

Pediatric Assessment

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Affiliated with
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No Disclosures



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Objectives



Summarize the differences of pediatric vs adult physiology impacting patient assessment and triage



Develop systematic approach to pediatric assessment and triage



Report escalation of pediatric emergencies and knowledge of resources



Discuss strategies to better support pediatric patients during medical care



Kids are not small adults!



Photo: The Denver Post

Adults



Personal Photo

Kids

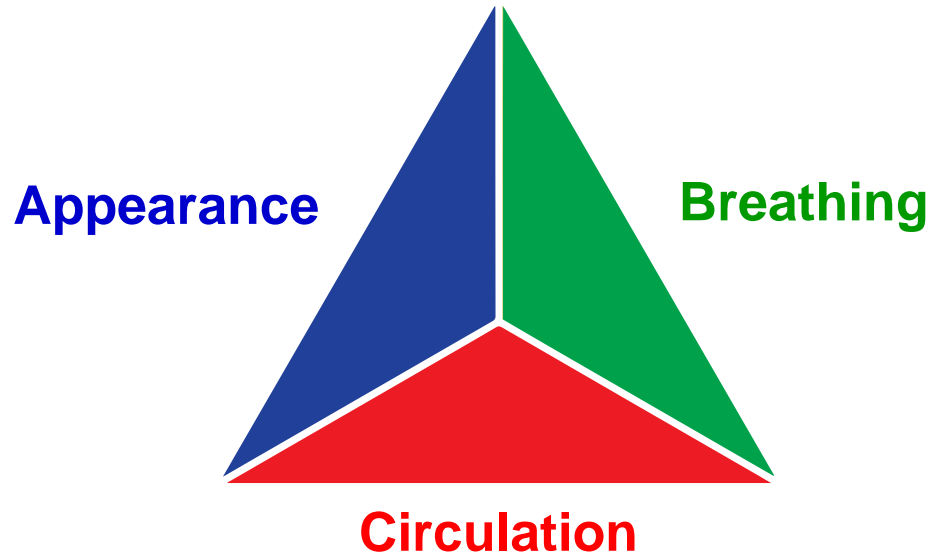


Pediatrics vs Adults

Differences	Implications
Greater BSA to body weight	Prone to hypothermia, dehydration
Higher metabolic rate	Prone to hypoxia, hypoglycemia
Higher fluid requirements	Prone to dehydration
Good vasculature and heart	Don't see hypotension until late
Babies are nose breathers	Can't breathe with secretions
Thin chest wall, weak IC muscles	Takes more effort to breathe



Sick or Not Sick: Pediatric Assessment Triangle



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Appearance - TICLS

TONE - moving? limp?

INTERACTIVENESS - alert? not following?

CONSOLABILITY - by caregiver?

LOOK/GAZE - observant?

SPEECH/CRY - high pitched, hoarse, muffled?

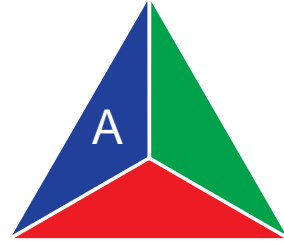


Photo: Children's Hospital Colorado







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Breathing – Rate and Effort

Abnormal positioning - extended neck, head bobbing, or tripod?

Abnormal airway sounds:

- Stertor - Secretions (both)
- Stridor - Upper (inspiratory)
- Wheeze - Lower (expiratory)

Nasal flaring

Retractions subcostal, intracostal, sternal, tracheal tug



Photo: Pearson



Normal



Trouble breathing

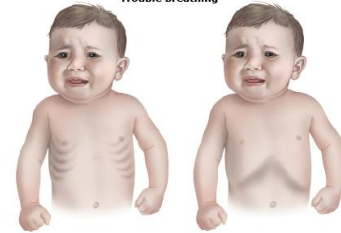


Photo: Up To Date



Photo: Stanford Medicine









Circulation

Skin color:

Early: Pale

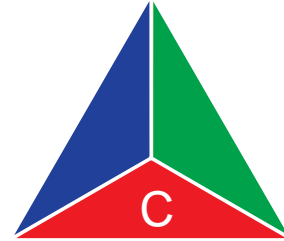
Late: Mottled, Cyanotic



Photo: BMJ



Photo: ResearchGate



Mucous membranes

Bruising or purpura?

Mental status - LOC changes



Photo: GrepMed



Photo: Consultant 360



Putting together the ABCs



Concern(s)	Meaning	Interventions
Breathing	Respiratory Distress	Positioning, oxygen, suction, consider meds as applicable
Appearance + Breathing	Respiratory Failure	Positioning, oxygen (mask), suction, get advanced airway ready
Appearance + Circulation	Shock	Oxygen (NRB), access (IV/IO), labs, fluids, reduce oxygen demand / treat cause of shock
Appearance	Neurologic / Metabolic	Check blood sugar, labs, oxygen as needed, determine and treat cause
All 3 (ABC)	Cardiorespiratory Failure	Position, oxygen (bag mask), advanced airway, compressions





What's Next?

