

IDPH ESF-8 Plan: Pediatric and Neonatal Surge Annex 2017

Shock Care Guideline

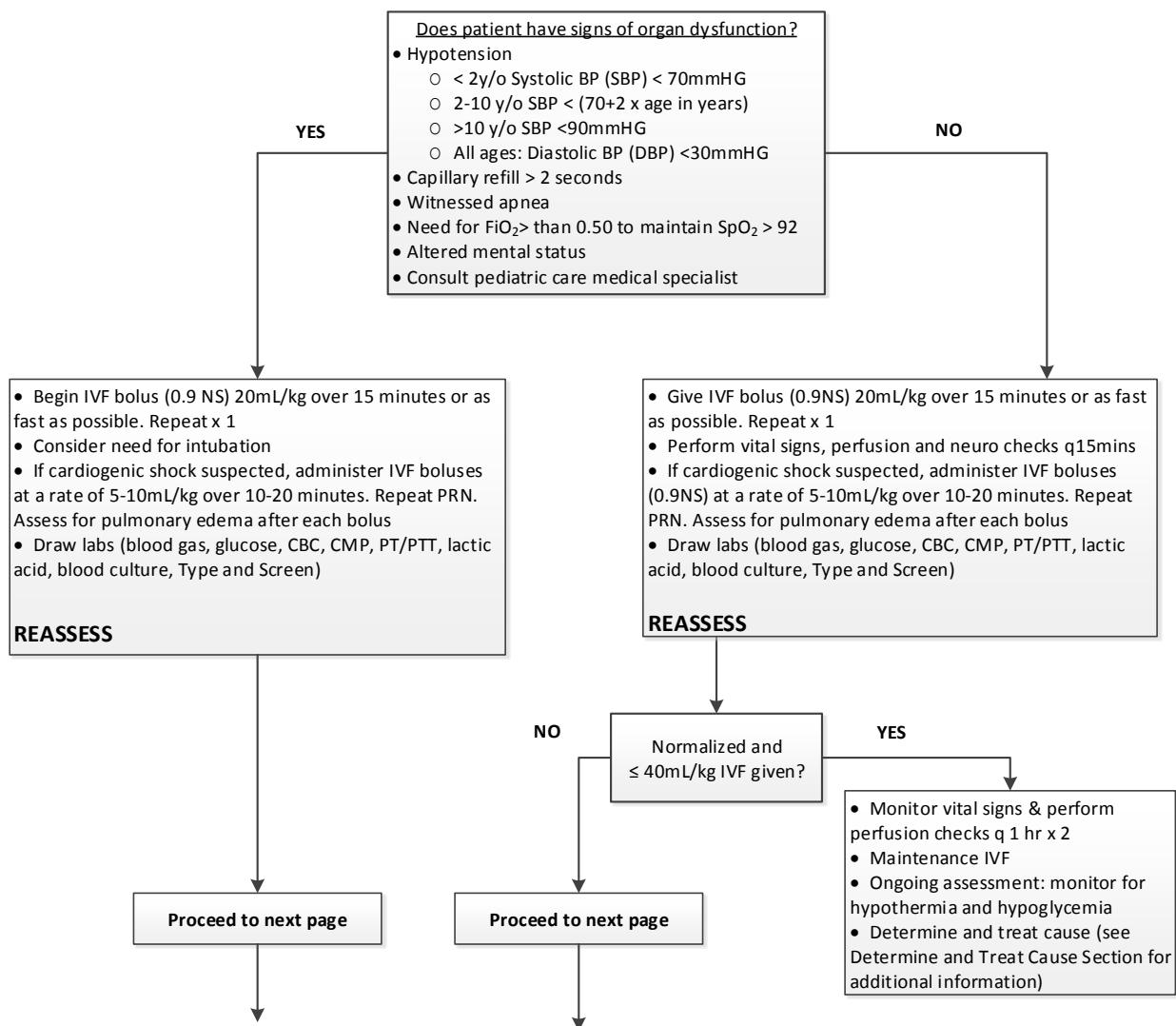
Purpose: To provide guidance to practitioners caring for pediatric patients during a disaster.

