocketpem.com

Multi-Victim Triage Methods

Remember:

- **Use the triage system you are MOST COMFORTABLE with even if another system is recommended.**
- **Over-triaging can cause significant delays in the triage system, so it's most important to reassess as opposed to pressuring oneself to "get it right the first time."**

JumpSTART Algorithm (Simple Triage and Rapid Treatment) is recommended for Pediatric Mass & Multiple Casualty Incident Triage

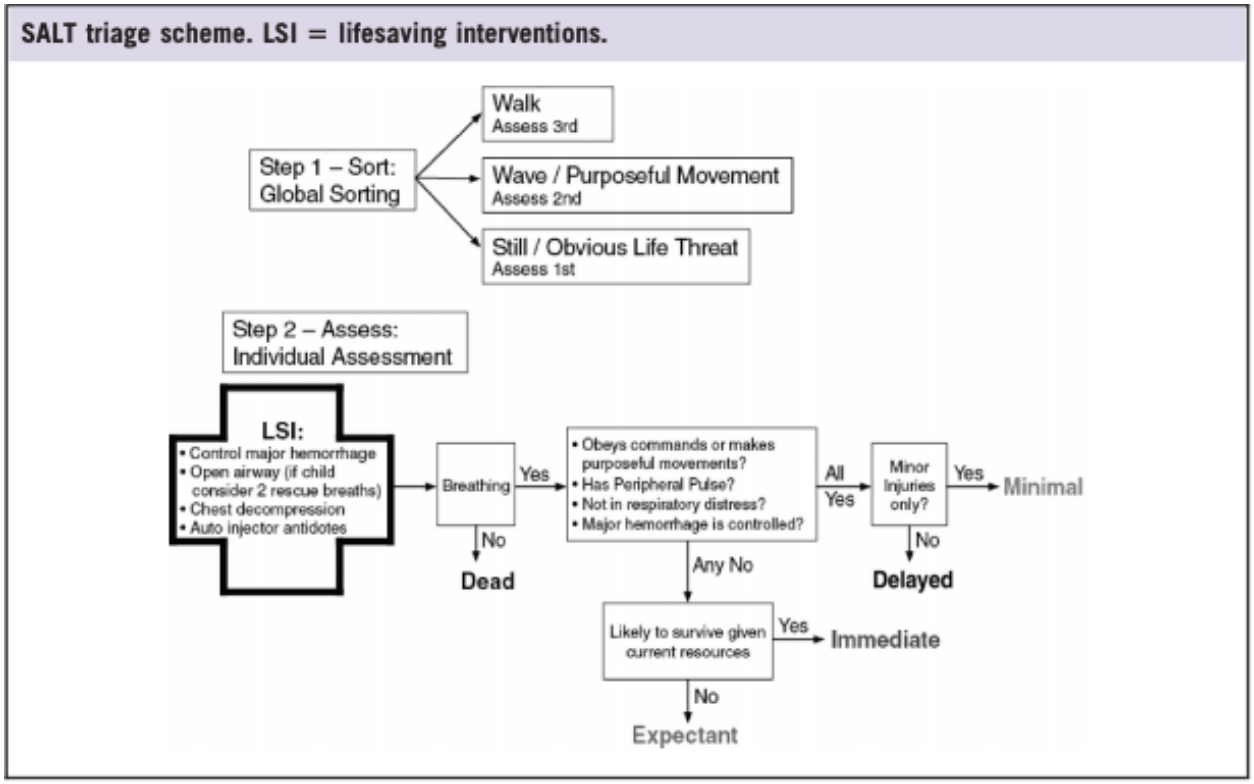


Adopted from http://www.jumpstarttriage.com/

START Algorithm for Pediatric patients: https://chemm.hhs.gov/startpediatric.htm

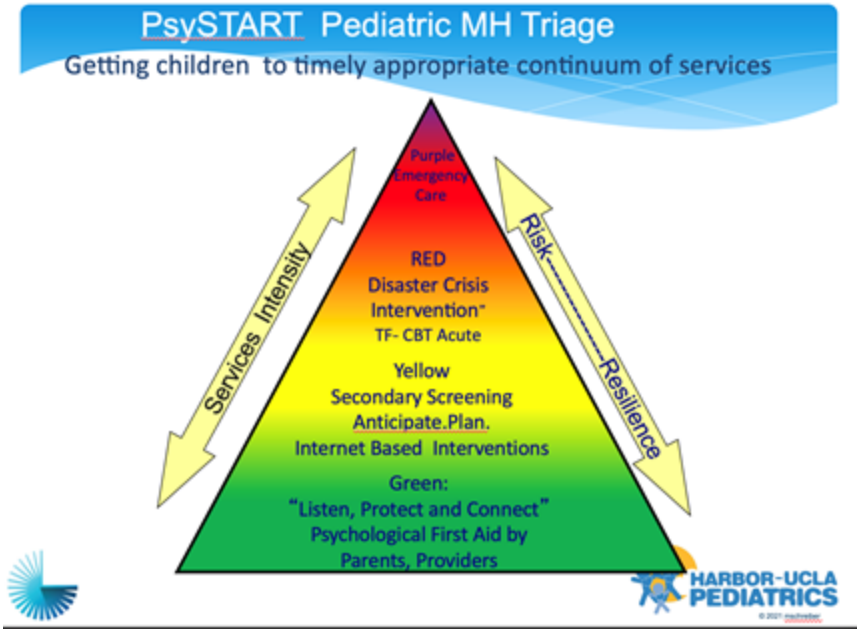
The Sort Assess Life-Saving Triage Method (SALT):

This method can be used for all ages



Source: Disaster Medicine and Public Health Preparedness, Special Focus, 2008

While JUMPSTART is recommended for the pediatric population, it is most important to use the method you know best.



Pediatric Physical Examination

Remember:

- **First and Foremost KEEP KIDS DRY AND WARM. Especially Infants and Toddlers: This should be a priority when evaluating all injured/ill patients. Remove any wet coverings!**
- **<u>Rectal</u> temperature is the gold standard, although invasive and uncomfortable. Attempt to use a less invasive method when possible.**
- **Altered mental status (AMS) in pediatric patients differs from adults. Irritability and inconsolability (despite parental comfort) could indicate abnormalities in infants and toddlers.**

- **The Pediatric Assessment Triangle is a quick and reliable method for providers to use when acutely evaluating pediatric patients!**

Evaluating active pediatric patients can be challenging. Remember, a child who fights back, is a child who has the mental and physical capability to fight back!

Consider these age categories/terminology when thinking about pediatric groups and vital sign norms in pediatric patients.

1. Newborns/Neonates (<1 mo old)
2. Infants (1mo-1 yr)
3. Toddler (1-2 yrs)
4. Preschooler (3-5yrs)
5. School-Aged Children (6-9yrs)
6. Pre-Adolescents (10-12 yrs)
7. Adolescents (12 and older)

Create a safe environment:

Infants:

Infants have a sensitive startle response that is triggered by flailing extremities. Hold arms and legs flexed against the baby's torso to calm the child. Wrap tightly in a blanket if possible. Use rocking and shushing noises to calm the infant. Use a gloved finger, pacifier, or sugar water to calm an infant. Take care in using anything that can be bitten off if the infant has teeth.

Toddlers:

Speak to a toddler at eye-level using clear, calm, reassuring statements. Try to give the opportunity for the toddler to make decisions. Make a game of it. Demonstrating what you plan to do on a toy or someone else such as an accompanying adult helps this age group to understand what to expect. (Example: placing a stethoscope on the chest of a stuffed animal). Distraction is particularly useful in this age group. Utilize puppets, songs, and toys.

School age:

This age group likes to be in charge of their bodies and they also like to make decisions. This has likely been reinforced by a parent or caregiver. Be sure to explain to school aged children what they can expect during your interaction. Be honest and concrete as abstract reasoning does not develop until 12 years of age. Give choices when able, such as which arm to give an injection. Good sources of comfort are hand-holding or stuffed animals. Distract the child by asking questions about his or her life (ex: sibling names, favorite toys, recess activities). Older children can also be helpful with younger siblings. Performing procedures on the older child first, can make the younger child less fearful.

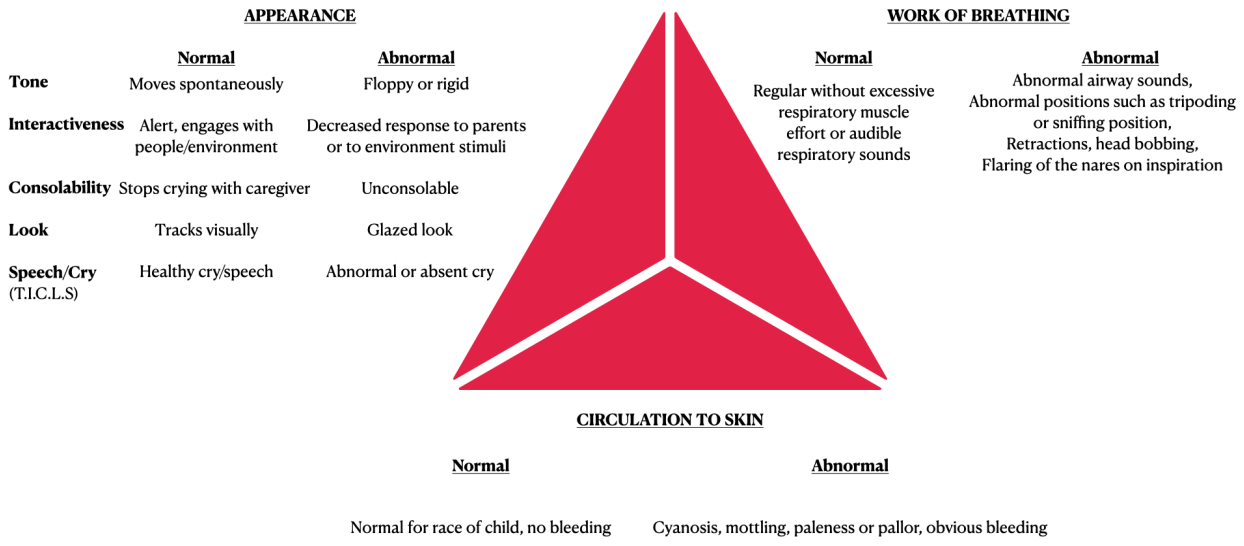
The Pediatric Assessment Triangle:

The American Academy of Pediatrics (AAP) recommends the use of the *Pediatric Assessment Triangle* when needing to obtain an immediate *general* impression of the patient. While this is NOT the same as the JumpSTART or SALT triage method (See Triage section above), this technique can be useful when employed correctly for the individual patient.

The Pediatric Assessment Triangle is used in conjunction with Triage.

The Pediatric Assessment Triangle (PAT) can help us evaluate:

1) Severity of condition
2) Basic physiological state/dysfunction
3) Urgency of Intervention



If any abnormalities are noted, perform immediate primary assessment and begin appropriate interventions. If no abnormalities are appreciated, proceed with a detailed history, assessment, and treatment plan.

Use the TICLS mnemonic to remember the components of appearance.

Video example of increased work of breathing:
https://www.youtube.com/watch?v=42jJ18fkZ0Y

T: TONE

I: INTERACTIVENESS

C: CONSOLABILITY

L: LOOK

S: SPEECH

APPEARANCE:

Characteristic	Normal Features
Tone	Moves spontaneously Resists examination Sits or stands (age appropriate)
Interactiveness	Appears alert and engaged with clinician or caregiver Interacts with people, environment Reaches for toys, objects (e.g., penlight)
Consolability	Stops crying with holding and comforting by caregiver Has differential response to caregiver versus examiner
Look/ gaze	Makes eye contact with clinician Tracks visually
Speech/ cry	Has strong cry Uses age-appropriate speech

Adapted from American Academy of Pediatrics

WORK OF BREATHING:

Characteristic	Abnormal Features
Abnormal airway sounds	Snoring, muffled or hoarse speech, stridor, grunting, wheezing
Abnormal positioning	Sniffing position, tripoding, preference for seated posture
Retractions	Supraclavicular, intercostal, or substernal retractions, head bobbing (infants)
Flaring	Flaring of the nares on inspiration

Adapted from American Academy of Pediatrics

CIRCULATION TO SKIN:

Characteristic	Abnormal Features
Pallor	White or pale skin or mucous membrane coloration
Mottling	Patchy skin discoloration due to varying degrees of vasoconstriction
Cyanosis	Bluish discoloration of skin and mucous membranes

Adapted from American Academy of Pediatrics

Developmental Milestones

Remember:

- **Keep in mind "stranger anxiety" may be present in a child as young as 6 months of age.**
- **Eight-Nine months of age, infants develop a sense of object permanence. Thus, they become upset when they realize that Mom isn't there (because they know she exists). Piaget's theory of Object Permanence**
- **A child's ability to follow commands depends on their age: 1 year old →1 step command, 2 year old → 2 step command, and so on.**