Length-Based Tape

RED to head

Kilogram (kg) weight in pediatrics

- Medication doses
- Equipment



Photo: Armstrong Medical



Weight	Laryngoscope Blade	ET Tube (mm) +0.5 uncuffed	ET Tube Depth (cm)	Suction Cath. (Fr)	IV (ga)	NG (Fr)	Urinary Cath. (Fr)
3-5 kg	1 straight	3.0 Cuffed	3 kg 9-9.5 4 kg 9.5-10 5 kg 10-10.5	8	22-24	5-8	5
6-7 kg	1 Straight	3.0 Cuffed	10.5-11	8	22-24	5-8	8
8-9 kg	1 Straight	3.0 Cuffed	10.5-11	8	22-24	5-8	8
10-11 kg	1 Straight	3.5 Cuffed	11-12	10	20-24	8-10	8-10
12-14 kg	2 Straight	4.0 Cuffed	13.5	10	18-22	10	10
15-18 kg	2 Straight	4.5 Cuffed	14-15	10	18-22	10	10-12
19-23 kg	2 Straight or Curved	5.0 Cuffed	16.5	10	18-20	12-14	10-12
24-29 kg	2 Straight or Curved	6.0 Cuffed	17-18	10	18-20	14-18	12
30-36 kg	3 Straight or Curved	6.5 Cuffed	18.5-19.5	10-12	16-20	16-18	12

PURPLE			
SEIZURE		ICP	
Lorazepam (2 mg/mL) (4 mg/mL)	1 mg (0.5 mL) 1 mg (0.25 mL)	3% Saline Mannitol (20% 0.2 g/mL)	21-53 mL 10 g (50 mL)
Diazepam IV (5 mg/mL)	2 mg (0.4 mL)	Furosemide (10 mg/mL)	10 g (40 mL) 10 mg (1 mL)
Phenobarbital (65 mg/mL) (130 mg/mL)	210 mg (3.2 mL) 210 mg (1.5 mL)	FLUIDS	
Phenytoin (50 mg/mL)	210 mg (4.2 mL)	Fluid Bolus	
Fosphenytoin (50 mg PE/mL)	210 mg PE (4.2 mL)	Crystalloid (NS or LR)	210 mL
Levetiracetam (100 mg/mL)	625 mg (5.25 mL)	Colloid/Blood	105 mL
OVERDOSE/HYPOTENSIA		Maintenance	
D ₁₀ W (0.1 g/mL)	5.25 g (52.5 mL)	DS 1/2 NS + 20 mEq KCL/L	43 mL/HR
D ₅ W (0.25 g/mL)	5.25 g (21 mL)	PAIN	
Naloxone (1 mg/mL)	1 mg (1 mL)	Fentanyl (50 mcg/mL)	10 mcg (0.2 mL)
	(0.4 mg/mL)	Morphine (2 mg/mL)	1 mg (0.5 mL)
Flumazenil (0.1 mg/mL)	0.1 mg (1 mL)		1 mg (0.25 mL)
Charcoal (25 g/100 mL)	10 g (50 mL)		
Glucagon (1 mg/mL)	0.5 mg (0.5 mL)		
EQUIPMENT		EQUIPMENT	
*E.T. Tube	4.0 Uncuffed/*3.5 Cuffed	Oxygen Mask	Pediatric NRB
E.T. Insertion Length	11-12 cm	*ETCO ₂	Pediatric
Stylet	6 French	*Urinary Catheter	8-10 French
*Suction Catheter	8 French	*Chest Tube	14-20 French
Laryngoscope	1-1.5 Straight	NG Tube	8-10 French
BVM	Child	Vascular Access	20-24 Ga
Oral Airway	60 mm	Intraosseous (IO)	15 Ga
*Nasopharyngeal Airway	18 French	BP Cuff	Child
*LMA	2	*May not be included in Organizer System(s).	

Photo: HMP Global Learning Network



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A FULL Set of Vital Signs

Pediatric “normal” varies by age

Think about order!

Heart rate

Respiratory rate - a full minute!

Saturations

Temperature

Blood pressure

CHILDREN'S HOSPITAL COLORADO
OneCall 720-777-3999 | Toll Free 1-800-525-4871

PEDIATRIC VITAL SIGN NORMS

Age	HR Range	Respiratory Rate (Breaths/min)	Blood Pressure		Mean Arterial Pressure (mm Hg)
			Systolic (mm Hg)	Diastolic (mm Hg)	
Birth-28 days	100-205	40-60	67-84	35-53	45-60
1-12 months	100-180	30-53	72-104	37-56	50-62
1-3 yrs.	98-140	22-37	86-106	42-63	49-62
3-5 yrs.	80-120	20-28	89-112	46-72	58-69
5-11 yrs.	75-118	18-25	97-115	57-76	66-72
12-18 yrs.	60-100	12-20	110-131	64-83	73-84

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Hate the 60s

- Heart Rate **60** = bradycardia
- Respiratory Rate **60** = tachypnea
- Systolic Blood Pressure **60** = hypotension/uncompensated shock
- BGL **60** = borderline
 - 40-60 hypoglycemic



American Heart Association.

AMERICAN ASSOCIATION of CRITICAL CARE NURSES

PALS

Vital Signs in Children

These 3 tables are reproduced or modified from Hazinski MF. Children are different. In: *Nursing Care of the Critically Ill Child*. 3rd ed. Mosby; 2013:1-18, copyright Elsevier.

Normal Heart Rates*

Age	Awake rate	Sleeping rate (beats/min)
Neonate	100-205	90-160
Infant	100-180	90-160
Toddler	98-140	80-120
Preschooler	80-120	65-100
School-age child	75-118	58-90
Adolescent	60-100	50-90

*Always consider the patient's normal range and clinical condition. Heart rate will normally increase with fever or stress.

Normal Respiratory Rates*

Age	Rate (breaths/min)
Infant	30-53
Toddler	22-37
Preschooler	20-28
School-age child	18-25
Adolescent	12-20

*Consider the patient's normal range. The child's respiratory rate is expected to increase in the presence of fever or stress.

