



***UPDATED* Pediatric Donor Management and Dosing Guidelines**

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Formulas for Weight, ETT Size, Depth ETT, IV Fluids, and Vital Signs

Estimated Wt in kg: 2 (age in years) + 8

Estimated body surface area: $\frac{4 \times \text{wt}(\text{kg}) + 7}{90 + \text{wt}(\text{kg})}$

ETT size: $\frac{16 + \text{age in years}}{4}$

Depth of ETT (cm) = 3 x size of the ETT **or** 10 + age in years (children 1-12 years of age)

Lowest Acceptable Systolic Blood Pressure = (2 x age in years) + 70

| Abnormal Vital Signs | RR | Pulse | SBP |
|-----------------------------|-----------|--------------|------------|
| Neonate | > 40 | > 160 | < 60 |
| Infant | > 40 | > 160 | < 70 |
| Toddler | > 30 | > 140 | < 75 |
| School age | > 25 | > 120 | < 85 |
| Adolescent | > 20 | > 110 | < 90 |

Hypoglycemia: 2 cc/kg IV of 25% Dextrose

Hourly Maintenance fluids: 1st 10 kg = 4 cc/kg
2nd 10 kg = 2 cc/kg
>20 kg = wt(kg) + 40

Fluid Resuscitation: 20 cc's/kg of Lactated Ringers, Normal Saline or 5% Albumin
Reassess, repeat x 2 as needed

(Hypotonic and dextrose containing IVF's should **never be used for fluid resuscitation)*

Hetastarch (Hespan) or other artificial plasma expanders should be avoided for fluid resuscitation

(Note: Large amounts of Hepsan or artificial plasma expanders can result in a coagulopathy and should be avoided in patients with severe bleeding disorders)

PEDIATRIC CODE MEDICATIONS

| AGE | NB | 3-9 mo | | 1 yr | 2-3 yr | 4 yr | 5-6 yr | 7-8 yr | 9 yr | 10 yr | 11 yr |
|---|---------------------|---------------|----------|-------------|---------------|-------------|-------------------|---------------|-------------|--------------|--------------|
| Weight (kg) | 3 | 5 | 7 | 10 | 12 | 15 | 20 | 25 | 30 | 35 | 40 |
| EPINEPHRINE 1:10,000 Conc: 0.1 mg/cc IV Dose: 0.01 mg/kg | 0.3 cc | 0.5 cc | 0.7 cc | 1 cc | 1.2 cc | 1.5 cc | 2 cc | 2.5 cc | 3 cc | 3.5 cc | 4 cc |
| ATROPINE Conc: 0.1 mg/cc IV Dose: 0.02 mg/kg | 1 cc | 1 cc | 1.4 cc | 2 cc | 2.4 cc | 3 cc | 4 cc | 5 cc | 6 cc | 7 cc | 8 cc |
| 8.4% Na BICARBONATE Conc: 1 meq/cc IV Dose: 1 meq/kg | 3 cc | 5 cc | 7 cc | 10 cc | 12 cc | 15 cc | 20 cc | 25 cc | 30 cc | 35 cc | 40 cc |
| 10% Ca CHLORIDE Conc: 100 mg/cc IV Dose: 20 mg/kg | 0.6 cc | 1 cc | 1.4 cc | 2 cc | 2.4 cc | 3 cc | 4 cc | 5 cc | 6 cc | 7 cc | 8 cc |
| ETT SIZE | 3.0 | 3.5 – 4.0 | | 4.0 – 4.5 | | 5.0 | 5.0-5.5 | 5.5-6.0 | 6.0-6.5 | 6.5-7.0 | 7.0-7.5 |
| | <i>Uncuffed ETT</i> | | | | | | <i>Cuffed ETT</i> | | | | |
| Depth of ETT (cm) | 9.0 | 10 | 10 | 11 | 12-13 | 14 | 15-16 | 18 | 20 | 21 | 22 |

Defibrillation: 2 joules/kg. May double and repeat X 2, and then as necessary

Synchronized Cardioversion: 1 joule/kg or ½ the defibrillation dose.