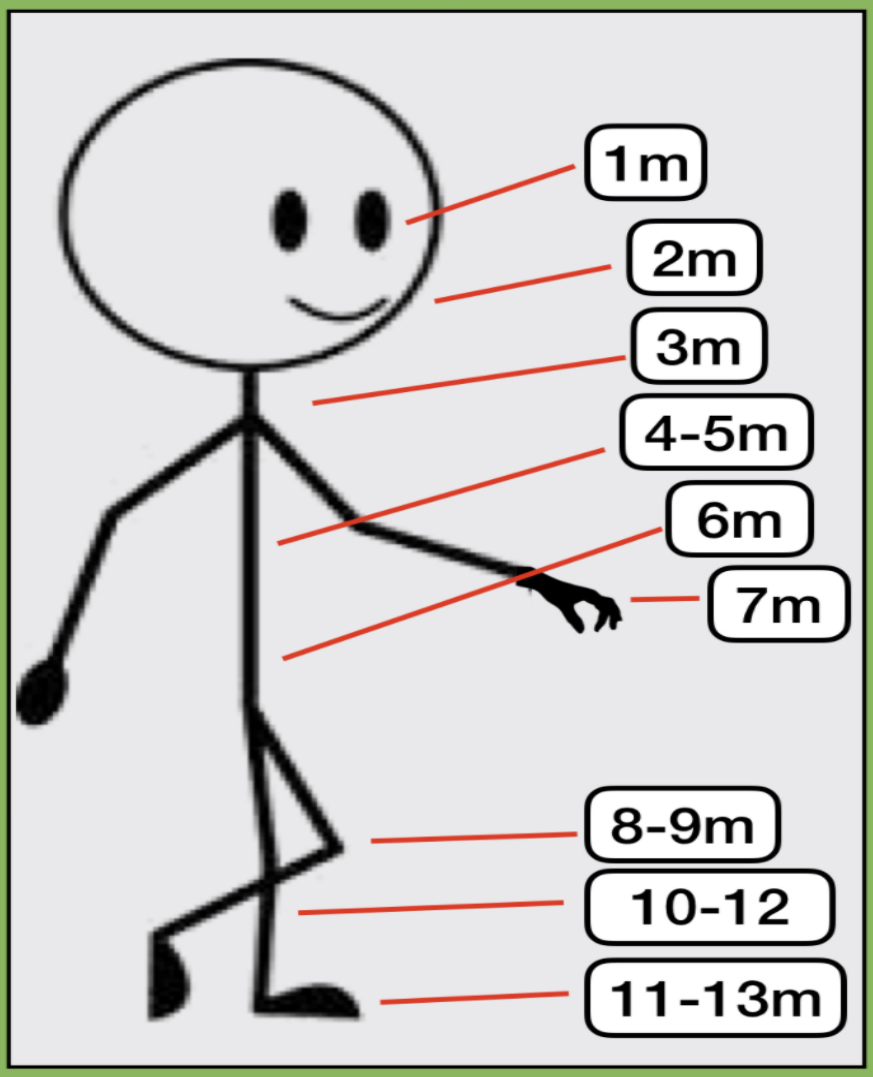
Quick Look at Developmental Milestones

Age	**Motor**	**Language**	**Social**
1-3 months	Head control	Cries and later coos (vowel sounds)	Regards faces
3-4 months	Rolls	Coos and laughs	Orients to voice and looks around
6 months	Sits unsupported	Babbles (consonant sounds)	Fears strangers
9 months	Crawls	Gestures and says "Mama" "Dada"	Interactive and playful
12 months	Walks	Uses a few words	Follows simple commands
2-4 years	Uses stairs	Full sentences	Follows 2 step commands
5 years	Jumps	Tells stories	Knows facts such as parents names and phone numbers

Developmental Milestones

1m	tracking
2m	smiles
3m	holds up neck
4-5m	rolls
6m	sits up

7m	pincer grasp
8-9m	crawls
10-12m	cruises
11-13m	walks



Used with permission from PocketPEM.com

Basic Physical Exam – A head to toe approach by age group

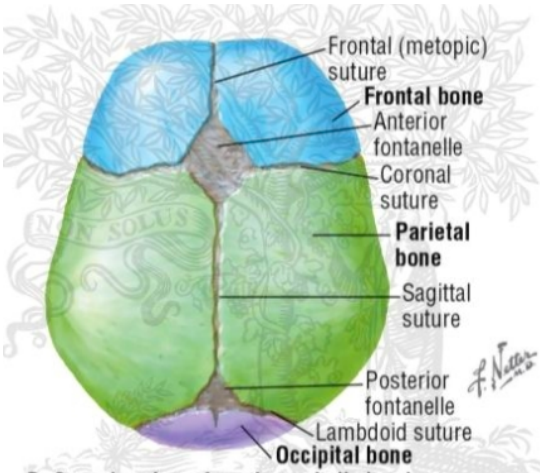
Make efforts to perform a physical exam and/or treatments while the child remains on the caregiver's lap.

Assess respiratory status before nearing or touching the patient. Caregivers can assist with taking off upper garments to observe chest movement.

Perform the least invasive parts of your exam (observation, auscultation) first before proceeding to more invasive parts of your exam.

Newborn to 1 month

1. Head: The quality of the anterior fontanelle changes based on intracranial pressure levels. The fontanelles can provide information about the hydration status and intracranial pressure.



B. Superior view of newborn skull showing fontanelles

Courtesy of Netter Image

a. The space should be flat with a palpable bony perimeter

i. Sunken → Dehydration

ii. Tense/Full → Increased intracranial pressure (ICP)

Iii. Posterior fontanelle closes between 6-8 weeks of age

iiii. Anterior fontanelle closes between 18 months to 2 years of age

2. Eyes:

    a. Briefly open in response to physical or verbal stimulation

    b. Able to track objects to midline

3. Mouth:

    a. Place a clean gloved finger or pacifier against the roof of the baby's mouth. Evaluating the sucking mechanism is part of a newborn's neurological assessment as well.

    b. Inspect for injury.

4. Clavicles:

    a. Palpate along clavicles from sternum to shoulders

    b. Bumps or step-off's indicate injury

5. Chest (Cardiac and Pulmonary)

    a. Visualize bare chest to observe breathing pattern

        i. Infants may exhibit periodic breathing with intermittent apnea lasting for up to 10 seconds in the first few weeks of life. However, cyanosis, desaturations, and accessory muscle use are never normal.

        ii. Abnormal signs: Increased work of breathing manifests as subcostal retractions, intercostal retractions, tracheal tugging, head bobbing, and nasal flaring. Infants and those with neuromuscular weakness may present with abdominal breathing rather than retractions.

    b. Auscultate heart sounds for signs of tamponade

    Infants may have benign systolic murmurs, however a murmur in the setting of hypoxia, tachypnea, and cyanosis may indicate congenital heart disease

    c. Auscultate lung sounds on the anterior chest at the mid-clavicular line because of the high position of a newborn's lungs

6. Abdomen

a. Protruding abdomens are normal but should be soft with bowel sounds.

b. A dried umbilical stump may be normal

7. Limbs

a. Normal spontaneous movement of all limbs against gravity

b. Extremities should be held in flexion

c. Frog leg positioning is indicative of hypotonia

8. Pulses

a. Use the brachial artery for upper extremity pulses. Palpate the groove between the biceps and triceps on the inner arm.

b. Use femoral pulses for lower extremity pulses. Palpate lightly with 3 fingers at the inguinal crease

9. Neurologic

a. Assess pertinent neonatal primitive reflexes

i. Suck

ii. Flick dorsum of foot to stimulate patient

iii. Babinski is up-going until 1 year of age (opposite in adults)

Newborns and infants are extremely susceptible to hypothermia-their head to body size is much larger. Coupled with the high vascularity of the head means infants lose consIderable heat through their heads. Covering their heads can prevent hypothermia.

Parents are the experts. Ask if their child is acting normal. If a parent has a concern, there is usually a reason.

AGE: 1 month to 1 year

Distract child with a toy or video while another provider performs the exam

1. Head
    a. Anterior fontanelle still present (closes at 18 mos to 2 years of age
2. Eyes
    a. Eyes should open spontaneously without the need for stimulation
    b. Baby can obviously track provider past midline
3. Ears
    a. Assess for hemotympanum as a sign of basilar skull injury
        i. Tympanic membranes are difficult to visualize in children under the age of 6 months
4. Mouth
    a. Check for a suck in babies that appear younger than 6 months of age and that cannot sit up on their own
5. Clavicles
    a. Palpate along clavicles from sternum to shoulders
    b. Bumps or step-off's indicate injury
6. Chest
    a. Visualize bare chest to observe breathing pattern
        i. Infants may exhibit periodic breathing with intermittent apnea lasting for up to 10 seconds in the first few weeks of life. However, cyanosis, desaturations, and accessory muscle use are never normal.
            a. Abnormal signs: Increased work of breathing manifests as subcostal retractions, intercostal retractions, tracheal tugging, head bobbing, and nasal flaring. Patients with hypotonia may not have retractions due to weakness. They may present with abdominal breathing only.
        ii. Auscultate heart sounds for signs of tamponade
        iii. Auscultate lung sounds on the anterior chest at the mid-clavicular line because of the high position of an newborn's lungs
7. Limbs - for neurodevelopmentally normal
        i. Infants 1-3 months should hold their extremities in flexion
        ii. Infants 3-6 months have less tone and can lie flat
        iii. Infants 6-9 months should be able to sit up unassisted
        iv. Infants 9-12 months may pull to stand

v. Palpate all limbs and joints to assess for areas of acute tenderness, perfusion and edema

8. Pulses
   i. Use brachial and femoral to assess pulses
   ii. May be able to feel posterior tibial and radial pulses in older children
9. Neurologic
10. Children over the age of 2 months should be awake and engaging with caregiver and/or environment.
11. Altered mental status or pain may manifest as extreme sleepiness or inconsolability in spite of comfort by the caregiver.

Babies may start eating appropriately prepared solid food as young as 4 months of age. Keep in mind they are unable to chew at this age.

The below additional points in this **Sample Infant Exam** are useful for pediatric patients**.**

General:	Overall behavioral state, color, respiratory status; any congenital anomalies, gender
HEENT:	*Head:* Occipitofrontal circumference and shape, fontanels, scalp trauma, defects Specific to <1 month of age: Molding (deformation of the skull caused by labor), caput succedaneum (normal scalp edema at the apex of the head secondary to the compression sustained during labor and delivery) versus cephalohematoma (subperiosteal

	bleeding), craniotabes (soft portions of the skull which are benign). *Eyes:* symmetry and completeness of iris, pupil reactivity *Ears*: shape and position, skin tags *Nose:* patency of nares *Mouth:* mucosa color, palpation of palate, presence of teeth
Neck:	Range of motion, length, cysts, sinuses or masses
Chest/Respiratory System:	Symmetry, pectus deformity, clavicles, breast tissue, color, respiratory rate and effort, presence, quality and equality of breath sounds, and work of breathing
Cardiovascular System/Pulses:	Rate and rhythm, presence of murmurs; situs and precordial activity. Pulse strength and equality in four extremities
Abdomen/Anus:	Placement of the umbilicus, palpation of the liver edge (not always palpable), palpation of the spleen and kidneys (not easily palpable), any masses, bowel sounds, contour (scaphoid, flat, distended)
Genitalia:	*Male:* foreskin and position of urethra, palpable descended testes, scrotum with rugae, no other masses in scrotum/groin. *Female*: labia majora and minora, position of urethra, discharge

Extremities:	Number of digits, hip exam for dysplasia/dislocation (Ortolani/Barlow), perineal creases, range of motion at all joints (especially the hips)
Neurological system/Spine:	Symmetry of movement, muscle tone, posture, strength, grasp reflex, suck reflex, Moro reflex, response to being handled, presence of dimples, cysts, tracts, cutaneous defects, swelling or tufts of hair
Skin:	Color, rashes, ecchymoses/petechiae, perfusion, nevi, pigmentation

AGE: Toddler to School Age

A playful approach can help with toddlers and young children e.g. making a game of “where the light goes” allowing them to listen to your chest first etc. Beginning the exam with the extremities e.g. feet and hands, and then moving towards more sensitive areas such as abdomen and face, can allow the toddler to become more comfortable with having a stranger touch them

1. Head
    a. Anterior fontanelle should be closed
2. Eyes
    a. Use a toy or a light to assess extraocular movements
3. Mouth
    a. Consider doing this part of the exam last, perhaps seizing the opportunity to assess the oral cavity if a child cries.
    b. Child is expected to speak in full sentences. Ask the parent about speech capability in order to evaluate baseline.
4. Chest

    Auscultate First-before the patient starts crying

    a. Auscultate for murmur, gallops or rubs at URSB, ULSB, LLSB, Apex listening posts
5. Abdomen
    a. Bring the child’s knees to their chest to relax the abdominal musculature prior to palpation
6. Limbs
    a. Children should follow commands to assess limbs (ex: high-five, kick leg)
    b. Children > 1 year of age may walk unassisted
7. Pulses
    a. For upper extremities use brachial pulses until age 2-3 years old then radial pulses. Posterior tibial pulses can be used for lower extremities.

AGE: Teenagers

Perform physical exam as for an adult with the following suggestions:

Discuss each component of the physical exam PRIOR to performing the action to help the teen feel in control and prevent emotional trauma. Use blankets or sheets to maintain privacy while performing more sensitive parts of the exam. Distract teenagers

with conversation while doing an abdominal exam to prevent anxiety from falsely causing guarding and tenderness.

Pediatric Fluid Status Assessment:

1. Signs of dehydration:
    a. Tachycardia -- refer to normal age dependent heart rates
    b. Dry mucous membranes
    c. Absence of tears
    d. In infants, sunken anterior fontanelle
    e. Capillary refill on big toe > 2 seconds
2. Resuscitation fluids:
    a. Evaluate cardiac status prior to fluid resuscitation
3. Signs of heart failure in neonates
    a. Murmur
    b. Edematous extremities
    c. Left chest wall heave
    d. SpO2 < 92%
    e. Liver edge > 2cm below costal margin
    f. Skin pallor or cyanosis
        i. If exam is normal, give 0.9% Sodium Chloride **20 mL/kg bolus** (max 1000 mL)
        ii. If signs of heart failure or unsure, start with e 0.9% Sodium Chloride **10mL/kg bolus** (max 500 mL)
        iii. Frequently assess the effect of your fluid bolus to avoid undertreating or overtreating shock.

Features of Vulnerability in the Pediatric Population

Remember:

- **Remember to pay close attention to body temperature in pediatric patients. Warm, dry clothes and a blanket go a long way!**
- **Pediatric patients' various physiological differences make them more vulnerable in every way.**

Pediatric patients are not "small adults." Their physiology differs by age group, and knowing the key differences can alter management and preserve life. These features are outlined in the American Academy of Pediatrics' manual, Pediatric Education in Disasters. An excerpt is included here, but please see American Academy of Pediatrics *Pediatric Education in Disasters Manual* for more information.