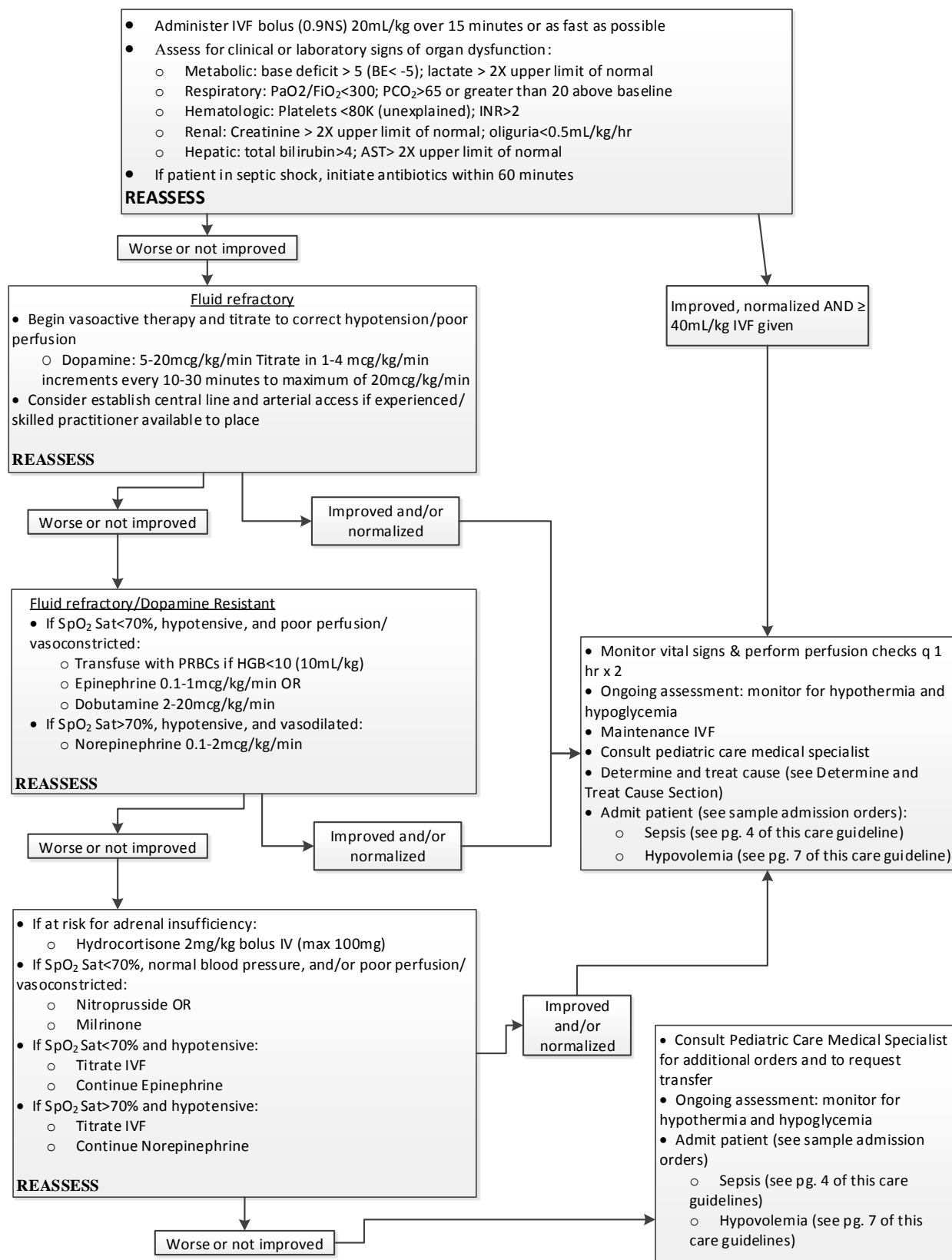
Disclaimer: This guideline is not meant to be all inclusive, replace an existing policy and procedure at a hospital or substitute for clinical judgment. These guidelines may be modified at the discretion of the healthcare provider.