Data from Fleming S et al. *Lancet*. 2011;377(9770):1011-1018.



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Photo: Eastern Illinois University

Respiratory Distress

Tachypnea
↑ Respiratory Effort
Abnormal Airway Sounds
Retractions
Accessory muscle use
Abdominal breathing

Can quickly progress

Cardiorespiratory Failure

Early

Tachycardia, cool/pale,
decrease UOP

Late

Bradycardia, hypotension,
cyanosis, unresponsive

And then...

Respiratory Failure

Marked Tachypnea (early)
Apnea (late)
↑/↓ respiratory effort
Poor/absent distal air
Movement
See saw breathing
Tracheal tug
Grunting
Nasal Flaring
Position of comfort



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Pain Scoring

Use the correct tool

- Pain is an abstract concept, hard for kids to number

Kids can withdraw from surroundings when in pain = misunderstandings

Treat pain:

- Fentanyl IV 1mcg/kg
OR Intranasal 2mcg/kg

CRIES -

32-60 weeks gestation

CRIES Scale			
	0	1	2
Crying	None	High-pitched	Inconsolable
Requires O ₂	None	<30% FiO ₂ needed	>30% FiO ₂ needed
Increased vital signs	Normal HR & BP	Increased HR & BP <20%	Increased HR & BP >20%
Expression	Normal	Grimace	Grimace & grunt
Sleeplessness	None	Wakes frequently	Awake constantly

FLACC -

< 3 years or nonverbal

FLACC Score			
CATEGORY	0 POINTS	1 POINT	2 POINTS
Face	Disinterested	Occasional grimace, withdrawn	Frequent frown, clenched jaw
Legs	No position or relaxed	Uneasy, restless, tense	Kicking or legs drawn up
Activity	Normal position	Squirming, tense	Arched, rigid, or jerking
Cry	No crying	Moans or whimpers	Constant crying, screams or sobs
Consolability	Content, relaxed	Distractible	Inconsolable

FACES -

3 - 12 years

Wong-Baker FACES Pain Rating Scale





Supporting Pediatric Patients

“We owe it to the future not to harm our children in their hearts and minds while we cure their diseases and repair their broken bones.”

Pate, JT et al. (1996)

Child Development Considerations

- Younger children
 - Separation anxiety
 - Involve caregivers (and patient as able)
 - Toddlers - offer choices
- School age children
 - Fear loss of competence or control
 - Involve the patient - helpers, writers, give them a job!
- Teenagers
 - Vague in complaints and needs
 - Fear being different
 - Normalize experience



Preparation using their senses

**Some kids say it sounds like...
feels like... smells like...**

See:

- Soft straw (IV)
- Bright lights (exam lights)

Hear:

- Loud noises like construction (MRI)
- Popping like a soda can opening (J-tip)

Taste:

- Salty (saline)
- Sprite without bubbles (oral contrast)

Feel:

- Cold, wet (soap)
- Tight hug/squeeze (tourniquet)
- Quick pinch/poke (IV)

Smell:

- The ocean (saline)
- Hand sanitizer (Chloraprep)



Child Development Considerations

AVOID:

“Don’t move while I do this”

“The IV will hurt”

“It will burn”

“It will taste bad”

“Show me how brave you are / what a big kid you are”

TRY:

“Your job is to hold as still as you can”

“You’ll feel a pinch/poke”

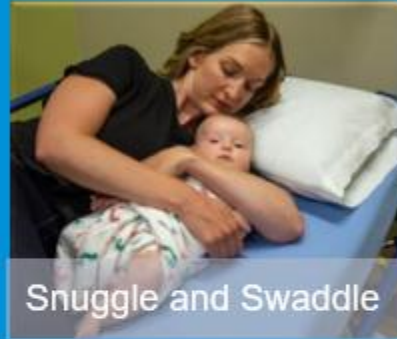
“It might feel warm / cool going in”

“It might taste bitter”

“Remember, your job is to be as still as you can. It’s OK to cry. I know this is scary.”



Comfort Positioning



Snuggle and Swaddle



Back to Chest



Chest to Chest



Side Sit



Alternative Focus / Distraction

- Tablet / smartphone
- Search and Find Books
- Stress balls
- Pinwheels
- Music / singing
- Deep breathing
- Grounding activities - counting



Grounding Activities



The 5-4-3-2-1 Grounding Technique

Ease your state of mind in stressful moments.



Acknowledge **5** things that you can see around you.

Acknowledge **4** things that you can touch around you.

Acknowledge **3** things that you can hear around you.



Acknowledge **2** things that you can smell around you.

Acknowledge **1** thing that you can taste around you.

#DeStressMonday

DeStressMonday.org

DE STRESS
MONDAY



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PANDA UP

P = Prepare *Use prep supplies and treatment room, educate family*

A = Anxiety Reduction *Implement relaxation methods and coping plan*

N = Numb *Use numbing agents prior to procedures; sucrose for infants*

D = Distract *Apply methods such as vibration tool and alternative focus*

A = Attitude *Maintain a calm, positive attitude*

U = Use One Person's Voice *Understand everyone's role*

P = Position *Use comfort positioning*





Systematic Approach



Pediatric Airway Challenges

Same: C-spine stabilization, jaw thrust if needed

Large head, short neck under 2 yo

Larger tongue, larger floppy epiglottis, cricoid cone shaped, small diameter

- “Built-in” obstruction

Infants - obligate nose breathers

- Quick distress with secretions

ABCDE



Photo: Columbia Reports

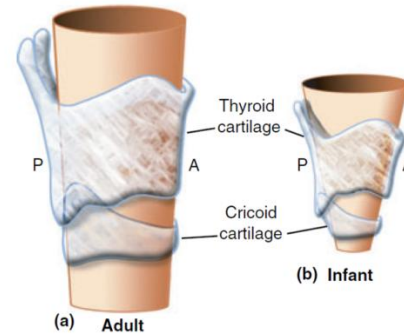


Photo: Open Anesthesia



Pediatric Airway Interventions

Shoulder Roll / Sniffing Position

- Head tilt chin lift
- E-C clamp technique

Suction - use saline!