Pediatric Characteristic	Special Risk During Disaster
Respiratory	Higher minute volume increases risk from exposure to inhaled agents. Nuclear fallout and heavier gases settle lower to the ground and may affect children, whose height is lower to the ground more severely.
Gastrointestinal	Higher risk for dehydration from vomiting and diarrhea after exposure to contamination.
Skin	Higher body surface area increases risk for skin exposure. Skin is thinner and more susceptible to injury from burns, chemicals, and absorbable toxins. Evaporation loss is higher when skin is wet or cold, so hypothermia is more likely.
Endocrine	Increased risk for thyroid cancer from radiation exposure.
Thermoregulation	Less able to cope with temperature problems, with higher risk for hypothermia.
Developmental	Lower ability to escape environmental dangers or anticipate hazards. Follow directions of safety personnel.
Psychological	Prolonged stress from critical events. Susceptible to separation anxiety.

AAP Pediatric Education in Disasters Manual Adapted from AAP, Pediatric Education for Prehospital Professionals. Jones & Bartletts Publishers, London, 2016

Special Populations within Pediatrics

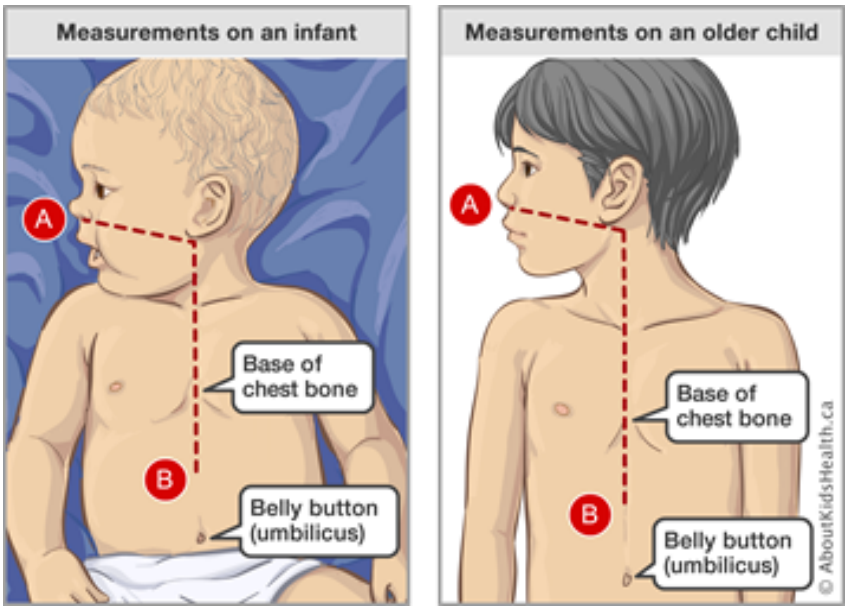
Remember:

- **Quickly inquiring about medical history can make all the difference in acute management.**
- **Be aware of the neurodivergent pediatric population, though they may appear to be a certain age, their capacities vary.**
- **Children with medical complexity may have multiple health issues requiring altered patient management, so be sure to ask parents if their child has any cognitive, behavioral, or other medical issues requiring surgery or special care needs.**
- **Medical disasters can cause those with preexisting mental health concerns to become dysregulated. Approach agitated patients with calming and nonthreatening verbal redirection and the support of family members. Asking parents "what usually helps?" allows them to share important information as well as to feel a part of their child's treatment team.**
- **Many patients with cerebral palsy may be on chronic benzodiazepines (BDZ), consider BDZ withdrawal if patient is agitated and does not have access to their daily medications.**

The pediatric population is diverse. This variety is part of what makes pediatrics both challenging and rewarding. We will next briefly review specific pediatric populations to further support your care. The Child Life Disaster Relief is a great resource to support these populations as needed https://cldisasterrelief.org

Special Pediatric Populations and Considerations

1. **Cardiac Issues:** Congenital Heart Disease
    a. Will be difficult to detect unless reported by family
    b. May have lower baseline SpO2 (75-85%) depending on their defect
    c. May also have EKG irregularities at baseline
    d. Findings will be defect-dependent and dependent on whether the defect(s) has/have been repaired
    e. Consider using smaller fluid boluses during resuscitation and frequently re-evaluate cardiovascular status in these patients.
2. **Respiratory Issues:** Trach/vent/oxygen dependence
    a. Always ask parents for home oxygen requirements,vent settings, and respiratory treatments.
    b. Families of children with tracheostomy dependence generally will have an airway kit containing a replacement tracheostomy tube.
3. **GI Issues:** GT/NG dependent/special formulas
    a. For most term infants, 20 kcal/kg infant formula (examples are Enfamil and Similac) is appropriate in an acute setting. Premature infants and older children with poor weight gain generally require higher calorie formulas.
    b. Ask caregiver about any special home formulas
    c. How to measure for NG placement



Courtesy of *About Kids Health: Nasogastric (NG) Tube: How to insert your child's NG tube*

Confirm NGT placement by placing a small amount of air into NGT using a syringe and listening with a stethoscope for a "*swoosh"* of air in the stomach. If available, NG tube placement can be confirmed with aspiration of gastric contents and detection of acid on pH paper or with visualization on KUB.

d. Gastrostomy tube (G-tube, GT) replacement

i. Always replace GT *as soon as possible* to prevent tract closure, which starts within 8 to 24 hours and narrows further as time passes.

ii. If the tube is dislodged and unable to be promptly replaced, a temporary tube (e.g. Foley catheter) should be placed in the track to prevent tract closure.

iii. If the tract has started narrowing, gradually dilate by advancing the size of the Foley every 1-2 hours until at goal size.

iv. Families usually have a spare GT in their supply kits.

v. Video demonstration: American College of Surgeons Replacing the Gastrostomy Tube

4. **Neurologic Issues:** Seizure Management and Cerebral Palsy

a. Seizure Management

i. History: Seizure characteristics, duration, previous history of seizure/seizure frequency, other history (presence of VP shunt, underlying metabolic/endocrine issues, renal failure/hypertension), medications including all anti-seizure, medication failures or adverse effects, family history of seizure disorders/developmental delay/neurological issues.

ii. Patients with seizure disorders have a lower seizure threshold in the setting of fever, acute illness, or stress. This predisposes them to breakthrough seizures and possibly status epilepticus.

iii. Evaluate airway, breathing, and circulation - suction secretions, give oxygen as needed

iv. Treat underlying cause: consider hypoglycemia, electrolyte disturbances, trauma, infection (meningitis/encephalitis), stroke/intracranial hemorrhage, unable to give medications

v. Seizure First Aid - counsel families on how to manage seizures, including

1. Ensure that the patient is placed on a safe surface where they cannot get hurt (generally the ground)
2. Place the patient on side so that secretions can come out of the mouth (avoid supine position)
3. Time the event, administer abortives for seizure > 5 minutes
4. Seek medical care for prolonged seizure not responsive to medications, post-ictal phase > 60 minutes, airway issues or concerns

vi. Seizures lasting > 5 minutes require abortive treatment (see medication table below)

1. Early consultation with neurology or critical care as needed/able

Medications used in acute seizures

Medication	Dose	Comments
1st line Treatment		
Lorazepam	0.1 mg/kg IV/IO (Max 4mg) May repeat once in 5-10 minutes	-Preferred 1st line agent if the patient has IV access. -Medication should be refrigerated.
Midazolam	0.2 mg/kg IV/IM/Nasal (max 10 mg) 0.2-0.5 mg/kg buccal (max 10 mg)	-Nasal- administer utilizing an atomizer, divide dose between nares
Diazepam	0.3 mg/kg IV/IO (max 10 mg) Rectal Gel (max dose 20 mg): 2-5 years- 0.5 mg/kg PR once 6-11 years- 0.3 mg/kg PR once >11 years- 0.2 mg/kg PR once Rectal using 5mg/ml parental formulation 0.5 mg/kg once, then 0.25 mg/kg q10 min if needed (Max 20mg/dose)	-IV dose preferred -Do not give IM -Rectal gel- will need to round to nearest 2.5 mg increment to match administration device.
2nd line Treatment		
Fosphenytoin	15-20 mg/kg (PE*) IV/IM once (Max 1500 mg)	-Use Phenytoin **OR** Fosphenytoin, not both.

(preferred over Phenytoin due to administration issues)		-*Dosed in phenytoin equivalents (PE) IV preferred -Dilute to 25 mg/mL for IV administration -Administer over 15-20 min. Max infusion rate= 2 PE/kg/min (max 150 PE/min) -Medication requires refrigeration
Phenytoin	Loading dose: 20 mg/kg IV (Max 1000 mg)	-Use Phenytoin **OR** Fosphenytoin, not both. -Infuse undiluted into a large vein over 20 min (max rate 50 mg/min) with an IV filter -Do not give in age <1 month -Caution- medication precipitates easily, may cause hypotension and bradycardia
Levetiracetam	60 mg/kg IV/IO once (max 4500 mg) (status epilepticus dosing)	-Dilute to 50 mg/mL and infuse over 15-20 mins
Phenobarbital	15-20 mg/kg IV (Max 1000 mg), may repeat with 5-10 mg/kg 10 minutes after loading dose	-Infuse over 15-20 min. Max infusion rate 50-100 mg/min -Commonly used in neonatal seizures -Avoid administration in small veins such as hand and wrist
Valproic Acid	40 mg/kg IV once (Max 3000mg)	-Dilute to a total volume of 50mL -Administer over 20-60 min
3rd line		
Propofol	1-2 mg/kg IV/IO followed by infusion at 1.2 mg/kg/hr (20 mcg/kg/min), then titrate to effect	***May require an advanced airway***

Table adapted from https://www.rch.org.au/clinicalguide/guideline_index/Afebrile_seizures/ accessed on 8/24/2021
Additional info added from uptodate.com accessed 8/24/2021

Additional Seizure Management information can be found:
https://www.emra.org/emresident/article/pediatric-seizure/

Cerebral Palsy (CP)

Patients with CP may have varying degrees of need, ranging from nearly normal to total care. Those with additional medical complexity (seizure disorder/epilepsy, dysphagia/tube feeding dependence, chronic respiratory issues, mobility/musculoskeletal problems, behavioral issues, etc) may challenge healthcare professionals during routine situations, let alone disasters.

1. Identify the chief complaint and take a good history. Include questions about past experiences with this complaint and what has worked well. Ensure medication regimens are reviewed. **Families will know their child best.**

2. Pediatric patients with cerebral palsy may experience contractures that can worsen without access to appropriate orthotics, especially in a disaster setting. Replace orthotics as soon as feasible.
3. Some patients with CP may be nonverbal. The family may know the patient's non-verbal cues. Pain may be difficult to assess and could be caused by spasticity, constipation, or other issues. Involve caretakers in calming efforts using their expertise.
    a. For spasticity, medications such as baclofen may be considered. Some patients may already be on chronic benzodiazepines. Also consider non-pharmacologic management with stretching and massage.
    b. Consider withdrawal if a patient is agitated and does not have access to their daily medications. Withdrawal symptoms will differ based on the medication. Withdrawal can be seen with benzodiazepines, baclofen, SSRIs or other psychotropic medications.
    c. For constipation, consider laxative therapy with polyethylene glycol or docusate.
    d. Other causes for pain could include hip dislocation. Some patients with CP have chronic hip dislocation. Consult with family.

Differences in Behavioral and Developmental Status:

1. Autism Spectrum Disorder (ASD) & Developmental Delay

a. Sensory sensitivity, including sound, are common in patients with ASD/DD and can cause these patients to be overwhelmed.
    i. Decrease noise and stimuli as much as possible.
    ii. Speak softly to decrease anxiety.
b. Benzodiazepines, antihistamines (eg. benadryl), and certain sedatives like Involve caretakers in calming efforts using their expertise.
c. An emergency experience is emotionally distressing and can exacerbate pre-existing self harm behaviors.
d. Propofol can cause paradoxical reactions in individuals with ASD. Ask families, "What has worked well in the past to decrease agitation?"

2. Trisomy 21 (Down Syndrome)

a. <u>Behavioral and psychiatric disorders</u>: Common in T21, namely autism, ADHD and aggressive behavior.
b. <u>Congenital Heart Disease</u> (CHD): Approximately one-half of individuals with T21 have CHD.

i. The most common cardiac lesion is complete atrioventricular septal defect (CAVSD), followed by atrial septal defect (ASD) or patent ductus arteriosus (PDA).

ii. Inquire about cardiac history for patients with T21.

c. Endocrine Disorders: Thyroid disorder (mainly hypothyroidism) and diabetes are common in T21.

i. Ensure patients have appropriate home medications.

d. Atlantoaxial Instability (AAI): Patients are predisposed to subluxation of the cervical spine.
   i. Diagnosis may be made with lateral neck radiographs taken in neutral position, flexion, and extension.
   ii. Patients with T21 may have asymptomatic AAI.
   iii. In the setting of trauma, patients may present with neck pain, new onset torticollis, gait abnormalities, loss of bowel or bladder control, or signs of quadriparesis or quadriplegia and require immediate stabilization.
      1. If in doubt, apply a cervical collar.
   iv. Consideration: Take care to avoid hyperextension when positioning the airway during sedation in patients with AAI.

3. Children with Mental Health Concerns

a. Pre-existing Psychiatric Condition: Ensure the patient has all daily medications to prevent withdrawal.
b. Dealing with acute onset agitation and aggression:

Prepare yourself and your environment

Potential Risk/Threat	Mitigation Strategy
Identify potential safety risks/items that may be used against you or may be distracting.	Secure long hair, glasses, watches, keys, rings, pens, clipboards, stethoscopes, etc.
Simplify the space	Building hazards, broken equipment, clearly identified ways of getting support in an emergency

Be aware of surroundings and possible escape routes for patients.	Pay attention to where you sit in relation to a patient and family and access to the door.
Identify isolated settings that may pose a risk to patients and staff.	Be aware of the location of stairwells, closets, bathrooms, medication dispensing rooms.

(Training Developed by Erika Miller, BSN, PMH-BC, Seattle Children's Hospital)

Assessing Risk and Safety

As professionals, we need to sensitize ourselves to the reality that our patients and families may become upset or angry. An upset or angry patient/parent is not necessarily an unsafe patient/parent. In all interactions, we are constantly assessing the situation for safety.