May double and repeat X 2, and then as necessary

Pharmacologic Agents Used for Hormonal Resuscitation

| Drug | Dose | Route | Comments |
|---|-----------------------------|--------------|--|
| Desmopressin (DDAVP®) | 0.5 mcg/hour | IV | ½ life 75-120 mins Titrate to decrease urine output to 3-4 cc/kg/hour May be beneficial in patients with an ongoing coagulopathy |
| Vasopressin (Pitressin®) | 0.5 – 1 milli-units/kg/hour | IV | ½ life 10-35 mins Titrate to decrease urine output to 3-4 cc/kg/hour Hypertension can occur |
| <p>Treatment of diabetes insipidus should consist of pharmacologic management to decrease but not completely stop urine output. Replacement of urine output with ¼ or ½ normal saline should be used in conjunction with pharmacologic agents to maintain serum sodium levels between 130-150 meq/L</p> | | | |
| Levothyroxine (Synthroid®) | 0.8 – 1.4 mcg/kg/hour | IV | Bolus dose 1-5 mcg/kg can be administered. Infants and smaller children require a larger bolus and infusion dose. |
| Triiodothyronine (T ₃) | 0.05 – 0.2 mcg/kg/hour | IV | |
| Methylprednisolone (Solu-Medrol®) | 20 – 30 mg/kg | IV | Dose may be repeated in 8-12 hours Fluid retention Glucose intolerance |
| Insulin | 0.05 – 0.1 units/kg/hour | IV | Titrate to control blood glucose levels to 60-150 mg/dL Monitor for hypoglycemia |

Hormonal replacement therapy should be considered early in the course of donor management. Use of hormonal replacement therapy may allow weaning of inotropic support and assist with metabolic stability for the pediatric donor

Inotropic Infusions

| Drug | Dose | Comments |
|---|---|--|
| Milrinone (Primacor®) | 0.25 – 0.75 mcg/kg/min IV | Loading dose: 50 mcg/kg Hypotension can occur |
| Dopamine | 2 – 20 mcg/kg/min IV | Titrate to desired blood pressure |
| Dobutamine (Dobutrex®) | 2 – 20 mcg/kg/min IV | Titrate to desired blood pressure |
| Epinephrine | 0.1 – 1 mcg/kg/min IV | Titrate to desired blood pressure |
| Norepinephrine (Levophed®) | 0.05 – 2 mcg/kg/min IV | Titrate to desired blood pressure |
| Phenylephrine (Neo-Synephrine®) | 0.1 – 0.5 mcg/kg/min IV | Bolus: 5 – 20 mcg/kg Titrate to desired blood pressure |
| Vasopressin (Pitressin®) | 0.3 – 2 milli-units/kg/min IV Note: Dosing is different for treatment of diabetes insipidus | Limited data in children. Not recommended as first line therapy. Titrate to desired blood pressure |

Inotropic agents are used for low cardiac output states to improve end organ perfusion. These agents should be titrated to maintain a normal blood pressure for age. Blood pressure alone does not indicate adequate tissue perfusion. Serum biomarkers such as lactate should be followed as inotropic support is titrated.

Antiarrhythmic Agents

| Drug | Dose | Route | Comments |
|-------------------------------------|-----------------------------------|---------------|--|
| Adenosine (Adenocard IV®) | 100 mcg/kg | Rapid IV push | Repeat dose: 200 mcg/kg Max single dose: 12 mg |
| Amiodarone (Cordarone®) | 5 mg/kg infused over 5-60 mins | IV | Repeat dose: 5 mg/kg Infusion: 5-15 mcg/kg/min Monitor for hypotension |
| Atropine | 0.02 mg/kg | IV | Min. dose: 0.1 mg Max. dose: 0.5-1.0 mg |
| Lidocaine | 1 – 2 mg/kg | IV | Infusion: 20-50 mcg/kg/min |
| Magnesium Sulfate | 30 mg/kg infused over 10 mins | IV | Max. dose: 2.5 grams Repeat dose: 10 mg/kg |

Oxygenation, acid base, temperature, and electrolyte disturbances can promote rhythm disturbances and should be corrected.