Initial Management of All Pediatric Shock Patients

- Stabilize ABCs and c-spine (Airway, Breathing, and Circulation)
- Obtain weight (actual or use of weight/length based tool)
- Establish 2 peripheral IVs (consider large bore if possible) or if unable, establish intraosseous (IO) access
- Control any external bleeding
- Monitor
 - Heart Rate (HR), Blood pressure (BP), Oxygen Saturation (SpO₂), mental status, temperature, perfusion, urine output, bedside glucose
- Perform history & physical exam
- Consult Pediatric Care Medical Specialist for assistance with care of the acutely and critically ill patient, to individualize the care of patient, if patient does not improve and needs to be admitted/transferred and as needed for further support and consult.

Management of all Pediatric Shock Patients





Determine and treat cause
Anaphylaxis: <ul style="list-style-type: none"> Epinephrine 1:1000 0.1 mL/kg (not to exceed 0.3 mg/dose) IM, every 15 minutes x 2 then every 4 hours OR Epinephrine Autoinjector 0.3 mg IM (for patients >30kg) OR Junior Autoinjector 0.15 mg (for patients 10-30 kg) OR If hypotension continues after IVF bolus, Epinephrine 0.01 mg/kg (1:10000) IV/IO every 3-5 minutes (max dose 1 mg) Benadryl 1.25-1.5 mg/kg IV/IO/IM every 4-6 hours (max dose 50 mg) <ul style="list-style-type: none"> Monitor for respiratory depression Methylprednisone 2 mg/kg IV initially (max 60 mg) then 0.5 mg/kg every 6 hours or 1 mg/kg every 12 hours (max 125 mg/day). Pepcid 0.5 mg/kg IV every 12 hours
Cardiogenic shock: <ul style="list-style-type: none"> Administer IVF boluses at a rate of 5-10 mL/kg over 10-20 minutes. Repeat PRN. Assess for pulmonary edema after each bolus Consider Diuretics Consider Milrinone Consider need to increase cardiac output <ul style="list-style-type: none"> Vasodilators Inotropes Reduce metabolic demands: <ul style="list-style-type: none"> Antipyretics PRN
Hemorrhage: <ul style="list-style-type: none"> If signs/symptoms of shock and at risk for hemorrhage, consider administering PRBCs 10 mL/kg <ul style="list-style-type: none"> Administering 10 mL/kg of PRBCs will increase hemoglobin by 2 g/dL or hematocrit 4-6%
Hypocalcemia <ul style="list-style-type: none"> Calcium chloride: 10-20 mg/kg (0.1-0.2 mL/kg calcium chloride 10%) infused at a rate that does not exceed 100 mg/min OR Calcium gluconate: 15 mg/kg
Hypoglycemia <ul style="list-style-type: none"> Birth-28 days: D10W 2 mL/kg IV >28 days-1 year: D12.5% 4-8 mL/kg IV >1 year: D25% 2-4 mL/kg IV D50% 1-2 mL/kg IV
Obstructive shock: Treat underlying cause: <ul style="list-style-type: none"> Cardiac Tamponade (perform pericardiocentesis if experienced/skilled practitioner available) Tension Pneumothorax (perform needle decompression and place chest tube if experienced/skilled practitioner available) Closed ductus arteriosus <ul style="list-style-type: none"> Prostaglandin E1 0.05-0.1 mcg/kg/min continuous IV Pulmonary embolism
Spinal cord injury: If hypotensive/bradycardic after IVF boluses: <ul style="list-style-type: none"> Atropine 0.02 mg/kg IV/IO (min single dose 0.1 mg/max single dose 1 mg). May repeat every 3 minutes to max 2 mg. If continue to be hypotensive and bradycardic: <ul style="list-style-type: none"> Dopamine to maintain SBP >90 Phenylephrine or vasopressin Consult neuro surgeon for further medical management
Sepsis: <ul style="list-style-type: none"> Antibiotics: broad spectrum antimicrobial agent <u>initiated within 60 minutes</u> <ul style="list-style-type: none"> Neonates: Ampicillin, Cefotaxime, Cefuroxime, Gentamicin Children > 1 month: Ceftriaxone, Vancomycin, Cefepime, Gentamicin, Piperacillin/Tazobactam, Clindamycin Antipyretics: Acetaminophen 15 mg/kg or ibuprofen 10 mg/kg.