Assessing Developmentally Appropriate (albeit unpleasant) vs Unsafe

a. Some patients can be developmentally volatile.

b. Children are egocentric and have a difficult time seeing past or considering things beyond their own situation – especially if they have been in the hospital for an extended period of time.

c. We will encounter patients that have difficult behaviors or use poor language

d. Anger can be a normal response to stressful situations. Behavior and language should not be considered personal to the provider.

Stages of Escalation and Intervention

Stage of Escalation	Recommended Intervention
Calm	Rapport building, structure, routine
Verbally Agitated	Provide support, validate feelings
Physically Agitated	Remove objects, give space but maintain line of sight
Verbally Threatening	Use short concrete words, give space maintain line of sight
Physically Threatening	Stop coaching, clear environment, give space, get help
Physically Violent	Safety is first priority, restraint and seclusion if needed

Additional Strategies to Consider

a. Verbal redirection is the first line de-escalation measure. Ask parents/ caregivers, “What has worked for the child in the past?”

b. Judicial use of pharmacotherapy may be necessary if a patient is a danger to self or others.

c. If available, consult psychiatry.

d. If not possible, consider sedating or psychotropic medications. Start with oral formulations, if able.

Medications to consider for acute escalations based on availability:

Medication	Dose	Onset Action	Duration	Note/monitoring
Diphenhydramine	1 mg/kg PO/IV/IM once Max 50 mg/dose	PO Peak:1-2 hr	4-7 hr	Avoid patient exhibits delirium
Lorazepam	0.05-0.1 mg/kg PO/IV/IM/NGT once, max 2mg/dose	PO: < 15 min IM: 15 min IV: 2-5 min	IM/IV:60-120min	
Clonidine	0.05-0.1 mg once			Monitor for hypotension and bradycardia
Chlorpromazine	0.55 mg/kg/dose PO Max 25 mg/dose 0.28-0.55 mg/kg/dose IV/IM Max 25 mg/dose			May cause QT prolongation Monitor for hypotension
Haloperidol	0.025-0.075 mg/kg Max 2.5-5 mg/dose	10-20 min	180-360 min	-Max total daily dose: <40kg: 6 mg/day >40kg: 15 mg/day ->3mg dose- increased risk of EPS, consider combining with diphenhydramine or benztropine -May cause QT prolongation

Hydroxyzine	0.5 mg/kg/dose IM/PO Max 50 mg/dose	PO: 30 min IM: <15 min		-Effective for anxiety -Large doses will sedate patient -IV use discouraged due to necrosis risk
Ketamine	IV- 1-1.5mg/kg (max 100mg) IM- 2-4mg/kg (Max 200mg)	IV- 30 sec IM- 3-4 min	IV:5-10 min IM:12-25 min	
Midazolam	IN 0.3 mg/kg (Max 5mg)	IN: 4-8 min	IN: 18-40 min	May repeat in 20 min
Olanzapine	IM or PO <9 years: 2.5mg >9-12 years: 5 mg >12 years: 10mg	PO: <60 min IM: 20-60 min	30 hr	-Significant respiratory depression may occur if combined with benzodiazepine. -Oral preferred if patient can tolerate/allow -May cause QT prolongation
Risperidone	0.005-0.01 mg/kg/dose	<60min	15 hr	May cause QT prolongation
Quetiapine	1-1.5 mg/kg/dose or 25-50 mg			May cause QT prolongation
Ziprasidone	<12 years: 5 mg >12 years: 10 mg	IM: 20-45 min		May cause QT prolongation, greatest risk of the antipsychotics

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4. Uptodate.com. Accessed August 24, 2021.
5. Primary Children's Hospital Internal Emergency Department Policy
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Additional Considerations for Children with Access or Functional Needs During a Disaster

Medication: Obtaining necessary supplies such as medications might become a critical issue in a disaster, especially if a family does not have extra medication on hand. It is important to consider the types of medications (asthma-related and others) and supplies (eg, inhaler) that a child might need to have unexpectedly. Medications may be supplied through G-tubes at home. Medications may also require refrigeration or other special storage.

Assistive technology needs:

Power Supply: Does the child need a power source for medical equipment or refrigeration for special supplies or food? Identify an alternative plan in the event there is no power. Can use the EM power app to determine power availability in their home prior to discharge

Food and Supplies: Does the child have allergies? Is there a need for special diet/food, baby food, formula, bottles?

Transportation: Will the child need a special vehicle for safe transportation (e.g. manual wheelchair, stair chair, or slide)?

https://www.aap.org/en-us/advocacy-and-policy/aap-health-initiatives/Children-and-Disasters/Pages/CYWSN.aspx

Part II: Managing the Pediatric Patient

Procedures in Pediatrics

In adults, procedures such as intravenous cannulations (IV's) are performed with such regularity that they are hardly thought of as procedures.

In pediatrics, the most routine procedures can cause great distress to our younger patients. It is normal for young children to scream incessantly during nasal cannula placement whereas older patients tolerate this well. The language we use to introduce procedures to children matters a great deal. Use simple language in terms the patient and parent/caregiver can understand.

For example:

What we say	What they hear	Try saying...
IV	Ivy?	Small straw to help give you medicine
Give you a shot	Are you mad? Why do you want to hurt me?	Give you some medicine using a small needle.
Stretcher	Stretch her...why?	Bed with wheels
Blood Pressure	Will there be blood?	Show them the cuff and how its "hugs" them
Flush your IV	Down the toilet?	Explain how liquid helps keep the IV clear.

Reprinted from Northwest Response Health Network's ***Planning and Caring for Pediatric and Neonatal Patients in Disasters***

Respiratory Management

Effective bag-mask ventilation skills are your best friend in pediatrics and may prevent unnecessary field intubations.

Remember:

- **Infants and young children have big occiputs, causing the neck to have a tendency towards flexion. Extension of the neck should be the first step in correcting an airway issue for these patients.**
- **Try to avoid overventilation. Overventilation contributes to gastric distention, emesis, and potential aspiration which can further worsen a tenuous respiratory status.**
- **Endotracheal tube size can be calculated by using the equation, "Age (in years)/4 + 4".**

Remember: Big heads, big tongues, big tissues, and big forces can cause airway obstruction

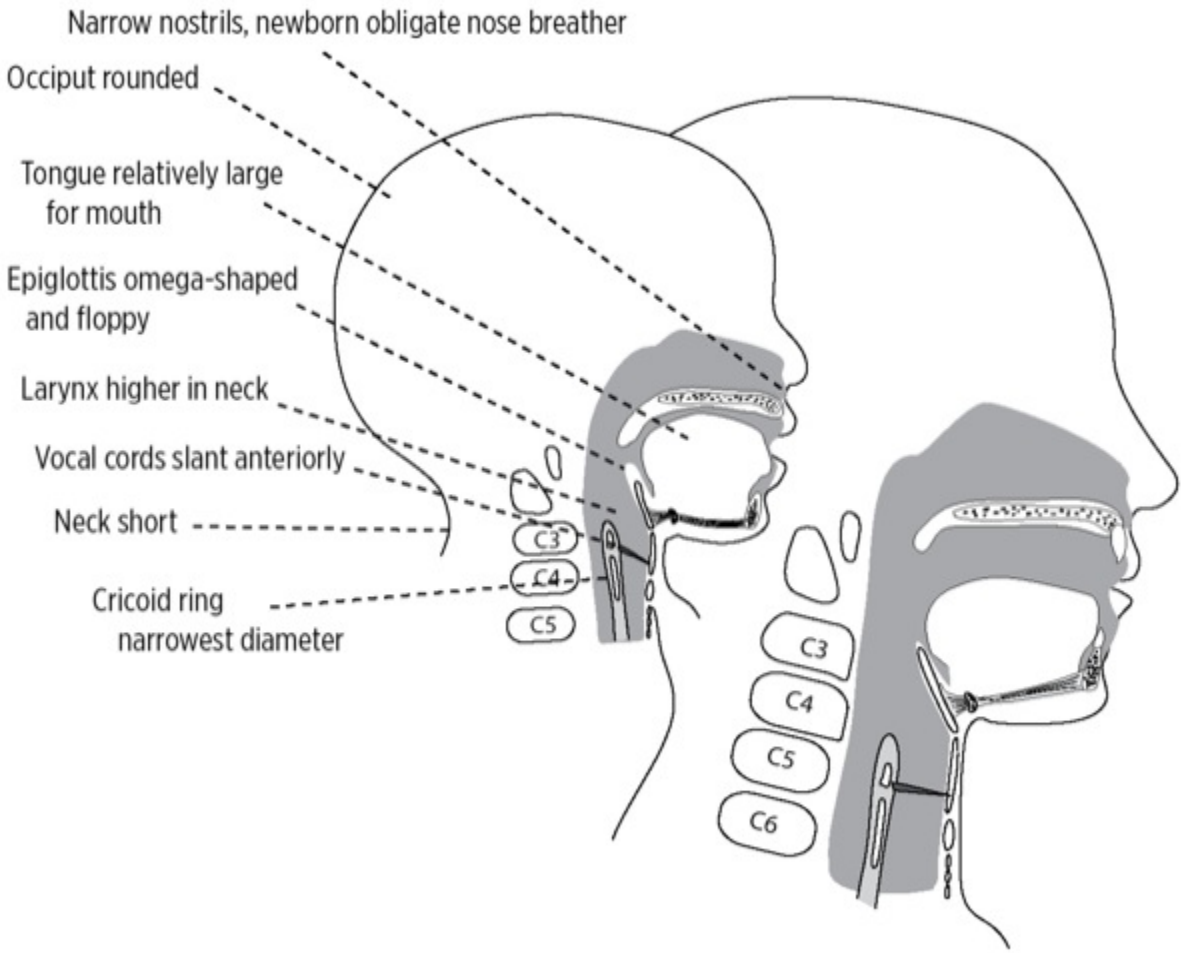
You are already experienced in airway management for the adult population. Most of those skills can be applied to pediatric airway management with adjustments. Therefore, this section will focus on the key differences for airway management in the pediatric population.

Anatomy:

Infants and young children:

1. Anatomic differences increase the opportunity for airway obstruction in this age group. See image below.
    a. In the supine position their large occiputs cause flexion of the neck
    b. Increased amounts of soft tissue, as well as a flexible trachea can add pressure to the tracheal rings
    c. External forces, like cricoid pressure can cause tracheal collapse
    d. Large tongues relative to the size of the oral cavity.
2. Anatomic differences predispose young infants to respiratory failure.

a. Young infants preferentially breathe through their noses and during oral breathing, must use soft palate muscles to maintain an open oral airway
b. Higher metabolic rates cause infants to use more oxygen per minute per kg of body weight than adults
c. Compliant chest walls and other unique lung physiology means that this population has to increase their respiratory rate to increase their ventilation, placing them at risk for respiratory muscle fatigue



From: https://www.anesthesiologynews.com/Review-Articles/Article/08-19/10-Common-Pediatric-Airway-Problems-And-Their-Solutions/55657?sub=B9BFD2B22AAB91C738BEFA44BD6987A27AB424466CD7E09740FF4A4786780, accessed 08/25/2021

By age 8, the pediatric airway is very similar to the adult airway.

Airway Management:

Non Invasive Interventions:

Reposition: Continue to use jaw thrust and/or chin lift techniques to maintain the neutral position of the airway, which will facilitate improved oxygenation and ventilation.

Use suction liberally but safely.

If croup or epiglottitis is suspected (exhibit Inspiratory stridor, do not suction. Use comforting measures to prevent crying and agitation that could result in further obstruction.

1. Oxygen Delivery:

a. Continue use of nasal cannulas, face masks, non rebreather masks

   Tip: Apply adhesive (e.g. tape/band-aids) to the oxygen piping that overlays the patient's cheeks in order keep the cannula in place and prevent removal.

2. Oral (OPA) and Nasal (NPA) Airways:

a. Particularly useful and often underused in pediatrics.
b. Oral airways should only be used in **unconscious** patients .
c. Oral airways can be helpful in lifting the large pediatric tongue that is obstructing an airway.
d. **OPA Sizing:** Measure the airway along the side of the patient's face from mouth to the angle of the mandible. EMTprep provides a useful video at https://youtu.be/D00IunbXP6g.
e. Nasopharyngeal airways can be used in **conscious** patients.
f. NPA should be used cautiously in young infants because their large adenoids and tonsils can be injured during insertion, resulting in bleeding
g. Insert NPA with bevel pointed away from septum to decrease risk of bleeding
h. **NPA Sizing:** To choose the correct size, be sure the airway extends from the nostril to the tragus of the ear. Lubrication improves ease of passage. Nostril size should be used as a guide for width. EMTprep provides a useful video at https://youtu.be/oJgpWPiH-Q4.
i. **Indications:** upper airway obstruction
j. **Contraindications:** NPA in patients with suspected basilar fracture, CSF leak, coagulopathy; OPA: alert/awake patients.

3. Bag-Mask Ventilation:

a. Remains an essential skill for pediatric providers and can be used as a temporizing measure.

b. E-C clamp is the most common technique used; **lift** the jaw into the mask or perform a chin lift; 2 hand technique is another option.
c. Avoid compression of neck soft tissues, as well as submental soft tissues when holding the jaw.
d. Start with approximately 5 cm H_2O of continuous positive airway pressure and titrate up as needed to maintain ventilation.
e. Normal tidal volume: 6-8ml/kg + dead space; estimate 10 ml/kg to cause chest rise.
f. If a 1 yr old 10 kg child requires 80 to 100 ml per breath, this is the equivalent of 6 tablespoons of air.
g. Ventilations with Bag Valve Mask (BVM) – breaths every 3-5 sec (12-20 breaths per minute).
h. Passive exhalation should be greater than inspiratory time. "Squeeze-release-release" is a helpful pacing technique.
i. Overventilation: The consequences of overventilation are particularly problematic in children. It can lead to gastric distention, emesis, difficulty ventilating because of elevation of the hemi-diaphragm.
j. CPAP and BiPAP are also options in pediatric patients; nasal prongs are used in infants and neonates.

To prevent overventilation, only squeeze until chest rise is seen.

Remember that repositioning, suctioning, supplemental oxygen, and adjuncts (OPA,NPA) can go a long way in managing the pediatric airway. Try these first before moving on to intubation.