Correction of Metabolic Acidosis

| | | | |
|--------------------------------|--|----|---|
| Sodium bicarbonate | 1 meq/kg | IV | May increase plasma osmolarity Hypernatremia can occur or be aggravated with repeated dosing |
| Tromethamine (THAM®) | Base deficit x wt(kg) = cc's of 0.3 molar solution of THAM | IV | Does not increase osmolarity or CO ₂ production Hypoglycemia can occur Contraindicated in renal failure May increase coagulation time |

Antihypertensives

| Drug | Dose | Comments |
|---|---|---|
| Sodium Nitroprusside (Nipride®) | 0.5 – 10 mcg/kg/min IV | Side effects include thiocyanate and cyanide toxicity Mix 10 mg thiosulfate for every 1mg of nitroprusside Titrate to control blood pressure Monitor for hypotension |
| Esmolol (Brevibloc®) | 50 – 250 mcg/kg/min IV | Loading dose: 100 – 500 mcg/kg Bronchospasm can occur Titrate to control blood pressure Monitor for hypotension |
| Labetalol (Normodyne®) (Trandate®) | Bolus: 0.2 – 1 mg/kg IV Infusion: 0.4 – 3 mg/kg/hour | Titrate to control blood pressure Monitor for hypotension |
| Nicardipine (Cardene IV®) | 1 – 3 mcg/kg/min IV | Titrate to control blood pressure Monitor for hypotension |
| Hydralazine (Apresoline®) | 0.1 – 0.5 mg/kg up to 20 mg IV | Dose may be repeated every 4 – 6 hours Monitor for hypotension |

Antibiotics

Ampicillin

100 – 200 mg/kg/day IV divided every 6 hours
Meningitis: 200 – 400 mg/kg/day IV divided every 6 hours

Gentamicin

< 30 days of age: 4 mg/kg/dose IV every 24 hours
>30 days of age: 2.5 mg/kg/dose IV every 8 hours
**Dosing adjusted based upon serum levels*

Cefazolin

(Ancef®, Kefzol®)

25 – 100 mg/kg/day IV divided every 8 hours

Ceftriaxone

(Rocephin®)

50 – 75 mg/kg/day IV/IM daily or divided every 12 hours
Meningitis: 100 mg/kg/day IV daily or divided every 12 hours
**Use with caution in neonates because of risk for hyperbilirubemia*

Cefotaxime

(Claforan®)

< 7 days of age: 100 mg/kg/day IV/IM divided every 12 hours
> 7 days of age: 100 – 200 mg/kg/day IV/IM divided every 8 hours
Meningitis: 200 mg/kg/day IV divided every 6 hours

Cefuroxime

(Zinacef®)

100 – 150 mg/kg/day IV/IM divided every 8 hours

Ceftazidime

(Fortaz®)

100 – 150 mg/kg/day IV divided every 8 hours

Clindamycin

(Cleocin®)

40 mg/kg/day IV divided every 6 hours

Oxacillin

100 – 200 mg/kg/day IV divided every 6 hours

Vancomycin

< 30 days of age: 15 mg/kg/dose IV every 12 hours
> 30 days of age: 40 mg/kg/day IV divided every 6 hours
Meningitis: 60 mg/kg/day IV divided every 6 hours
**Dosing adjusted based upon serum levels*

Transfusion Therapy

| | | |
|-------------------------------|--|---|
| Packed red blood cells | 10-15 cc's/kg | Administer over 2-3 hours. May be administered faster if hypotension or bleeding requires more aggressive correction of anemia |
| Fresh frozen plasma | 10-15 cc's/kg | Administer over 1-2 hours. May be administered faster if correction of coagulopathy is associated with volume depletion or hypotension |
| Cryoprecipitate | 5-10 cc's/kg <i>or</i> 1 unit for every 10 kg of body weight | Administer for hypofibrinogenemia |
| Platelets | < 15 kg: 10-20 cc's/kg > 15 kg: single unit of platelets | Administer slowly over 2-3 hours |

Maintaining Mean Arterial Pressure in the Pediatric Organ Donor

Hemodynamically Stable

- Methylprednisolone
- Levothyroxine **OR** Triiodothyronine administration should be considered in this patient population
- Diabetes Insipidus
 - a. Desmopressin
 1. Continuous infusion (preferred)
 2. Intermittent dose**OR**
 - b. Vasopressin administered by continuous infusion

Hemodynamically Unstable

- Volume loading with crystalloid or colloid
- Inotropic support
 - Dopamine
 - Dobutamine
 - Epinephrine
 - Phenylephrine
 - Norepinephrine
- Methylprednisolone
- Bolus dose of Levothyroxine followed by continuous infusion **OR** Triiodothyronine infusion
- Diabetes Insipidus
 - Vasopressin administered by continuous infusion

Desmopressin has a longer $\frac{1}{2}$ life. This agent can be discontinued 2-3 hours prior to organ recovery. Consultation with pediatric intensivists and transplant surgeons should occur to discuss preferences in pharmacologic agents used to maintain hemodynamic stability.