Sample Pediatric Septic Shock Admission Orders

Admitting physician: _____
Diagnosis: _____
Condition: ☐ Critical ☐ Serious ☐ Stable
Weight (kg): _____ **Height(cm):** _____
Allergies: _____
Isolation: _____

Assessment:

- ☐ Continuous cardiac monitoring
- ☐ Continuous pulse oximetry
- ☐ Blood pressure with all vital signs
- ☐ Routine I&O
- ☐ Strict I&O
- ☐ Daily weight
- ☐ Seizure precautions
- ☐ Neuro checks ever _____ hours
- ☐ All non-rectal temperatures > 38°C/100.4°F should be confirmed rectally on infants ≤60 days of age

Tests:

- ☐ CBC with differential
 - ☐ now (order if not performed prior to admission)
 - ☐ at _____
 - ☐ every _____ hours
- ☐ CMP
 - ☐ now (order if not performed prior to admission)
 - ☐ at _____
 - ☐ every _____ hours
- ☐ BMP
 - ☐ now (order if not performed prior to admission)
 - ☐ at _____
 - ☐ every _____ hours
- ☐ Blood culture (order if not performed prior to admission)
- ☐ Viral blood culture
- ☐ Catheterized urinalysis (order if not performed prior to admission)
- ☐ Catheterized urine culture (order if not performed prior to admission)
- ☐ Stool culture
- ☐ Stool for Rotavirus
- ☐ Stool gram stain
- ☐ RSV
- ☐ Influenza
- ☐ Viral culture
- ☐ Chest x-ray (PA and lateral) (order if not performed prior to admission)

For infants ≤60 days of age with fever:

- ☐ CSF for (laboratory should perform these in ranking order as listed below)
 - ☐ Cell count
 - ☐ Glucose

- ☐ Protein
- ☐ Gram stain
- ☐ Aerobic culture
- ☐ Viral culture
- ☐ Enterovirus PCR
- ☐ Herpes PCR
- ☐ Meningitis antigen profile
- ☐ Conjunctiva viral culture
- ☐ Viral culture of skin lesion on _____
- ☐ Rectal viral culture
- ☐ _____
- ☐ _____
- ☐ _____

Medications:

- ☐ Analgesics/Antipyretics:
 - ☐ Acetaminophen (Tylenol) (15mg/kg/dose) _____ mg PO/GT every 4 hrs PRN for temperature 38.6°C/101.5°F or discomfort (max dose 3000mg/day)
 - ☐ Acetaminophen (Tylenol) (20mg/kg/dose) _____ mg PR every 4 hrs PRN for temperature ≥ 38.6°C/101.5°F or discomfort (max dose 3000mg/day)
 - ☐ Ibuprofen (Motrin) (10mg/kg/dose) _____ mg PO/GT every 6 hours PRN for temperature ≥ 38.6°C/101.5°F or discomfort (for infants >5 months)
- ☐ Antibiotics:
 - ☐ Ceftriaxone _____ mg IV every _____ hours (max 4gm/day)
 - ☐ Vancomycin _____ mg IV every _____ hours (max 1gm/dose)
 - ☐ _____
 - ☐ _____
 - ☐ _____
 - ☐ For infants ≤ 30 days of age with fever:
 - ☐ Ampicillin _____ mg IV every _____ hours (200 mg/kg/day)
 - ☐ Cefuroxime _____ mg IV every _____ hours (200 mg/kg/day)
 - ☐ Cefotaxime _____ mg IV every _____ hours
 - ☐ Acyclovir _____ mg IV every _____ hours(If greater than or equal to 35 weeks post-conceptual age, give 60 mg/kg/day divided every 8 hours. If less than 35 weeks post conceptual age, give 40 mg/kg/day divided every 12 hours)
 - ☐ Gentamycin _____ mg IV every _____ hours
- ☐ Topical anesthetic for IV start and lab draws:
 - ☐ Apply topically once 30-90 minutes prior to procedure (maximum 1gm, 10 centimeter area squared, or application time of 2 hours)