Invasive Interventions:

1. **Emergent Endotracheal Intubation**
   a. Equipment: Similar standard equipment as with adult intubation (oxygen, suction, ETCO2 detector, etc) with the exception of a choice in blade type and tube type.
2. **Should a cuffed or uncuffed tube be used?**
   a. Previous concern was expressed over the use of cuffed tubes in children under 8 years old, due to a risk of ischemic damage to tracheal tissue from compression between the cuff and the cricoid ring. Adding to this risk is the narrow diameter at the cricoid.
   b. This is now less of a risk because of the improved design of more modern ETTs, therefore use of cuffed tubes in younger ages is increasing. Microcuff tubes may be used for smaller pediatric patients as well.

3. **Sizing:**
   a. Laryngoscope Blade:

Age	Weight (kg)	Laryngoscope Blade Size
Premature/ Newborn	1 - 3	Miller 0
1 month to 2 years	3.5 - 12	Miller 1
3 - 6 years	15 - 20	Miller 2, MacIntosh 2 (by 5 yo)
6 - 12 years	20 - 35	Miller 2, MacIntosh 2 or 3
>12 years	>35	MacIntosh 3

4. **Endotracheal Tube (ETT):**
   a. Use a length based tape for endotracheal tube sizing (e.g., Broselow tape), but if not available, use the equations below:

      Uncuffed tubes: [Age (in years)/4] + 4

      Example: [4 years old/4] + 4 = 5 uncuffed

      Cuffed tubes: [Age (in years)/4] + 3.5

      Example: [4 years old/4] + 3.5 = 4.5 cuffed

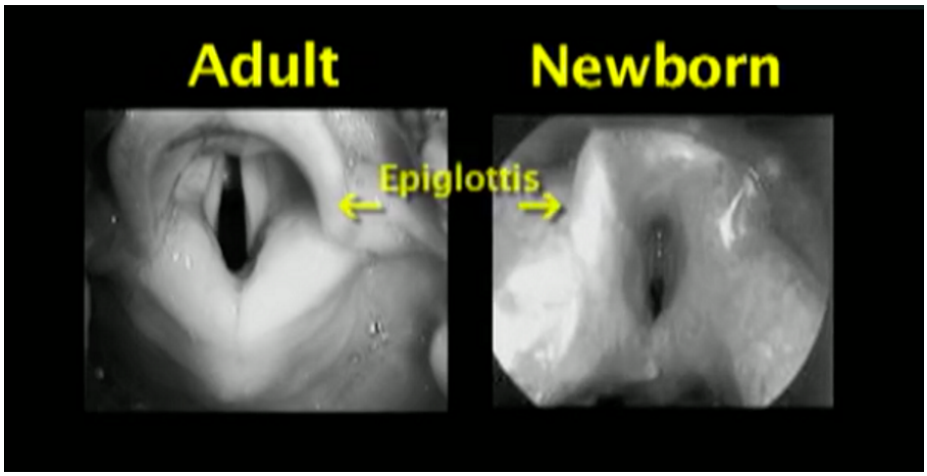
Use of the equations has been shown to be more accurate than using the width of the patient's fifth finger.

   b. Depth of Insertion:
      i. Neonates and Infants: The "1, 2,3, 4--7,8,9,10 rule" has been commonly used (cuffed tubes). For example, a 1 kg infant will have the tubed taped at 7 cm at the maxillary alveolar ridge (not lip), 2kg infant at 8 cm, etc.
      ii. Older Children: Multiply the internal diameter (in mm) x 3
   c. Cuffed Tube Inflation:
      i. No more than 20 cm H_2O (mucosal blood flow to trachea is compromised at 30 cm H_2O)
      ii. An acceptable air leak with a cuffed tube (deflated) is 15-25 cm H_2O

Adult airway diameter is narrowest at the level of the vocal cords, while in children, <u>the narrowest diameter is at the cricoid ring</u>. Therefore, an ETT may fit through the vocal cords but be too large to pass through the cricoid ring.

Endotracheal Intubation Technique:

1. An infant's epiglottis is narrow, and short, angled into the airway lumen (see image below). The epiglottis descends to a lower cervical station as a child ages (C2-C3 at birth then C4-C5 by age 3).



2. Larynx position is higher in infancy.

Tip: Use a straight rather than a curved blade.

3. Large occiput can result in neck flexion and difficulty visualizing airway.

Tip: Apply "shoulder roll" if less than 2 years old.

Suboptimal airway positioning

Improved airway positioning

4. Simple extension of the head as opposed to the traditional "sniffing position" may improve alignment of oral, pharyngeal, and tracheal axes.

5.The recommendation to use a Miller blade in infants in young children is based on anatomical studies NOT comparative studies with the McIntosh blade.

Tip: Miller blade can be placed BEHIND the epiglottis to lift it up or by moving the tip of the blade just behind the epiglottis; if using a Macintosh, place the place the tip behind the epiglottis, in the vallecula.

6.Miller blade may help with tongue displacement and better control, but it is **most important** to use the blade you are most experienced using.

7.iv.If there is difficulty visualizing the glottis, external manipulation can improve the view using the **"backwards-upward-rightward pressure"** on the thyroid (BURP maneuver).

The difficult airway mnemonic, DOPES, is applicable in pediatrics also. DOPES stands for Displacement, Obstruction, Pneumothorax, Esophageal placement/Equipment malfunction, Stacking (breath stacking). Consider these five elements when a patient fails to respond appropriately to ventilation via an endotracheal tube.

Commonly used Rapid Sequence Intubation (RSI) Medications:

RAPID SEQUENCE INTUBATION (RSI) Medications: SEDATION			
Medication	Dose	Side Effects	Contraindication
Etomidate	0.3mg/kg IV	Transient adrenal suppression	Septic Shock
Ketamine	1-2 mg/kg, 3-7mg/kg IM	Controversy over effect in increased intracranial pressure	
Propofol	1-1.5 mg/kg IV	Hypotension	Avoid in infants
Midazolam	0.2-0.3mg/kg IV (max 10 mg)	May cause hemodynamic instability at doses needed for sedation	
Fentanyl	1-5mcg/kg	Give over 30 to 60 sec to avoid chest wall rigidity and respiratory depression	

RAPID SEQUENCE INTUBATION (RSI) Medications: Paralytic			
Medication	Dose	Side Effects	Contraindication
Rocuronium	1mg/kg IV	--	---
Succinylcholine	Infants and children ≤2 years old: 2 mg/kg IV >2 years old: 1.5 mg/kg (4 mg/kg IM)	Controversy over effect in increased intracranial pressure	Do not use with crush injury (extensive), rhabdomyolysis, Becker Muscular Dystrophy, Cerebral Palsy with paralysis, 48-72 hours after burn injury, multiple trauma, history of malignant hyperthermia, hyperkalemia

Source: UptoDate, "Rapid Sequence Intubation in Emergency Settings"

Vascular Cannulation

A) Venous Access

Procedure	Population	Materials	Procedure	Complications
Scalp Cannulation	Neonates and infants	22 to 25 g catheters or butterfly needles	Place rubber band cephalad to eyebrows and cannulate veins	Arterial cannulation is identified by blanching of scalp after injection of saline
External Jugular Cannulation	All ages	22g -24 g catheters in younger children; 16-18g in adolescents	Place in Trendelenburg to increase venous return	Arterial cannulation, observe for pulsations
Umbilical Vessel Cannulation	Vein-up to 2 wk after birth. Artery-24 hr - 1week of age	Feeding tube or catheter (5F fT/3.5F Preterm) attach to 5mL syringe, tie down or suture at base of umbilical cord	Vein=thin walled, located at 12 o'clock position on stump Artery: thick walled, located at 4 o'clock position on stump. Advance 4-5 cm until blood returns.	Thrombosis, air embolism, vessel perforation

Procedure	Population	Materials	Procedure	Complications
Intraosseous Access	All ages Site in Peds = 2cm below tibial tuberosity or distal tibia superior to medial malleolus	18 g needle, Bone marrow needles, commercially available IO kit	Apply firm steady pressure. Prepare for a sudden decrease in resistance when piercing bone cortex. Aspirate marrow or blood with syringe to confirm placement	Avoid areas of ongoing infection. Rare complications are fat and air emboli.
Central line: Femoral is preferred site	All ages	Seldinger kits	Same as in adults	Air embolus, bleeding, arterial cannulation, thrombus formation

Resource: Procedures in Pediatric Emergency Medicine

Pediatric Fluid Management

Resource: Harriet Lane Handbook

Remember:

- **Newborns can experience rapid shifts in their electrolytes when receiving fluids. Try to use enteral routes when possible to meet their maintenance needs.**
- **Only bolus with isotonic fluids, while maintenance fluids should contain glucose (ideally D5) and isotonic fluids.**
- **Unless the patient has a known cardiac condition, use 20 ml/kg as your starting point for fluid boluses. Unlike adult patients, primary cardiac disease is not nearly as common.**
- **Changes in blood pressure are late findings in shock for pediatric patients. Rely on your clinical exam to evaluate for hypovolemia/dehydration.**
- **The younger the patient, the higher the fluid requirement per kilogram. Infants work hard to stay warm and breathe!**
- **Maintenance Hourly Fluids: The 4-2-1 Rule**
    - **4 ml/kg/hr for the first 10 kg (0-10 kg)**
    - **2 ml/kg/hr for the next 10 kg (11-20 kg)**
    - **1 ml/kg/hr for remaining weight (21 kg and up)**
- **Blood products are not dosed in units in pediatrics. Administer 10 mL/kg of PRBC.**

A person's total blood volume (TBV) is related to body weight. The TBV of a child is around 75-80 ml/kg and is higher in the neonatal period.

Premature infants total blood volume = 100 ml/kg

Infants younger than 3 months total blood volume = 85 ml/kg

Children older than 3 months total blood volume = 75 ml/kg

Adolescents total blood volume = 65-70 ml/kg

If a pediatric patient weighs at least 20 kg, know that their maintenance fluid requirement will be 60 mL + 1 mL per kg. Example, a child weighs 46 kilograms. His fluid needs will be 86 mL per hour.

4 mL/ kg x 10 kg = 40 mL for the first 10 kg

2 mL/ kg x 10 kg = 20 mL for 2nd 10 kg

1 mL/ kg x 26 kg for each kg > 20 kg

Breastfeeding:

You may encounter infants (accompanied by a breastfeeding parent) that require breastmilk or may not be with that parent and need formula. Small infants need to **eat every 2 to 3 hours**. Not only does breastfeeding meet a nutritional need, but it also supports the infant emotionally, as well. This bond is very important and should not be taken lightly. An upset infant may not be in pain, but simply needs to be fed!

If the parent can breastfeed, please allow that parent to do so, and offer covering for the parent. If the child cannot be breastfed, use the formulas that are available to feed the child.

Bottle feeding:

How much do you feed a baby?	
1-2 weeks	1-2 oz every 2-3 hrs
2-3 weeks	2-3 oz every 2-3 hrs
1-2 months	3-4 oz every 3-4 hrs
2-4 months	3-6 oz every 3-5 hrs
4-6 months	4-6 every 4-6 hrs
6-8 months	6-8 oz every 5-8 hrs
8-12 months	8 oz every 6-8 hrs
1+ yrs	16-24 oz whole mild per DAY

Used with permission from PocketPEM.com

Maintenance fluids:

1. Infants may not be able to sustain a normal blood glucose for greater than 3 hours
2. Use the 4:2:1 rule to calculate maintenance IV fluid rate. See formula below.

> 4 mL/ kg for the first 10 kg
>
> 2 mL/ kg for 2nd 10 kg
>
> 1 mL/ kg for each kg > 20 kg
>
> Example: For a 36 kg patient, maintenance volume = 40+20+6 = 66 ml/hr

3. Dextrose 5% with 0.45 % sodium chloride is an appropriate choice for neonates
4. Dextrose 5% with 0.9% sodium chloride is appropriate for children > 10 kg

Blood Products:

1. Blood products are NOT administered in units
    a. 1 Unit of blood is ~250 mL
    b. Administer packed red blood cells 10 mL/kg
    c. Administer platelets 5-10 mL/kg

Management of Acute Anxiety and Acute Pain in Pediatric Patients

Remember:

- **Weight based dosing is the pediatric way when it comes to medications. If you don't have a scale, use weight estimates from parents, use the average weight chart (appendix I) or the length based tape as a resource.**
- **Acetaminophen can be used for all ages. Infants greater than 6 months old may use ibuprofen.**

Medication administration to children should be weight-based with defined maximum doses. Dosing in children is calculated using **mg/kg** or **ml/kg**. Ask parents if the patient is able to take tablets or capsules. If not, liquid oral medications should be offered.

Ibuprofen and Acetaminophen. Ibuprofen should be dosed in those greater than 6 months old at 5 - 10 mg/kg. Acetaminophen can be dosed at 15 mg/kg.

See Appendix II for a Pediatric Medication Quick List.

Pediatric Pain Management (>28 days)

Pediatric Pain Scale:

Wong-Baker FACES Pain Rating Scale for patients >3 years

Children may have a difficult time expressing pain in acute settings, especially if encountering a stranger. Negative past experiences in medical settings may have created the narrative: “If I say I am in pain, they will give me something that involves a needle. I hate needles, so I won’t say I am in pain.” Be aware of this when asking children and adolescents about pain. Older adolescents may look like adults, but traumatic events may cause regression, and they may have an “exaggerated” fear response to medications or needles.

<u>Quick Guide</u>

	Oral options	**IV options**
Step 1 **(mild pain)**	Acetaminophen *or* ibuprofen	Acetaminophen (Ofirmev)
Step 2 **(moderate pain)**	Oxycodone	Ketorolac (Toradol)
Step 3 **(severe pain)**	Oxycodone *or*	Morphine *or* Hydromorphone
	Acetaminophen and/or NSAID should be scheduled to reduce overall opiate requirement.	

Adapted from Benioff Children’s Hospital Pain Guide. Revised 2017.

1. Include non-pharmacological adjunctive treatments when possible.
2. Use techniques, deep breathing, warm packs, and toys as a distraction.

