GUIDELINES

ORGAN DONOR ASSESSMENT AND MANAGEMENT – PEDIATRICS

Consult adult guidelines for children over 60 kgs.

TRANSPLANT QUÉBEC

Standing Orders

The following are recommendations only and are not intended to replace clinical judgement.

Patient Positioning (A)

- A1 • Semi-Fowler's position: 30 °
- A2 • Turn and position Q2h

Nutrition (B)

- B1 • Enteral feeding at 1 Kcal/kg/h
- B2 • Parenteral nutrition should not be started. However, it should be continued if already initiated.

Hydratation (C)

- C1 • Depending on K + level: D5% NS 0.45% +KCl at...*/ Kg/h to maintain therapeutic levels

* Choice of solution or rate may vary depending on natremia, kalemia or enteral nutrition tolerance and should target homeostasis.

Minimal Monitoring Requested and Targeted Goals (D)

- D1 • Cardiac monitoring
- D2 • Arterial line; Monitor blood pressure (BP) Q1h, target: Mean Arterial Pressure (MAP)
  - ➤ ≥ 5 years MAP ≥ 60 mmHg
  - ➤ < 5 years MAP ≥ 50 mmHg

  Heart rate (HR), systolic, diastolic blood pressure and hemodynamics – See page 2 (section 1.8)
- D3 • Continuous O_2 saturation: monitor Q1h, target ≥ 95%
- D4 • Central Venous Pressure (CVP): Monitor Q1h, target 5 - 10 mmHg
- D5 • Urinary catheter: Monitor intake and output Q1h, target output 0.5 - 3 cc/kg/h
- D6 • Nasogastric tube on free drainage (if no gavage)
- D7 • Blood glucose*: Q1h, maintain 6 - 10 mmol/L
- D8 • Body temperature: Q4h, target 36.0 - 38.0 ° C
- D9 • Central Venous Oxymetry: $ScVO_2$, target ≥ 70%

* Blood glucose: If glucose within normal range and stable monitor Q2h, then Q4h.

Mechanical Ventilation (E)

- E1 • Assist control mode
- E2 • Tidal volume (VT): 8 -10 cc/kg of ideal weight
- E3 • Positive end expiratory pressure (PEEP): 5 cm H_2O
- E4 • If possible, adjust the respiratory frequency to obtain arterial $PaCO_2$ between 35-45 mmHg
- E5 • Oxygen concentration: Minimal FiO_2 to maintain SaO_2 ≥ 95%

Eye care (F)

- F1 • Keep eyelids closed
- F2 • Clean eyelids with NS Q4h and PRN
- F3 • Avoid oily or greasy substances

Donor evaluation (G)

Initially

G1 Identifying Center

- Blood type and screen
- Height and weight
- Urinalysis , urine culture and blood cultures X 2
- Chest X-ray and EKG
- Gram stain and endotracheal tube aspirate culture

G2 CH de prélèvement*

- Blood type and screen, crossmatch for 4 units of PRBC's
- Height and weight
- Urinalysis and urine culture, blood cultures x 2
- Chest X-ray and EKG
- Gram stain and endotracheal tube aspirate culture
- Abdominal ultrasound if trauma
- Cardiac ultrasound for anatomical structure and function

G3	Q4 h	CBC, PTT, INR, Na, K, glucose, urea, creatinine, lactate, Central Venous Oxymetry ($ScVO_2$), and for **arterial** blood gases (ABG'S) Q2-4h (refer to section X)
G4	Q8 h	CL, Mg, Ca, PO_4, AST, ALT, ALP, total and direct Bilirubin, GGT, LDH, CK, CKMB, Troponin I or T, amylase, lipase or pancreatic amylase
G5	Q12 h	Urinalysis
G6	Q24 h et PRN	Chest X-ray, EKG, protein, albumin

* Serology, virology and tissue typing with Transplant Québec coordinator clinical advisor approval

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Criteria and Management Goals

The following are recommendations only and are not intended to replace clinical judgement.