“Deep suctioning”



Photo: Life with Gremlins

ABCDE



Photo: UCD Emergency Medicine



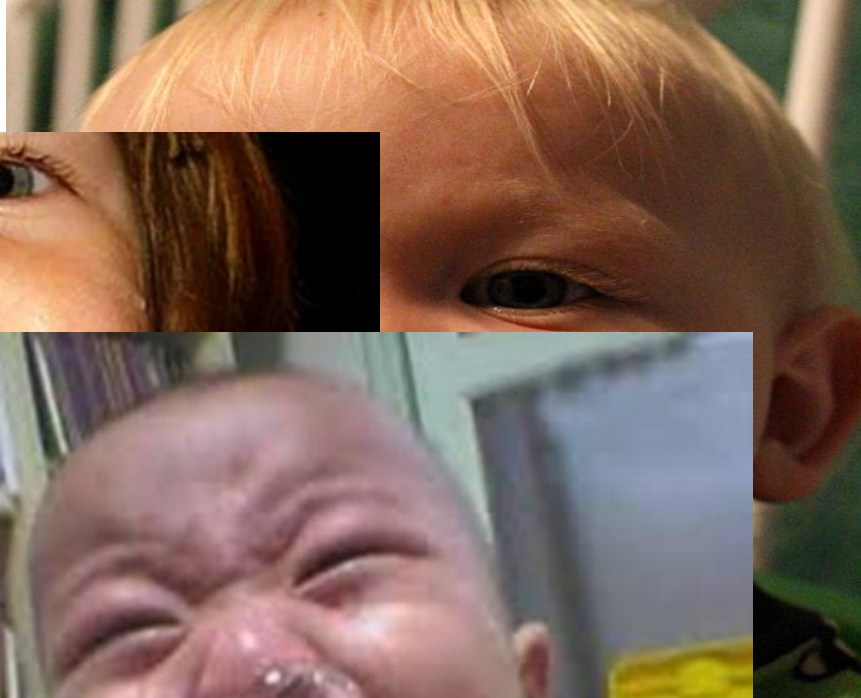
Photo: Anaesthesia, Pain & Intensive Care



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Photo: Children's Wisconsin

Nasal Aspirator = Lifesaver



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Pediatric Breathing Challenges

Same: Intubate at GCS 8, significant respiratory failure, compensated shock, laryngeal reflex, impending herniation

Thin chest wall, cartilaginous sternum/ribs, poorly developed intercostal muscles

- Rapid RR, rely on diaphragm/abdominal muscles for respirations

Children have smaller lung capacity and higher oxygen consumption

- Increased RR first sign of distress, hypoxia risk

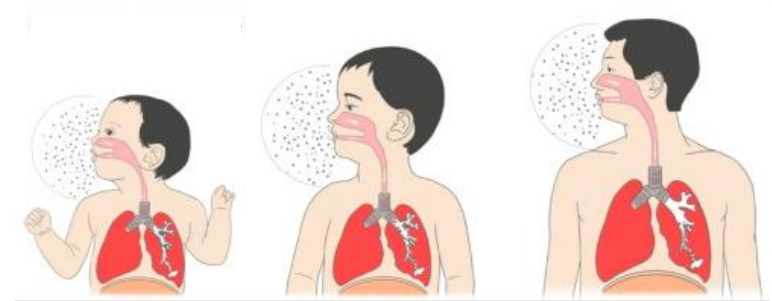


Photo: Science Direct

Age	Rate
Infant	30-53
Toddler	22-37
Preschooler	20-28
School Aged	18-25
Adolescent	12-20

Source: AHA / PALS



Pediatric Breathing Interventions

Upper vs lower airway

- Stridor vs wheeze

Airway adjuncts - nasal and oral

- Bring a bunch to the bedside

Oxygen - cannulas and masks

- NO “blow by”



Photo: Serphinity



Photo: Intersurgical



Photo: Children's Health Ireland

ABCDE



Photo: Flexicare

Nasal cannula -
Min: low
Max: Infant 3L,
Pediatric 6L



Photo: Medline

Simple mask -
Min: 6L
Max: 10L



Photo: Grayline

Non-Rebreather -
Min: 10L (keep bag inflated with breaths)
Max: 15L



Pediatric Circulation Challenges

Capillary refill

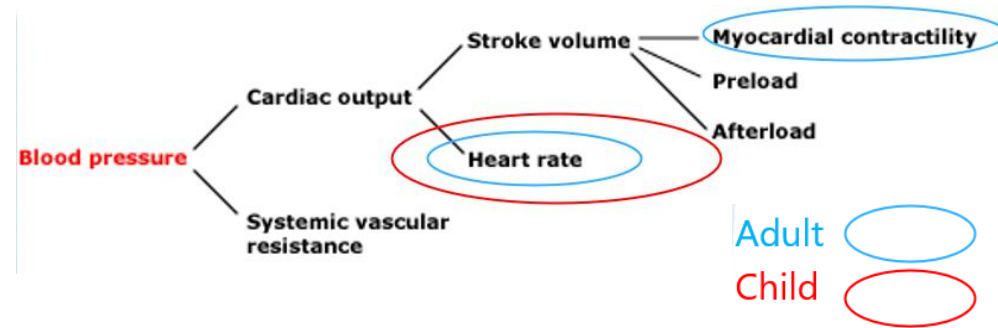
- More dependent on room-temp

Blood pressure - repeat q15 min

- Kids compensate... hypotension is late

End organ function

- Mental status - parents may notice first!
- Ask about wet diapers



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

Source: AHA / PALS



Pediatric Circulation Interventions



IVs:
Saphenous
AC/hand
Head



IOs:
Stabilize leg, slight
external rotation
Proximal tibia:
tibial tuberosity
flat, 1-3cm below
knee joint