Pharmacologic Analgesia and Anxiolysis in the Acute Setting

Pain Management		
Medication	**Dose**	**Comments**
1st line Treatment		
Acetaminophen	PO/PR/IV/IO- 10-15 mg/kg every 4-6 hours as needed, Max 650-1000 mg/dose	
Ibuprofen	PO- 10 mg/kg every 6-8 hours as needed, Max 600-800mg/dose	
2nd line Treatment		
Fentanyl	IV/IO- 0.5-1 mcg/kg every 30 minutes-2 hours as needed, Max 50 mcg/dose IN- 2 mcg/kg once, Max 100 mcg	IN-Use parenteral formulation with an atomizer device
Morphine	IV/IO- 0.05- 0.1 mg/kg every 1-4 hours as needed, Max 4-8 mg/dose *Infants- 0.025-0.05 mg/kg IV every 1-4 hours as needed	Prefer max at 4mg, can repeat dose if needed.

Hydromorphone	IV/IO-10-15 mcg/kg every 1-4 hours as needed, Max 500 mcg/dose	Prefer max at 500mcg, can repeat dose if needed.
Anxiolysis		
Medication	**Dose**	**Comments**
Midazolam	IV/IO- 0.05-0.1 mg/kg every 1-4 hours as needed, Max 5 mg IN- 0.2-0.4 mg/kg once, Max 10mg/dose	IN- Use 5 mg/ml parental formulation with an atomizer device

Infants <6 months may respond well to non-nutritive sucking, oral sucrose alone or use a small amount of juice to mix with medication . However, do not rely on this as your only solution to pain management.

NSAIDS are contraindicated in infants <3 months and used judiciously < 6 months.

See Appendix II for a comprehensive list of commonly used medications and dosing.

Psychosocial Aspects of Pediatric Care

Providing care for pediatric patients can be challenging, especially in the context of extreme stress in disaster and mass casualty situations. This section offers guidance on trauma-informed pediatric disaster care that integrates physical care, And the mental health needs of pediatric patients, their families and providers. Twenty-Thirty percent of children with acute traumatic injuries and 30-40% of children directly impacted by a disaster or mass casualty event develop enduring post-traumatic stress disorder and/or clinical depression. The experience of both event related injury or illness and other disaster exposure and losses potentiates risk for enduring consequences. Prompt triage to care holds the promise to mitigate and possibly prevent serious mental health consequences after injury and/or disaster.

Remember:

- **Family Centered Care is now the standard for pediatric emergency care:**

  Parents/Caregivers are essential partners in pediatric care. It's important to listen to their concerns about their child and integrate them into care at the outset..

- **Complex Trauma resulting from a traumatic injury or illness and/or disaster/mass casualty incident generates a range of acute traumatic stress reactions. To learn more about recognizing symptoms of acute trauma in children go to: https://www.nctsn.org/what-is-child-trauma/about-cheld trauma. Even simple strategies**

How to help: Emotional Support

Tips to help families of injured or ill children

1 Encourage parent presence.

- Encourage parents to be with their child as much as possible during hospital stay.
- Encourage parents to talk with their child about worries, hopes, etc.
- Parents know their child better than anyone, and can help staff understand their child's needs and coping strengths.

2 Empower parents to comfort and help their child.

- Help parents understand the illness or injury and treatment plan — so that they can give age-appropriate explanations to their child.
- Encourage parents to use the ways they have learned to soothe and calm their child at home.
- Parents may welcome specific suggestions from staff about how to help their child during procedures — e.g., "You can hold his hand and talk to him while we do this."

3 Encourage social support & involvement in "normal" activities.

- Suggest age-appropriate positive activities that fit the child's medical status (play, family time, videos.)
- Promote the child's appropriate contact with friends, classmates, teachers (letters, calls, email.)

- **Even simple strategies, such as distraction can make a difference in children's coping with medical trauma. Many children can use relaxation assisted distraction techniques. Consider downloading the free "Sesame Street," Breath, think, do relaxation for younger children. For older children the "Breathe to relax" app can be very helpful.**

Guidance for Supporting Parent Engagement

1. Parental engagement is essential when caring for pediatric patients. At times, when parents are injured, separated physically from their children or otherwise unable to care for their child, alternative strategies to support children, particularly unaccompanied children are ethically required.

2. After identifying yourself, ask the parent what soothes his/her child, and if logistics allow for this, have the parent hold the child or make physical contact with the patient while care is being administered. If this is not possible, explain to the parent that holding the child is not possible at the moment, but a compromise may be allowing the parent to hold the child's hand or sit next to him/her so that the child can see their parent/guardian.
3. Ask the parent/guardian what they are most worried about for their child. This may not only elicit vital information about the child's health history, but also signals that their knowledge matters.
4. Parents are accustomed to "being in control" and the current context might have stripped this away. Acknowledging this loss of control can go a long way in fostering a trusting environment.
5. If a parent is unable to remain calm, despite validating their concerns, it may be necessary to ask a staff member to support you. This staff member will be helpful in explaining the steps you are attempting to take to stabilize their child.
6. Remembering that you and the parent are a team in the care of the patient. Partnering with parents/caregivers in caring for a child can improve outcomes.
7. After presenting your assessment and treatment plan, ask the parent and/or child for any questions they have proactively.
8. Access to embedded child mental health providers AND/or access to telehealth access to pediatric trauma trained mental health providers is available via the WRAP=EM Mental Health Rapid Response Support Team.

Supporting the Pediatric Patient

In a disaster setting the added stress or injury may complicate matters. As with all patient care situations, communication is key:

All ages:

- When taking care of pediatric patients, remember that distraction is your friend!
- Ask about a patient's pet, stuffed animal, movie, video game, etc to give you the two minutes you need.
- Regression is normal in a major event. Prepare for care keeping that in mind.
- Seek support from Incident Command for mental health support services.

For infants:

Develop trust with the infant. If parents are not available to assist you, attempt to locate an oral soothing tool, like a pacifier or clean gloved finger. It sounds simple but can mean the difference in viewing the patient as inconsolable due to pain, or it may simply

remove an emotional barrier that allows you to examine the child more closely and accurately.

For toddlers:

Set a method of communicating. Children in this age group likely have an attachment to an object that historically offers comfort. This can come in the form of a soft shirt from the parent or stuffed animal. You may talk to their doll first. And the doll may talk back. Providing a sense of safety will help patients calm. Remember, keeping the patient as calm as you can during your examination can improve accuracy. In addition, it gives you helpful information. If a child cannot be calmed, then there may be a painful injury that the patient cannot verbalize and that you cannot see externally. Physiologically, it is difficult, if not impossible, for children in this age group to interrupt the cycle of emotional overflow they may be experiencing. Despite your efforts, they may still be in a state of distress. This is a normal reaction for a toddler in this situation. Though they may not understand everything you are saying, remembering to communicate your actions in simple, understandable terms to a child may help ease their stress and avoid further worsening their emotional trauma. If this patient needs a wound dressing, band-aid or cast, bandaging a stuffed animal or toy may help the child cope.

For School Age:

This age is learning!!! Their minds are an open book. Take advantage of that. Ask them questions about anything, sports, favorite subject. Share your experiences. Let them help you make decisions when able, no matter how big or small. They can help hand you things for themselves and/or other family members. Help them to understand what is happening with the outside situation as well as themselves. Distraction is a good tool and can come in the form of giving them a job. “Your job is to hold your arm above your heart on this pillow.” “Your job is to tell me if your baby sister wakes up.”

For Adolescents:

Adolescents can be difficult even outside of the context of a traumatic event. Their frontal cortex (logic centers) is developing, and their bodies are changing, not to mention the pulses of hormones they are navigating on a daily basis. They may “refuse” to talk to you. Reverting back to “child-like” coping mechanisms is not uncommon in particularly stressful events. Though their treatments may mirror those of adults, it is important to remember they still may require parents at their side. Offering a semblance of control can help lessen the fear. For example, if you encounter “needle phobia” with an adolescent, try giving them the choice of knowing when you’re going to insert the needle for an IV line or not. This tactic along with the previously mentioned guidance can mean the difference between a thrashing adolescent versus a calmer one. This supports a safer environment for all parties involved.

Understanding Psychological Risk/Resilience of Children in Disasters and Other Acute Traumatic Events:

Post Traumatic Stress Disorder (PTSD) rates in the pediatric population after traumatic injury range between 20-30% and are dependent on secondary medical trauma experiences, levels of care (eg. ICU, ventilatory support), prior mental health and trauma history and parental availability and coping.

In disasters, there is frequently “Compound risk” which is the impact of the traumatic injury/illness plus disaster exposure and losses. These compound both acute distress and risk for enduring conditions such as PTSD and depression. It is important to assess all risk factors using PsySTART early and refer for mental health consult as early as practical including tele-behavioral support.

Specialized pediatric behavioral and mental health assessment and subject matter reachback expertise can be found at https://wrap-em.org.

Emergency Psychological Triage for Children:

Although distress is nearly universal in acute disasters with medical trauma, actual risk for a psychological disorder is more limited.

To determine a child’s psychological risk, you can use the WRAP-EM PsySTART Mental Health Triage System. PsySTART does not require direct questioning of the child, can be obtained from history of presenting illness/injury or chief complaint and does not require a mental health professional to complete. Prior feasibility studies have found it can be integrated in routine trauma and disaster care as was used in the Sandy Hook School Shooting and Boston Marathon response.

PsySTART®

WRAP-EM

Incident Name: training test

Original-
Patient Chart

Date: 2021-09-24	C045
First Name: Field Medical Tent #1	Last Name:
Age: Child	Gender: Female

EXPRESSED THOUGHT OR INTENT TO HARM SELF/OTHERS?	
FELT OR EXPRESSED EXTREME PANIC?	
FELT DIRECT THREAT TO LIFE OF SELF OR FAMILY MEMBER?	
SAW / HEARD DEATH OR SERIOUS INJURY OF OTHER?	
MULTIPLE DEATHS OF FAMILY, FRIENDS OR PEERS?	
DEATH OF IMMEDIATE FAMILY MEMBER?	
DEATH OF FRIEND OR PEER?	
DEATH OF PET?	
SIGNIFICANT DISASTER RELATED ILLNESS OR PHYSICAL INJURY OF SELF OR FAMILY MEMBER?	
TRAPPED OR DELAYED EVACUATION?	
HOME NOT LIVABLE DUE TO DISASTER?	
I HAVE FAMILY MEMBER(S) WHO ARE CURRENTLY MISSING	
I AM A CHILD CURRENTLY SEPARATED FROM ALL CAREGIVERS	
FAMILY MEMBERS SEPARATED DUE TO COVID RISK OR EXPOSURE?	
PRIOR HISTORY OF MENTAL HEALTH CARE?	
CONFIRMED EXPOSURE OR INFECTION WITH COVID?	
DE-CONTAMINATED?	
RECEIVED MEDICAL TREATMENT FOR EXPOSURE/ CONTAMINATION?	
HEALTH CONCERNS TIED TO EXPOSURE TO COVID?	
NO TRIAGE FACTORS IDENTIFIED?	

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Confidential Patient Information

PsySTART® Triage Levels

Purple: Indicates need for secondary psychiatric emergency assessment with Columbia Suicide Scale, ASQ Scale and psychological consult to assess immediate danger to self or others

Red: Indicates one or more evidence based risk factors for PTSD and/or clinical depression. The presence of 2 or 3 “red” risk factors indicates the need for secondary

trauma assessment by a pediatric mental health provider for possible acute stepped triage to care.

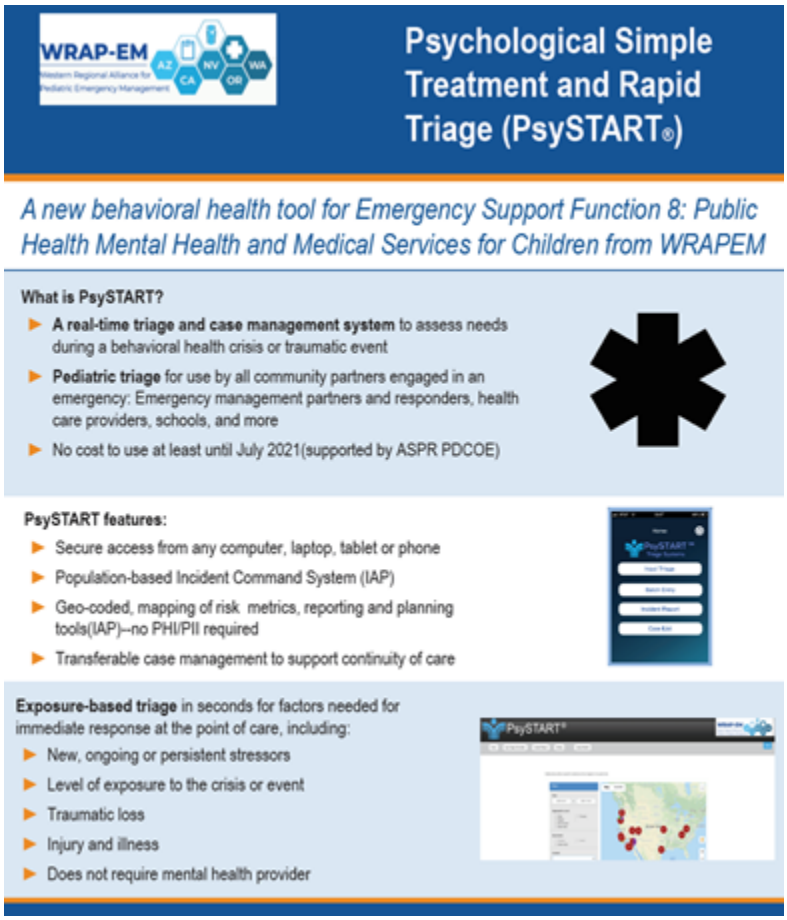
Yellow: Indicates one or more stress triggers that can be assessed in less urgent manner EXCEPT for “I am a child currently separated from all caregivers. This is an indicator for immediate protection strategy for an unaccompanied child in the disaster context.