IV Therapy:

- ☐ Saline lock
- ☐ D5 ½ NS with 20 mEq KCl/L running at _____ mL/hr (ensure patient is voiding)
- ☐ _____ running at _____ mL/hr
- ☐ _____ running at _____ mL/hr

Supplemental Oxygen Orders:

- If SpO₂ < 90% on room air, apply oxygen to maintain SpO₂ 91-94%
 - Nasal Cannula
 - Aerosol Mask
 - Titrate oxygen to maintain SpO₂ > 90%
 - Wean oxygen if oxygen saturation maintains 94%.
 - Decrease oxygen by ½ liter per minute (LPM) and reassess patient 5-10 minutes after change in oxygen
 - Do not decrease oxygen more frequently than every 60 minutes
- Ventilator Settings: _____
- For more information, see: Use of Strategic National Stockpile (SNS) Ventilators in the Pediatric Patient: Instructional Guidelines with Training Scenarios, 2nd edition
- See **Sample Pediatric Standard Admission Orders** for additional examples for diet, IV, labs etc

Sample Pediatric Hypovolemic Shock Admission Orders

Admitting physician: _____
Diagnosis: _____
Condition: ☐ Critical ☐ Serious ☐ Stable
Weight (kg): _____ **Height(cm):** _____
Allergies: _____
Isolation: _____

Assessment:

- ☐ Continuous cardiac monitoring
- ☐ Continuous pulse oximetry
- ☐ Blood pressure with all vital signs
- ☐ Routine I&O
- ☐ Strict I&O
- ☐ Daily weight

Tests:

- ☐ CBC with differential
 - ☐ now (order if not performed prior to admission)
 - ☐ at _____
 - ☐ every _____ hours
- ☐ CMP
 - ☐ now (order if not performed prior to admission)
 - ☐ at _____
 - ☐ every _____ hours
- ☐ BMP
 - ☐ now (order if not performed prior to admission)
 - ☐ at _____
 - ☐ every _____ hours

Medications:

- ☐ Analgesics/Antipyretics:
 - ☐ Acetaminophen (Tylenol) (15mg/kg/dose) _____ mg PO/GT every 4 hrs PRN for temperature $\geq 38.6^{\circ}\text{C}/101.5^{\circ}\text{F}$ or discomfort (max dose 3000mg/day)
 - ☐ Acetaminophen (Tylenol) (20mg/kg/dose) _____ mg PR every 4 hrs PRN for temperature $\geq 38.6^{\circ}\text{C}/101.5^{\circ}\text{F}$ or discomfort (max dose 3000mg/day)
 - ☐ Ibuprofen (Motrin) (10mg/kg/dose) _____ mg PO/GT every 6 hours PRN for temperature $\geq 38.6^{\circ}\text{C}/101.5^{\circ}\text{F}$ or discomfort (for infants >5 months)
- ☐ Antiemetic:
 - ☐ _____
 - ☐ _____
- ☐ Antibiotics:
 - ☐ _____
 - ☐ _____
 - ☐ _____

- ☐ Topical anesthetic for IV start and lab draws:
 - ☐ Apply topically once 30-90 minutes prior to procedure (maximum 1gm, 10 centimeter area squared, or application time of 2 hours)

IV Therapy:

- ☐ _____
- ☐ D5 ½ NS with 20 mEq KCl/L running at _____ mL/hr (ensure patient is voiding)
- ☐ _____ running at _____ mL/hr
- ☐ _____ running at _____ mL/hr

Supplemental Oxygen Orders:

- If SpO₂ < 90% on room air, apply oxygen to maintain SpO₂ 91-94%
 - Nasal Cannula
 - Aerosol Mask
- Titrate oxygen to maintain SpO₂ > 90%
- Wean oxygen if oxygen saturation maintains 94%.
 - Decrease oxygen by ½ liter per minute (LPM) and reassess patient 5-10 minutes after change in oxygen
 - Do not decrease oxygen more frequently than every 60 minutes
- ☐ Ventilator Settings: _____
 - For more information, see: *Use of Strategic National Stockpile (SNS) Ventilators in the Pediatric Patient: Instructional Guidelines with Training Scenarios, 2nd edition*
- ☐ See **Sample Pediatric Standard Admission Orders** for additional examples for diet, IV, labs etc