Rapid Fluid Administration:
3-way connector
Pull/push: pull from
IVF bag into syringe,
push in from syringe



Pediatric Shock

Identification - 3 things at once

- Oxygen - NRB
- Monitor - keep cycling BP!
- Access - IV/IO, don't delay

20 ml/kg isotonic boluses - load them up

- Hepatomegaly, rales/crackles - go slower

“Do not delay inotropes” - PIV, double up

- Epinephrine
- Norepinephrine
- Dopamine

Consider hydrocortisone

0 min

Recognize decreased mental status and perfusion.
Begin high flow O₂ and establish IO/IV access according to PALS.

5 min

If no hepatomegaly or rales / crackles then push 20 mL/kg isotonic saline boluses and reassess after each bolus up to 60 mL/kg until improved perfusion. Stop for rales, crackles or hepatomegaly. Correct hypoglycemia and hypocalcemia.
Begin antibiotics.

15 min

Fluid refractory shock?

Begin peripheral IV/IO inotrope infusion, preferably Epinephrine 0.05 – 0.3 µg/kg/min
Use Atropine / Ketamine IV/IO/IM if needed for Central Vein or Airway Access

Titrate Epinephrine 0.05 – 0.3 µg/kg/min for Cold Shock.
(Titrate central Dopamine 5 – 9 µg/kg/min if Epinephrine not available)
Titrate central Norepinephrine from 0.05 µg/kg/min and upward to reverse Warm Shock.
(Titrate Central Dopamine ≥ 10 µg/kg/min if Norepinephrine not available)

60 min

Catecholamine-resistant shock?

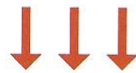
If at risk for Absolute Adrenal Insufficiency consider Hydrocortisone.
Use Doppler US, PICCO, FATD or PAC to Direct Fluid, Inotrope, Vasopressor, Vasodilators
Goal is normal MAP-CVP, ScvO₂ > 70%* and CI 3.3 – 6.0 L/min/m²

Algorithm of management of shock in infants and children by American College of Critical Care Medicine

Compensated Shock



Hypotensive Shock



Cardiac Arrest

Possibly hours

Potentially minutes



Case Study



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Sam

- 5 days old
- Uncomplicated pregnancy and birth, first baby
- Presents with poor feeding since last night, pale, no wet diapers overnight, fast breathing, seems cold

Pediatric Assessment Triangle

Appearance



Breathing

Circulation



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Situational Awareness

Alterations in Appearance (lethargy)

Breathing (tachypnea) and

Circulation (cool extremities)

A + B + C = Cardiorespiratory Failure



On the monitor, focused assessment

Monitor (cycle that BP):

T 36.3

HR 190

BP 52/30

RR 66

Sats 92

Further Assessment:

Gen: lethargy, pale, mild hypotonia

Skin: mottled, cold, 4s cap refill

Cardiac: tachycardic, weak pulses

Respiratory: tachypnic, mild retractions

Abdomen: soft, non-distended



Next Steps

Differential?

- Sepsis, hypovolemia, CCHD, adrenal or metabolic issue

High flow O2

Access - IV/IO

Labs

- Glucose

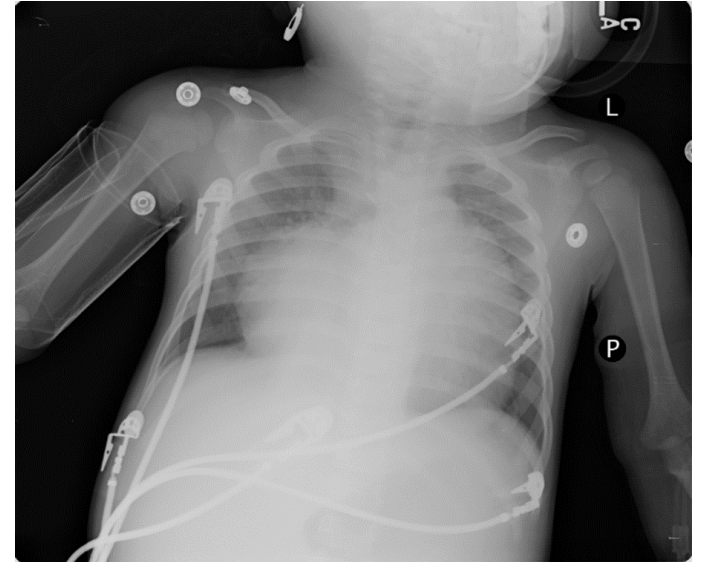
Fluids

- Dose for 4kg baby



Infant Cardiogenic Shock

- What if **sat on L toe was 75?**
- Other queues:
 - Narrow BP
 - Crackles, hepatomegaly - **adjust fluid 5ml/kg**
 - Mottled, cool
- **Prostaglandin (PGE1) 0.05 mcg/kg/min** until duct dependent defect excluded
 - PDA closing - can uncover coarc or other things...
 - Pulses and BP in all 4 extremities, call cardiology
 - What side effect do you anticipate?