PsySTART® Psychological Triage

PsySTART® is a mental health triage tool that does the following:

Keeps a record of events to identify trends in the events where PTSD and Depression are most common

1. Identifies individuals in the pediatric population at increased risk for development of new clinical disorders resulting
2. Direct interview of pediatric patient is not necessary
3. Staff members of any level can learn to administer the tool
4. Gives providers an “in the moment” assessment of pediatric mental health picture for receiving health systems



What are the treatment recommendations for pediatric patients?

Reprinted from Northwest Response Health Network's *Planning and Caring for Pediatric and Neonatal Patients in Disasters*

Children's Characteristics, Reactions, and Interactions

Age	Characteristics	Typical Reactions	Keys to Successful Interactions
Newborn: Birth to 1 month	• Likes to be held. • Likes to be kept warm. • May be soothed by having something to suck on or being swaddled.	• May startle easily. • May become fussy or agitated when near or held by adults who are experiencing anxiety or upset.	• Speak softly. • Use simple words. • Use the child's name. • Avoid loud noises and bright lights.
Infant: 1 to 12 months	• Likes to be held. • Familiar objects from home can be soothing.	• Distress when separated from parents. • Distress when approached by someone unfamiliar, usually starting when the child is approximately 6- 8 months of age.	• Parent/ caregiver should always be nearby and hold the child when feasible and allowed to stay with the child. • Enlist the parent's/caregiver's help. • Distract with a toy or penlight. • Examine infants and young children on a parent's lap. • Examining the child in the direction of the toes to the head is less threatening. • Talk to the infant throughout the examination. • Avoid loud noises and bright lights. • Use familiar objects from home such as a stuffed animal, blanket, or toy to help comfort the infant before, during or after a procedure.

Children's Characteristics, Reactions, and Interactions, continued

Age	Characteristics	Typical Reactions	Keys to Successful Interactions
Toddler: 1 to 3 years	• Do not like (or are unable) to sit still. • May grab at the penlight or push your hand away. • May refuse to look at you. • May try to run.	• Have fears of separation from family. • May be unusually fearful, "fussy," clingy, and have crying bouts. • Have problems sleeping. • Startle easily.	• Make a game of assessment. • Parent/ caregiver should always be nearby and allowed to stay with the child. • Adjust your height to that of the child. • Distract the child with a toy or penlight. • Examine in the direction of the toes to the head. • Do not ask the child's permission to perform an examination if it will be performed in any case. • Allow the parent/ caregiver to participate. • Respect modesty, keeping child covered when possible. • If possible, let family visit/ stay.

Children's Characteristics, Reactions, and Interactions, continued

Age	Characteristics	Typical Reactions	Keys to Successful Interactions
Preschooler: 3 to 6 years	• Most can sit still on request. • Understands speech. • May make up explanations for anything not understood. • Learns best through play and "medical play". • Able to make choices when choices are possible. • No clear concept of future events.	• Have fears of being separated from parent/ caregiver. • Can be unusually fearful, clingy, and have crying bouts or an increase in tantrums. • Regress to outgrown behaviors, such as bed-wetting or baby talk. • Have nightmares or trouble sleeping. • Have stomach aches, headaches, or other physical complaints that do not have a medical basis. • Startle easily. • May have loss or increase in appetite.	• Explain actions using simple language. • Tell the child what will happen next. • Tell the child just before the procedure if something will hurt. • Distract child with a story, toy, electronic device. • Respect modesty, keeping child covered when possible. • Do not ask the child's permission to perform an examination if it will be performed in any case. • Parent/ caregiver should always be allowed to stay with the child, including overnight if the child is hospitalized, and to remain with the child during procedures when possible. • Allow the child to make choices when possible.

Children's Characteristics, Reactions, and Interactions, continued

Age	Characteristics	Typical Reactions	Keys to Successful Interactions
School- aged: 6 to 12 years	• Expresses feelings and gains a sense of control over what is happening to them through play. • Cooperation is gained through trust.	• May have unusual outbursts of anger. • May have nightmares or problems sleeping. • May withdraw from family and friends. • May engage in repeated play that depicts the disturbing events repeatedly. • Can be fearful, anxious, or preoccupied with safety and danger. • May revert to outgrown behavior. • Express feelings of guilt. • Have frequent somatic complaints. • Problems focusing, paying attention and learning new concepts.	• Introduce yourself to the child at the beginning of the interaction. • Be friendly and sympathetic. • Honesty is especially important. • Describe actions before carrying them out. • Reassure the child if injury is not severe. • Provide developmentally appropriate information and education on what they are dealing with. • Allow the child to make choices when possible.

Children's Characteristics, Reactions, and Interactions, continued

Age	Characteristics	Typical Reactions	Keys to Successful Interactions
Adolescent: 12 to 18 years	• Wants to be treated with respect. • May resent not being included in discussions about their treatment. • Values privacy and modesty. • Do not assume teens manage emotions the same way adults do.	• Appetite changes. • May suffer from headaches or gastrointestinal problems. • Loss of interest in social activities. • Sadness or depression. • Feelings of anger and aggression. • Isolation from others and less interest in friendships. • Repetitive behaviors such as hand washing. • Increased risk-taking behaviors. • Use of drugs or alcohol to cope. • Hopelessness regarding their future.	• Introduce yourself at the beginning of the interaction. • Speak in a respectful, friendly manner. • Get history from patient if possible. • Address the adolescent directly, respecting independence. • Respect the modesty of the patient throughout the examination. • Consider when to ask questions about sexual activity, or drugs or alcohol use. The patient may be reluctant to answer such questions honestly in the parent's presence. • Allow parents to be involved in the examination if the patient wishes. • If you think the patient may be reluctant to share sensitive information, ask those questions in private.

Trauma-Informed Care

The National Child Traumatic Stress Network and The National Center for Post Traumatic Stress Disorder worked together to create an evidence based method to reduce the acute stress response, as well as influence the short-term and long term impacts of a stressful event. This method can be used in both children and adults.

Trauma-informed care recognizes that a child or teen may have had experiences in their past which might make certain actions on the part of a healthcare provider very frightening. These events may include sexual, physical or emotional abuse, painful and frightening medical procedures, and a history of negative experience with authorities of all types. Unexpected emotional and behavioral responses to a conversation or some aspect of treatment can be confusing for the healthcare provider, but may be indicative of previous trauma. By approaching all patients in a planful manner, this distress may be alleviated. For example:

1. Making yourself heard prior to entering the youth's room or space so as not to startle them.
2. Introducing yourself and your role.
3. Asking permission prior to touching.
4. Explaining what you will be doing and soliciting questions.
5. Offering choice when possible.
6. As much as possible, providing some privacy.
7. Creating low sensory places for care by reducing noise, lights, sudden movements.

Psychological First Aid:

There are several different models of Psychological First Aid for Children including comprehensive trainings and just-in-time. Listen.Protect.Connect and Psychological First Aid System (PFA) are available on fema.gov. Parents can use this on their own without training if needed and train-the-train guides are also available at no cost on FEMA websites:
https://www.ready.gov/sites/default/files/documents/files/LPC_Booklet.pdf .

A version for parents is also available:
https://www.ready.gov/sites/default/files/documents/files/PFA_Parents.pdf

For information on the comprehensive NCTSN PFA system and training:
https://www.nctsn.org/resources/psychological-first-aid-pfa-online

Palliative and End of Life Care

Communication is key to effectively supporting parents and children who are in palliative or end of life care. From discussions which are direct and clear about why a child is being referred for this type of care, to ongoing care planning and choices, parents, patients and other family members need to understand what is going on with their loved one. Palliative care can be offered at any point in an illness and has as the primary goal, keeping the child as comfortable as possible. This may mean helping with pain, side effects of medication, nausea and difficulty eating, and also supporting family. It does not preclude ongoing treatment and is designed to provide support for the family system by addressing physical, emotional, psychological and spiritual needs (WHO Ladder: Cancer Pain Relief and Palliative Care. Technical Report Series 804. Geneva: World Health Organization; 1990). Palliative care can be used for months to years. End of life or hospice care is for the child who is assumed to be at the end of their lives and is a form of palliative care.

Critical values for palliative/hospice care are:

1. Patient and family-centered care focus.
2. Respect- considering family and child preferences, values, spiritual and cultural traditions, and having a care plan that engages the child and family in decision-making.
3. Comfort- keeping the child as free of pain as is possible and addressing physical issues such as nausea or dyspnea, psychological issues, such as anxiety, and practical issues around equipment, daily functioning and respite.
4. Support- for the child, for parents and for siblings and other family members who are impacted.

Care teams are encouraged to engage in mental health and spiritual care services as a part of patient care planning. Pediatric deaths are known to be particularly traumatic for healthcare providers and so Care teams are also encouraged to be intentional about self-care and to engage in peer support, and psychological and spiritual counseling. (https://pediatrics.aappublications.org/content/132/5/966)

Despite our best efforts, some patients may die from their injuries or medical conditions during disasters. Pediatric patients are not immune to these circumstances. Psychological considerations include:

1. Engaging in conversations that are clear, direct, and involve parents/patients in establishing what their wishes are (e.g.,where the child will be, access to spiritual care or cultural practices, concerns they might have).
2. Maximum flexibility in terms of parents and siblings being present with the patient if they choose.

3. Education for parents/caregivers around what changes they might expect, such as changes in rates and sounds associated with breathing, as the child gets close to death.
4. Reassuring parents/caregivers that all means necessary will be used to provide relief from pain and discomfort.

Clinical guidelines for end of life (EOL) symptom management to help in these situations are found below.

Clinical Guidelines for Symptom Management

Symptom	Pharmacologic	Non-Pharmacologic
Dyspnea	• Opioids are the primary treatment for dyspnea at EOL • Opioid dose for dyspnea is generally 25% of the amount used for pain • Consider lorazepam as an adjunct: 0.05 mg/kg/dose PO/IV q4-6h PRN (max initial dose 2 mg/dose)	• Oxygen • Elevate head of bed • Bedside fan • Fluid restriction
Secretions	• Glycopyrrolate 4-10 mcg/kg/dose IV q4h PRN OR 40-100 mcg/kg/dose PO q4h PRN (use low end as starting dose and titrate as needed)	• Fluid restriction • Gentle suction • Reposition patient • Educate families that noisy breathing may occur when death is imminent; although it may be distressing for families to hear, the child likely does not experience discomfort
Agitation/ Anxiety	• Lorazepam 0.05 mg/kg/dose PO/IV q4-6h PRN (max initial dose 2 mg) • Consider midazolam infusion if intermittent lorazepam is required more than q3h • Agitation caused by delirium may be worsened by benzodiazepines; may consider use of antipsychotics in these cases with expert opinion	• Low lighting • Soothing music • Familiar people/objects • Decrease sensory stimuli • Provide developmentally appropriate supportive therapy (e.g. Child Life, SW)
Nausea/ Vomiting	• 1st line: ondansetron or granisetron • 2nd line: lorazepam • 3rd line: prochlorperazine, haloperidol, scopolamine, metoclopramide, dexamethasone (requires attending approval for oncology patients)	• Acupuncture/Acupressure • Avoid irritating foods and smells • Consider etiology/sources of nausea when choosing your agents • Be aware of the distinction between true reduction in nausea versus sedation

** Remember to consider intranasal, buccal, subcutaneous and sublingual administration in patients with limited IV access*

UCSF Benioff Children's Hospitals Pediatric End-of-Life Care Management Reference Card. March 2015.

<u>Intermittent Opioid Dosing for EOL Pain Management</u>

Morphine 0.1 mg/kg/dose IV x1 dose (max initial dose 4 mg)

<u>OR</u>

Hydromorphone (Dilaudid) 0.015 mg/kg/dose IV x1 dose (max initial dose 0.5 mg)

***No ceiling dose exists for opioids in end-of-life symptom management. The appropriate dose is the one that relieves the patient's symptoms. In austere conditions, consider available resources when prescribing.**

Provider Self-Care

Pediatric medical care requires both compassion and competence. Taking care of children in life or death situations is one of the most difficult tasks we can take on as healthcare providers. Therefore, it is important to debrief with colleagues or mental health professionals. It is normal to have strong emotions in response to this work. Dealing with both your patient and family members add to the stressors of a high stakes environment. Remember that you are not alone, that you are not any less of an excellent healthcare provider, and that you are a compassionate one.

Resources:

1. Physician Support Line
2. Five essential principles of post-disaster psychosocial care: looking back and forward with Stevan Hobfoll
3. Psychological First Aid

Quick References

Appendix I Weight-based Dosage Chart

Pediatric Vital Signs

Ranges—"normal" guidelines. Treatment may vary by patient's individual condition.

Age	Weight	Resp Rate	Heart Rate	Systolic Bp	Length	Broselow Color
Newborn	3-5 kg	30-60	80-190	65-104	50 cm	Grey-Pink
6 mos	8 kg	30-60	80-160	70-110	62 cm	Red
1 Year	10 kg	20-45	80-160	70-112	74 cm	Purple
2 Years	13 kg	20-45	80-140	70-112	82 cm	Yellow
3 Years	15 kg	16-40	80-140	75-116	95 cm	White
5 Years	20 kg	16-40	75-130	75-116	108 cm	Blue
8 Years	25 kg	16-35	70-120	80-112	127 cm	Orange
10 Years	30 kg	16-30	65-115	85-126	138 cm	Green
15 Years	55 kg	12-24	60-110	90-136	155 cm	No Broselow

Adapted from American Heart Association, 2010; Centers for Disease Control and Prevention (CDC) & National Center for Health Statistics, 2001; Broselow Pediatric Emergency Tape ©2007 Edition B.