Pediatric Donor Management Goals

| <p style="text-align: center;">Hemodynamic Support</p> <ul style="list-style-type: none"> • Normalization of blood pressure <ul style="list-style-type: none"> ◦ Systolic blood pressure appropriate for age ◦ Note: Lower systolic blood pressures may be acceptable if biomarkers such as lactate are normal. • CVP < 12 (if measured) • Dopamine < 10 mcg/kg/min • Normal serum lactate | <p style="text-align: center;">Blood Pressure</p> <table border="0"> <thead> <tr> <th></th> <th style="text-align: center;">Systolic</th> <th style="text-align: center;">Diastolic</th> </tr> </thead> <tbody> <tr> <td>Neonate</td> <td style="text-align: center;">60-90</td> <td style="text-align: center;">35-60</td> </tr> <tr> <td>Infants (6 months)</td> <td style="text-align: center;">80-95</td> <td style="text-align: center;">50-65</td> </tr> <tr> <td>Toddler (2 years)</td> <td style="text-align: center;">85-100</td> <td style="text-align: center;">50-65</td> </tr> <tr> <td>School age (7 years)</td> <td style="text-align: center;">90-115</td> <td style="text-align: center;">60-70</td> </tr> <tr> <td>Adolescent (15 years)</td> <td style="text-align: center;">110-130</td> <td style="text-align: center;">65-80</td> </tr> </tbody> </table> <p style="text-align: center;">Normal systolic blood pressure = 80 + 2 x age in years</p> | | Systolic | Diastolic | Neonate | 60-90 | 35-60 | Infants (6 months) | 80-95 | 50-65 | Toddler (2 years) | 85-100 | 50-65 | School age (7 years) | 90-115 | 60-70 | Adolescent (15 years) | 110-130 | 65-80 |
|--|---|------------------|-----------------|------------------|----------------|-------|-------|------------------------------|-------|-------|-----------------------------|--------|-------|--------------------------------|--------|-------|---------------------------------|---------|-------|
| | Systolic | Diastolic | | | | | | | | | | | | | | | | | |
| Neonate | 60-90 | 35-60 | | | | | | | | | | | | | | | | | |
| Infants (6 months) | 80-95 | 50-65 | | | | | | | | | | | | | | | | | |
| Toddler (2 years) | 85-100 | 50-65 | | | | | | | | | | | | | | | | | |
| School age (7 years) | 90-115 | 60-70 | | | | | | | | | | | | | | | | | |
| Adolescent (15 years) | 110-130 | 65-80 | | | | | | | | | | | | | | | | | |
| <p style="text-align: center;">Oxygenation and Ventilation</p> <ul style="list-style-type: none"> • Maintain PaO₂ > 100 mmHg • FiO₂ 0.40 • Normalize PaCO₂ 35-45 mmHg • Arterial pH 7.30-7.45 • Tidal volumes 8-10 cc/kg • PEEP 5 cm H₂O | <p style="text-align: center;">Fluids and Electrolytes</p> <ul style="list-style-type: none"> • Serum Na⁺ 130-150 meq/L • Serum K⁺ 3-5.0 meq/L • Serum glucose 60-150 mg/dL • Ionized Ca⁺⁺ 0.8-1.2 mmol/L (if measured) | | | | | | | | | | | | | | | | | | |
| <p>Thermal Regulation</p> <ul style="list-style-type: none"> • Core body temperature 36 – 38°C | | | | | | | | | | | | | | | | | | | |

- The management of the pediatric organ donor will be dictated by regional standards of care and the physicians caring for the child.
- Consultation with a pediatric intensive care specialist and your regional medical director is essential to ensure the best possible outcome for organ recovery
- Become familiar with the intensive care specialists and transplant surgery guidelines in the institutions that you serve.

The following provides standard pediatric dosages for various pharmacologic agents used for management of the pediatric organ donor. Doses provided are guidelines only and are not intended to substitute for the medical judgment of the treating physician or transplant professional. Actual doses may vary depending on the child's condition and other relevant circumstances.



The Organization for Transplant Professionals

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