Pediatric Disability – Da Brain, Dextrose

Same: Mental status - Awake Verbal Pain Unresponsive

Fontanelles! (6-18 months)

Mental status - what's normal?

Dextrose - less liver capacity to store glycogen

Head trauma - majority of pediatric trauma deaths

Think about ingestion! - if they can crawl...

Modified Glasgow Coma Scale for Infants and Children

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



Pediatric Disability Interventions

Check **GLUCOSE!**

Rule of 50s:

50 = D50 x 1ml/kg

50 = D25 x 2ml/kg

50 = D10 x 5ml/kg

50 = D5 x 10ml/kg

Suspected Increased ICP:

Head midline, elevate 30

Maintain normotension

Do not excessively hyperventilate - EtCO₂ 35

Consider Mannitol, Hypertonic

Sedation

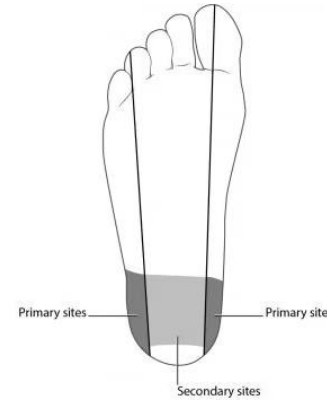


Photo: Medscape



Photo: CHOP



Case Study



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Elin

- 9 years old, no PMHx
- Hard hit/fall at soccer game, no LOC
- Presents with parents 3 days later: tired, irritable, didn't recover well from recent cold, vomiting, headache
- You notice she is thin, very tired, dry mucous membranes, deep/labored breathing

Pediatric Assessment Triangle (plus vitals):

Appearance



Breathing

Circulation



Focused assessment

Vitals:

T 36.5

HR 104

BP 70/45

RR 25

Sats 91

Further Assessment:

Sleepy, awakens to painful stimuli

Sluggishly reactive 4-5mm pupils

Minimally interactive

Clear breath sounds

Cool extremities, poor pulses



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Situational Awareness

Alterations in Appearance (lethargy, not interactive)

Circulation (cool extremities, poor pulses)

A + C = Shock

Concern(s)	Meaning	Interventions
Breathing	Respiratory Distress	Positioning, oxygen, suction, consider meds as applicable
Appearance + Breathing	Respiratory Failure	Positioning, oxygen (mask), suction, get advanced airway ready
Appearance + Circulation	Shock	Oxygen (NRB), access (IV/IO), labs, fluids, reduce oxygen demand / treat cause of shock
Appearance	Neurologic / Metabolic	Check blood sugar, labs, oxygen as needed, determine and treat cause
All 3 (ABC)	Cardiorespiratory Failure	Position, oxygen (bag mask), advanced airway, compressions



Next Steps

What's on your differential?

- Hypovolemic shock
- Something neurologic/metabolic? Ingestion?

Oxygen (NRB)

Access, fluid

- 20/kg NS

Glucose? Labs?

- 550, pH 7.1, urine +ketones

Pediatric DKA is different

- Do NOT bolus insulin, esp with s/s cerebral edema



Diabetic Ketoacidosis (DKA) Treatment ALGORITHM

Pediatric DKA

ASAP:

- 2 PIVs, NPO, CR monitor, neuro checks q1 hr
- NS 10-20/kg over 1 hour, no more than 40/kg
- Check electrolytes
- **DO NOT BOLUS INSULIN**
- Start regular insulin 0.1 unit/kg/hr
 - Start at 0.05 if signs of cerebral edema

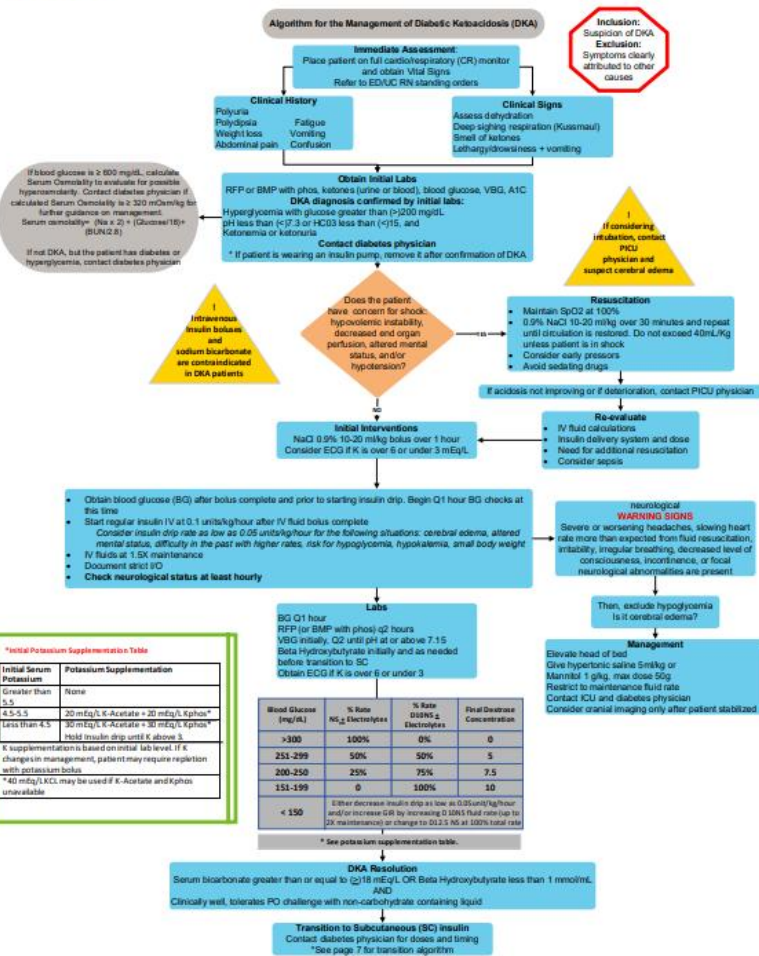
BACKGROUND | DEFINITIONS

Diabetic ketoacidosis (DKA) is a life-threatening medical emergency requiring immediate evaluation and treatment. Please notify the diabetes physician on call through One Call for all patients with known or suspected DKA.