Appendix II Commonly Used Medications/Dosages

Pediatric Emergency Room Pocket Drug Reference

Version 2

Poison Control 1-800-222-1222

Common Medications			
Medication	Route	Dose	Max
Acetaminophen	PO	15 mg/kg	650 mg
Fentanyl	IV	1 mcg/kg	50 mcg
	Nasal	2 mcg/kg	100 mcg
Ibuprofen	PO	10 mg/kg	600 mg
Ketamine	IV	1mg/kg	
-Alternative	IV	1.5 mg/kgx1 then 0.75mg/kg	
Midazolam	IV	0.05 mg/kg	5 mg
-Min sedation	Nasal	0.4 mg/kg	10 mg
Morphine	IV	0.05-0.1mg/kg	4 mg
Ondansetron	IV	0.1mg/kg	4 mg
Propofol*	IV	1 mg/kg	40 mg
	*may repeat up to 5 total doses		

Written medication order correct format:
Medication--Dose (mg/kg)--Total Dose--Route--Frequency

Do not use these abbreviations:
U, IU, QD, QOD, MS, MSO4, MGSO4

No leading decimal, use 0.1 mg, **NOT** .1 mg
No trailing zero, use 1 mg, **NOT** 1.0 mg

Pediatric Advanced Life Support			
Medication	Route	Dose	Max
Adenosine	IV	0.1 mg/kg	First-6 mg
-Second Dose	IV	0.2 mg/kg	Second-12mg
Amiodarone	IV	5 mg/kg	300 mg
Atropine	IV	0.02 mg/kg	Max 0.5 mg
Calcium GLUC	IV	100 mg/kg	2000 mg
Epinephrine --0.1mg/mL	IV	0.01 mg/kg (0.1 mL/kg)	1mg(or>50kg) (10 mL)

Rapid Sequence Intubation			
Medication	Route	Dose	Max
Atropine	IV	0.02 mg/kg	Max 0.5 mg
Etomidate	IV	0.3 mg/kg	20mg
Lidocaine (↑ICP)	IV	1 mg/kg	100 mg
Rocuronium	IV	1 mg/kg	--
Succinylcholine	IV	2 mg/kg	150 mg
Vecuronium	IV	0.1 mg/kg	--

Anaphylaxis			
Medication	Route	Dose	Max
Epinephrine 1mg/mL	IM	0.01 mg/kg	0.3 mg
Dexamethasone	PO	0.6 mg/kg	16 mg
Diphenhydramine	IV/PO	1 mg/kg	50 mg
Ranitidine	IV	1 mg/kg	50mg
	PO	2 mg/kg	150mg
Famotidine	IV/PO	0.5 mg/kg	20mg
Methylprednisolone	IV	1 mg/kg	

Other			
Medication	Route	Dose	Max
Dextrose 10%	IV	5 mL/kg	250 mL
NACL 3%	IV	5 mL/kg	500 mL
Mannitol	IV	0.5-1 gm/kg	50 gm
Sodium Bicarb	IV	1 mEq/kg	50 mEq
	<5kg use 4.2%		

Cardiovascular Drips		
Medication	Route	Starting Range
Dopamine	IV	5-20 mcg/kg/min
Epinephrine	IV	0.05-1 mcg/kg/min
Milrinone	IV	0.25-0.75 mcg/kg/min
Norepinephrine	IV	0.1-1 mcg/kg/min
Alprostadil	IV	0.05-0.1 mcg/kg/min

Reversal Agents			
Medication	Route	Dose	Max
Naloxone-Partial	IV	0.01 mg/kg	0.2 mg
Naloxone-Full	IV/IM	0.1 mg/kg	2 mg
Flumazenil	IV	0.01 mg/kg	0.2 mg

Respiratory			
Medication	Route	Dose	Max
Albuterol	Neb	2.5mg/3mL	10 mg
Ipratropium	Neb	0.5 mg	1 mg
Magnesium -Give over 20 min	IV	50 mg/kg	2000 mg
Albuterol -Continuous	Neb	<20 kg- 10 mg/hr ≥20 kg- 20 mg/hr	
Racemic Epi	Neb	0.5 mL	In 3 mL NS
Dexamethasone	PO	0.6mg/kg	16 mg

Seizures			
Medication	Route	Dose	Max
Fosphenytoin	IV	20 mg/kg	1500 mg
Levetiracetam	IV	20 mg/kg	2000 mg
Lorazepam	IV	0.1 mg/kg	4 mg
Phenobarbital	IV	20 mg/kg	1000 mg
Valproic Acid	IV	20-40 mg/kg	
Midazolam	IN	0.2 mg/kg	10mg

This document presents an evidenced-based approach that is appropriate for most patients. It should be adapted to meet the needs of individual patients and situations, and should not replace clinical judgement.

Commonly Used Medications cont.

Nausea			
Medication	Route	Dose	Max
Metoclopramide	IV	0.1-0.2 mg/kg	10 mg
Ondansetron	IV/PO	0.1 mg/kg	4 mg
Prochlorperazine ≥ 2 years old	IV	0.1-0.15 mg/kg	10 mg
Promethazine **NOT IN HAND IV!!!**	IV/PO	0.25-1 mg/kg	25 mg

Pain			
Medication	Route	Dose	Max
Acetaminophen	PO/PR	15 mg/kg	650 mg
Diazepam-Spasms	IV	0.05 mg/kg	5 mg
Fentanyl	IV	1 mcg/kg	50 mcg
	IN	2 mcg/kg	100mcg
Hydrocodone/APAP	PO	0.1-0.2 mg/kg	10mg
Hydromorphone	IV	10-15 mcg/kg	500mcg
Ibuprofen	PO	10 mg/kg	600 mg
Ketorolac	IV	0.5-1 mg/kg	30 mg
Morphine	IV	0.05-0.1 mg/kg	4 mg
Oxycodone<6month	PO	0.025- 0.05 mg/kg	5 mg
>6month	PO	0.05- 0.15 mg/kg	10 mg

Sedation			
Medication	Route	Dose	Max
Midazolam	IV	0.05-0.1 mg/kg	3 mg
	IN	0.4 mg/kg	10 mg
Ketamine	IV	1 mg/kg	
Alternative	IV	1.5 mg/kg x1 then 0.5 mg/kg	
Ondansetron	IV	0.1 mg/kg	4 mg
Propofol	IV	1 mg/kg	40 mg
	*may repeat up to 5 total doses		

Antibiotics			
Medication	Route	Dose	Max
Acyclovir AdjBW->	IV	10-15 mg/kg	
HSV<90 days	IV	20 mg/kg	
	PO	20 mg/kg	800mg
AMOXicillin	PO	25-50 mg/kg	1000 mg
Dosage forms: 250, 500 mg caps, 400mg/5mL			
AMOXacillin/Clav (Augmentin)	PO	20-45 mg/kg	2000 mg
Dosage Forms: 250mg,500mg,875mg tabs; 400mg, 600mg/5mL			
AMPicillin	IV	50 mg/kg	2000 mg
Ampicillin/sulbact (Unasyn)	IV	50 mg/kg	2000 mg (amp)
Azithromycin (Zithromax)	IV/PO	10 mg/kg STD→	500 mg 1000mg
Dosage Forms:250mg tabs, 200 mg/5mL			
Cefazolin (Ancef)	IV	33-50 mg/kg	2000 mg
Cefdinir (Omnicef)	PO	7-14 mg/kg	600 mg
Dosage Forms: 300mg cap 125 mg/5mL 250 mg/5mL			
Ceftazidime (Fortaz)	IV	50 mg/kg	2000 mg
Cefotaxime (Claforan)	IV	50-75mg/kg	2000 mg
Cefoxitin (Mefoxin)	IV	40 mg/kg	2000 mg
Ceftriaxone (Rocephin)	IV	50-100 mg/kg	2000 mg
Cephalexin (Keflex)	PO	12.5-25 mg/kg	1000 mg
Dosage Forms: 250mg 500mg caps, 250mg/5mL			
Clindamycin (Cleocin)	IV/PO	13 mg/kg Toxic Shock->	600 mg 900 mg
Gentamicin	IV	5-7.5 mg/kg	IBW
Metronidazole (Flagyl)	IV	10 mg/kg	500 mg
Appendicitis	IV	30 mg/kg	1500 mg
Piperacillin/Tazo (Zosyn)	IV	75 mg/kg	3000 mg (pip)
Vancomycin	IV	20 mg/kg	2000 mg

Common Combinations			
Medication	Route	Dose	Max
Appendicitis			
Ceftriaxone	IV	75mg/kg	2000 mg
Metronidazole	IV	30 mg/kg	1500 mg
Asthma LVN		TV=17ml	
Albuterol	Neb	10 mg	
Ipratropium	Neb	1 mg	
Croup			
Racemic Epi	Neb	0.5 mL	TV=3.5ml
Dexamethasone	PO/IV/ IM	0.6 mg/kg	16 mg
Migraine			
Prochlorperazine	IV	0.15mg/kg	10 mg
Diphenhydramine	IV	1 mg/kg	50 mg
Ketorolac	IV	1 mg/kg	30 mg
Choosing Augmentin Conc			
High Dose--90mg/kg/day		AugmentinES 600mg/5ml	
All other dosing		Augmentin **NON** ES	
Zero Harm Safety Techniques			
ARCC-Ask, Request, Concern, Chain of Command			
Standardized Handoff			
SBAR-Situation, Background, Assessment, Recommendation			
STAR- Stop, Think, Act, Resolve			
Stop and Resolve			
Clarifying Question-Repeat Back/Read Back			

Prepared by Greg Nelsen PharmD Last Updated 10-2020

Appendix III Oral Airway Chart

Stanford Children's Health

Stanford MEDICINE

Age	Newborn	1 mo	6 mo	8 mo	1 yr	2 yr	4 yr	6 yr	8 yr	10 yr
Weight (kg)	3-4	5	6-7	8-9	10-11	12-14	15-18	19-23	24-29	30-36
Mask	Infant (#2)		Toddler (#3)			#3/#4	Child/Small Adult (#4)			
OPA	50 mm				60 mm			70 mm	80 mm	
NPA	14 Fr				18 Fr	20 Fr	22 Fr	24 Fr	26 Fr	30 Fr
LMA (King)	1		1.5		2			2-2.5	2.5	3
LMA (Stanford)	1			1.5		1.5-2	2			

*Above serves as a guideline

Measuring Tips

Mask: Bridge of nose to chin with mouth slightly open

NPA: Tip of nose to ear lobe

OPA: Angle of mouth to angle of mandible

Continue with the appropriate adult mask size for children >36 kg.

Appendix IV Medical Calculators

The Cornell University Sandra and Sanford I. Weill Medical College Department of Critical Care Pediatrics provides a variety of references:

- Integrated dosing calculators
- Drip medication concentrations table
- Conversion charts
- Metabolic calculators
- Respiratory calculators
- Pharmacology calculators

Access the medical calculators at http://www-users.med.cornell.edu/~spon/picu/calc/medcalc.htm.

Appendix V Manual Drip Primer

Clinical Procedures for Safer Patient Care is an online open-accessible text that provides guidance on manual intravenous infusions: https://pressbooks.bccampus.ca/clinicalproceduresforsaferpatientcaretrubscn/chapter/8-6-infusing-iv-fluids-by-gravity-or-an-electronic-infusion-device-pump/.

Table 8.9 Calculating the Drops per Minute (gtts/min) for an Infusion by Gravity	
Steps	*Additional Information*
1. Verify the physician's order.	An order may read: ● Example 1. *Give 0.9% NS IV 125 ml/hr* ● Example 2. *Give 1000 ml of 0.9% NS IV over 8 hours.*
2. Determine the drop factor on the IV administration set.	The drop factor is the amount of drops (gtts) per minute. IV tubing is either macro tubing (10, 15, or 20 gtts/min) or micro tubing (60 gtts/min). The drop factor (or calibration of the tubing) is always on the packaging of the IV tubing.

3. Complete the calculation using the formula.	Use the formula: $\frac{\text{infusion rate (ml/hr)} \times \text{IV drop factor (gtts/min)}}{60 \text{ (administration time is always in minutes)}}$ = drops per minute To calculate ml/hr, divide 1000 ÷ 8 = 125 ml/hr. Example: *Infuse IV NS at 125 ml/hr. IV tubing drop factor is 20 gtts/min* $\frac{125 \times 20}{60}$ = 41.6 gtts/min, round up to 42 gtts/min (round down or up to the nearest whole number)

4. Regulate IV infusion using the roller clamp.	With tubing already primed, open the blue roller clamp and count the drips in the drip chamber and regulate for 42 gtts/min (one full minute). Alternatively, divide 42 by 4 (rounded down from 10.4 to 10 gtts/min) to count for 15 seconds. The gtts/min should be assessed regularly to ensure the IV is infusing at the correct rate (e.g., every 1 to 2 hours, if the patient accidentally bumps the IV tubing, or if a patient returns from another department). *Regulate IV tubing by using a roller clamp*
Data sources: Fulcher & Frazier, 2007; Perry et al., 2018	

When an infusion is by gravity, there are several factors that may alter the flow/infusion rate (Fulcher & Frazier, 2007). In addition to regulating the flow rate, assess the IV system to ensure these factors are not increasing or decreasing the flow of the IV solution. These factors are listed in Table 8.10.

Table 8.10 Factors Influencing the Flow Rate of Infusions

Factors	*Additional Information*
Tube occlusion	May occur if the tubing is kinked or bent. Tubing may become kinked if caught under the patient or on equipment, such as beds and bed rails. Sometimes the cannula itself is kinked at the insertion site.
Vein spasms	Irritating or chilled fluids (fluids stored in the fridge) may cause a reflex action that causes the vein to go into spasm at or near the intravenous infusion site. If fluids or medications are chilled, bring to room temperature prior to infusion.
Height of the fluid container	The IV tubing drip chamber should be approximately 3 feet above IV insertion site.

Location/position of IV cannula	If the cannula is located in an area of flexion (bend of an arm), the IV flow may be interrupted when the patient moves around. To avoid this issue, replace IV cannula.
Infiltration or extravasation	If the cannula punctures the vein, the fluid will leak into the surrounding tissue and slow or stop the flow, and swelling will develop.
Accidental touching/bumping of the control clamp or raising arm above heart level	Instruct the patient not to touch the roller clamp and to take care not to bump the clamp, as this may accidentally change the flow rate. Instruct patient to keep hand/arm below heart level; an elevated hand/arm will slow or stop an infusion running by gravity.
Needle or cannula gauge/diameter	The smaller the needle or cannula, the slower the fluid will flow.
Data sources: Fulcher & Frazier, 2007; Perry et al., 2018	

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