Definitions and Other Pediatric Shock Information
TYPES
<p>Distributive Shock <i>Definition:</i> Excessive vasodilation and impaired distribution of blood flow <i>Common types:</i> Sepsis, anaphylaxis, spinal cord injuries (neurogenic)</p> <p>Hypovolemic Shock <i>Definition:</i> Deficiency of intravascular blood volume <i>Common causes:</i></p> <ol style="list-style-type: none"> 1. Intravascular volume loss: gastroenteritis, burns, diabetes insipidus, heat stroke 2. Hemorrhage: trauma, surgery 3. Interstitial loss: burns, sepsis, nephrotic syndrome, intestinal obstruction, ascites <p>Obstructive Shock <i>Definition:</i> Circulatory failure caused by a physical obstruction <i>Common causes:</i> Physical causes of shock should be considered (e.g. cardiac Tamponade or pulmonary embolism), especially in neonates who may have been born with obstructive congenital health disease (i.e. coarctation of the aorta, severe aortic valvular stenosis) <i>Presentation:</i> Neonates who present with signs of shock associated with enlarged liver, enlarged cardiac silhouette and/or heart murmur</p> <p>Cardiogenic Shock <i>Definition:</i> Impaired cardiac contractility <i>Common causes:</i></p> <ol style="list-style-type: none"> 1. Congestive heart failure 2. Cardiomyopathy 3. Cardiac Tamponade 4. Drugs 5. Tension Pneumothorax
Key Points
<p>Stages of shock: Compensated, Decompensated & Irreversible</p> <ul style="list-style-type: none"> • Tachycardia=Compensated • Progression to next stage can be abrupt • Adolescents compensate like kids, not adults • Hypotension=Decompensated <p>Early indicators of shock Hyperthermia/hypothermia, leukocytosis/neutropenia, unexplained tachycardia, tachypnea, poor distal perfusion</p>

SYSTEM	DISORDERS	GOALS	THERAPIES
Respiratory	Acute respiratory distress syndrome	Prevent/treat: hypoxia and respiratory acidosis	Oxygen
	Respiratory muscle fatigue	Prevent barotrauma	Early endotracheal intubation and mechanical ventilation
	Central apnea	Decrease work of breathing	Positive end-expiratory pressure (PEEP) Permissive hypercapnia High-frequency ventilation Extracorporeal membrane oxygenation (ECMO)
Renal	Pre-renal failure Renal failure	Prevent/treat: hypovolemia, hypervolemia, hyperkalemia, metabolic acidosis, hypernatremia/ hyponatremia, and hypertension Monitor serum electrolytes	Judicious fluid resuscitation Low-dose dopamine Establishment of normal urine output and blood pressure for age Furosemide (Lasix) Dialysis, ultrafiltration, hemofiltration
Hematologic	Coagulopathy (disseminated intravascular coagulation)	Prevent/treat: bleeding	Vitamin K Fresh frozen plasma Platelets
	Thrombosis	Prevent/treat: abnormal clotting	Heparinization Activated protein C
Gastrointestinal	Stress ulcers	Prevent/treat: gastric bleeding Avoid aspiration, abdominal distention	Histamine H2 receptor–blocking agents or proton pump inhibitors Nasogastric tube
	Ileus Bacterial translocation	Avoid mucosal atrophy	Early enteral feedings
Endocrine	Adrenal insufficiency, primary or secondary to chronic steroid therapy	Prevent/treat: adrenal crisis	Stress-dose steroids in patients previously given steroids Physiologic dose for presumed primary insufficiency in sepsis
Metabolic	Metabolic acidosis	Correct etiology Normalize pH	Treatment of hypovolemia (fluids), poor cardiac function (fluids, inotropic agents) Improvement of renal acid excretion Low-dose (0.5-2 mEq/kg) sodium bicarbonate if the patient is not showing response, pH < 7.1, and ventilation (CO2 elimination) is adequate