Diabetic ketoacidosis (DKA) is a life-threatening condition. Almost 1 in 100 children with DKA will develop clinically significant cerebral edema, which has a mortality rate of 21-24%. Those with severe DKA have a much higher mortality and risk of complications. Meticulous attention to the details of therapy and the child's clinical course can decrease this risk. A patient who is unresponsive to vocal commands or presents with hypotension is rare and requires immediate critical care in a hospital. Urgent critical care and diabetes consultation should be obtained.

DKA is defined by:

- Hyperglycemia with glucose greater than 200 mg/dL, and
- pH less than 7.3 or HCO₃⁻ less than 15 and
- Ketonemia or ketonuria



***Initial Potassium Supplementation Table**

Initial Serum Potassium	Potassium Supplementation
Greater than 5.5	None
4.5-5.5	30 mEq/L K-Acetate + 20 mEq/L K-phos*
Less than 4.5	30 mEq/L K-Acetate + 30 mEq/L K-phos*

* Hold insulin drip until K above 3.
K supplementation is based on initial lab level. If K change in management, patient may require repletion with potassium bolus.
*40 mEq/L KCl may be used if K-Acetate and K-phos unavailable.



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Pediatric Exposure Interventions

Clothes off - look under diaper too

- Then bundle them back up

Aim for normothermia

Warm: Blankets, Warmed IVF, Bair Hugger

Cool: Remove layers, Wet washcloths,
Cooling blankets, antipyretics



Photo: Wyoming Department of Health



TEN-4-FACESp

Bruising Clinical Decision Rule for Children < 4 Years of Age

When is bruising concerning for abuse in children < 4 years of age?
If bruising in any of the three components (Regions, Infants, Patterns) is present without a reasonable explanation, strongly consider evaluating for child abuse and/or consulting with an expert in child abuse.

TEN

Torso | Ears | Neck



FACES

Frenulum
Angle of Jaw
Cheeks (*fleshy part*)
Eyelids
Subconjunctivae

REGIONS

4 months and younger



Any bruise, anywhere

INFANTS

Patterned bruising



Bruises in specific patterns like slap, grab or loop marks

PATTERNS

See the signs

Unexplained bruises in these areas most often result from physical assault. TEN-4-FACESp is not to diagnose abuse but to function as a screening tool to improve the recognition of potentially abused children with bruising who require further evaluation.

TEN-4-FACESp was developed and validated by Dr. Mary Clyde Pierce and colleagues. It is published and available for FREE download at luriechildrens.org/ten-4-facesp.

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Objective Screening and Documentation

Over 6 months, all ED patients:

1. For children presenting for evaluation of a possible injury, was there a possible or definite **delay** in seeking medical attention given the severity of injury/injuries?
2. Are you concerned that the history may not be **consistent** with the injury or illness?
3. Did you observe ANY bruising or marking in the shape of an object?
4. Did you observe TEN-4-FACESp bruising?
5. Are there findings that might reflect **poor supervision, care or nourishment**?
6. Are there any **additional comments or concerns** related to child abuse or neglect?

Under 6 months, instead of #3 and #4:

Did you observe ANY bruise, burn, subconjunctival hemorrhage, or frenulum injury?



Case Study

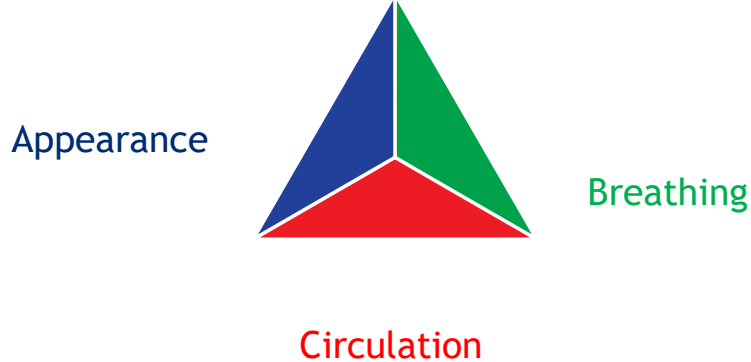


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Will

- 12 years old, no PMHx
- Recently home from camping trip
- Presents to ED with fever, fatigue, chills, body aches, lethargy
- T 39.5, HR 145, RR 24, BP 85/48, Sats 91

Pediatric Assessment Triangle (plus vitals):



Situational Awareness

- Alterations in **Appearance** (fatigue) and **Circulation** (dizziness, nausea, fever, cap refill delayed)
- Slight tachypnea... maybe just anxious?

A + C = Shock

VS changes are subtle:

- Tachycardia - most sensitive sign
- Tachypnea - easily missed in kids
- Hypotension is late



Next Steps

High flow O₂ (Non-rebreather)

Why, sats are good?!

Shock is a state of hypoperfusion, oxygen is not being delivered to the tissues - regardless of good sats

Access - IV/IO

Labs - Culture

Fluids

- 20/kg up to 60/kg
- “don’t delay inotropes”

0 min

Recognize decreased mental status and perfusion.
Begin high flow O₂ and establish IO/IV access according to PALS.

5 min

If no hepatomegaly or rales / crackles then push 20 mL/kg isotonic saline boluses and reassess after each bolus up to 60 mL/kg until improved perfusion. Stop for rales, crackles or hepatomegaly. Correct hypoglycemia and hypocalcemia.
Begin antibiotics.

15 min

Fluid refractory shock?

Begin peripheral IV/IO inotrope infusion, preferably Epinephrine 0.05 – 0.3 µg/kg/min
Use Atropine / Ketamine IV/IO/IM if needed for Central Vein or Airway Access

Titrate Epinephrine 0.05 – 0.3 µg/kg/min for Cold Shock.
(Titrate central Dopamine 5 – 9 µg/kg/min if Epinephrine not available)
Titrate central Norepinephrine from 0.05 µg/kg/min and upward to reverse Warm Shock.
(Titrate Central Dopamine ≥ 10 µg/kg/min if Norepinephrine not available)





Take Away Points

- Keep in mind pediatric differences
- Use validated tools and a systematic approach
- Consider child development and communication techniques
- Basic interventions save lives
- Early recognition of decompensation is key
- Know your resources:

CHCO OneCall 720-777-3999

CHCO Pathways

<https://www.childrenscolorado.org/health-professionals/clinical-resources/clinical-pathways/>



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Thank you
Questions?



Case Study



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Aviana

- 3 years old, PMHx febrile seizures x2
- Presents with “trouble breathing and a barking cough”
- You note she appears flushed, tachypnea, stridor which is worse with crying, and moderate suprasternal retractions (AKA ???)

Pediatric Assessment Triangle

Appearance



Breathing

Circulation



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Situational Awareness

Alteration in **Breathing** (tachypnea, stridor, tracheal tug)

B = Respiratory Distress



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Focused assessment

Vital Signs:

T 38

HR 126

BP 90/50

RR 52

Sats 98

Further Assessment:

No murmur

High-pitched sounds - whistle or squeak

Warm extremities, good pulses



Next Steps

What's on your differential?

- Croup, Foreign Body, Epiglottitis, Anaphylaxis

Keep calm, position of comfort

Access? Oxygen?

Meds?

- Racemic epi, dexamethasone





Case Study



Sam

- 5 days old
- Uncomplicated pregnancy and birth, first baby
- Presents with poor feeding, fast breathing, lethargy, mottled skin, delayed cap refill

Pediatric Assessment Triangle

Appearance



Breathing

Circulation



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Situational Awareness

Alterations in Appearance (lethargy)

Breathing (tachypnea) and

Circulation (mottled skin, cool extremities)

A + B + C = Cardiorespiratory Failure



On the monitor, focused assessment

Monitor (cycle that BP):

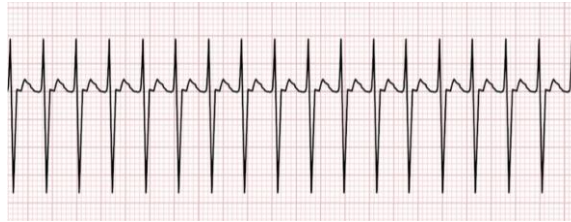
T 38

HR 220

BP 60/46

RR 65

Sats 95



Further Assessment:

Fast HR, no murmur

Crackles on BS

Liver down 3cm

Cool extremities

Delayed cap refill, poor pulses



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Next Steps

High flow O2

Access - IV/IO

- **What med?**

Labs

- **Glucose**

Fluids

- **Dose for 4kg baby**

	Weight, kg	Adenosine, mL
A	2	0.07

0 min

Recognize decreased mental status and perfusion.
Begin high flow O₂ and establish IO/IV access according to PALS.

5 min

If no hepatomegaly or rales / crackles then push 20 mL/kg isotonic saline boluses and reassess after each bolus up to 60 mL/kg until improved perfusion. Stop for rales, crackles or hepatomegaly. Correct hypoglycemia and hypocalcemia.
Begin antibiotics.

15 min

Fluid refractory shock?

Begin peripheral IV/IO inotrope infusion, preferably Epinephrine 0.05 – 0.3 µg/kg/min
Use Atropine / Ketamine IV/IO/IM if needed for Central Vein or Airway Access

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Titrate central Norepinephrine from 0.05 µg/kg/min and upward to reverse Warm Shock.
(Titrate Central Dopamine ≥ 10 µg/kg/min if Norepinephrine not available)

60 min

Catecholamine-resistant shock?

If at risk for Absolute Adrenal Insufficiency consider Hydrocortisone.
Use Doppler US, PICCO, FTD or PAC to Direct Fluid, Inotrope, Vasopressor, Vasodilators
Goal is normal MAP-CVP, ScvO₂ > 70%* and CI 3.3 – 6.0 L/min/m²



Infant Cardiogenic Shock

- Could just be SVT... but what if **sat on L toe was 75?**
- Early queues:
 - BP was 60/46 (narrow)
 - Crackles, hepatomegaly
 - Mottled, cool
- Prostaglandin (PGE1) 0.05 mcg/kg/min until duct dependent defect excluded
 - PDA closing - can uncover coarc or other things...
 - Pulses and BP in all 4 extremities, call cardiology
 - What side effect do you anticipate?