1 Hemodynamics

1.1 Baseline Monitoring
Arterial line
Central line
Intake and output Q1h

1.2
D5% NS 0.45%* + KCl
According to K + level at... /kg/h
Adjust and correct according to diuresis (renal failure or diabetes insipidus)

1.3
V/S and CVP Q1h
EKG Qday

1.4 General Goals

- Target: If ≥ 5 year old: MAP ≥ 60
- Target: If < 5 year old: MAP ≥ 50
- CVP 5-10 mmHg
- Target normovolemia
- $ScVO_2$ ≥ 70%

Objectifs spécifiques selon l'âge voir section 1.8

1.5 Hypotension
According to age and if CVP < 8
NS 0.9% bolus of
10cc/kg IV / Q15min x 3
(or colloids**) PRN

1.6 If hypotension and CVP normalized

1. Dopamine ≤ 10 ug/kg/min or equivalent
2. Vasopressin 0.0003-0.0007 U/kg/min to a maximum dose of 2.4 U/hour
3. Norepinephrine, Epinephrine, Phenylephrine < 0.2 ug/kg/min

1.7 Hypertension Age related treatment

- 0 - 3 months BP > 90/60
- 3 months - 1 year BP> 110/70
- 1 - 12 years BP > 130/80
- 12 - 18 years BP > 140/90

1. Wean vasopressors / inotropes
2. Nitropresside 0.5-5.0 ug/kg/min and/or
3. Esmolol 100-500 ug/kg/min bolus followed by 100-300 ug/kg/min infusion

1.8 Age-related norms for heart rate (HR) and blood pressure (BP)

Age	HR BPM (Beats per/min)	Systolic/Diastolic BP
0 - 3 months	100 – 150	65 – 85 / 45-55 mmHg
3 - 6 months	90 – 120	70 – 90 / 50-65 mmHg
6 - 12 months	80 – 120	80 – 100 / 55-65 mmHg
1 - 3 years	70 – 110	90 – 105 / 55-70 mmHg
3 - 6 years	65 – 110	95 – 110 / 60-75 mmHg
6 - 12 years	60 – 95	100 – 120 / 60-75 mmHg
> 12 years	55 – 85	110 – 135 / 65-85 mmHg

* The choice of solution or rate may vary depending on natremia, kalemia nutrition tolerance and should target homeostasis.
** In case of renal failure, it is recommended to avoid the use of hydroxyethylamide colloids.

2 Mechanical Ventilation

2.1 Goals

- Minimal FiO_2 to keep SaO_2 ≥ 95% (PaO_2 ≥ 80 mmHg)
- PH 7.35 - 7.45
- $PaCO_2$ 35 - 45 mmHg
- Tidal volume (TV) 10 cc/kg of ideal weight
- PEEP of 5 cm H_2O
- Peak inspiratory pressure (PIP) ≤ 30 cm H_2O

2.2

- Continuous pulse oximetry monitor saturation
- Semi-Fowler's position: 30°
- Pulmonary auscultation
- Routine ETT suctioning PRN
- Respiratory physiotherapy PRN
- Turn and position Q2h

3 Diuresis

3.1 Goal
0.5 – 3.0 cc/kg/h

3.2 Oliguria
If urine output < 0.5 cc/kg/h and CVP < 6 mmHg
⇩
Bolus NS 0.9% (10cc/kg) Repeat PRN

3.3
If urine output < 0.5 cc/kg/h and CVP ≥ 6 mmHg
Rule out secondary causes (i.e.: post-renal obstruction)
Rule out low cardiac output and/or hypovolemia despite CVP ≥ 6 mmHg

3.4 Polyuria
If urine output > 4cc/kg/h
Rule out diabetes insipidus*

3.5
DDAVP 0.25 - 1.0 ug IV Q6h or nasal spray
or
If hemodynamic support required, use vasopressin as first choice
(vasopressin IV infusion 0.0003-0.0007 U/kg/min max. 2.4 U/h)

* **Diabetes insipidus :** Urine output > 4 cc/kg/h, Na ≥ 145 mmol/L, serum osmolarity ≥ 300 mosM, urine osmolarity ≤ 200 mosM, urine specific gravity < 1.005

Criteria and Management Goals (Cont'd)

Pediatrics

4 Temperature

4.1	4.2	4.3	4.4
Goal Core T° 36.0-38.0 °C	Monitor T° Q4 h	< 36.0°C Warming blanket • **Cover the head**	> 38.0°C Septic profile: Antibiotics for confirmed or suspected infections

5 Combined Hormonal Therapy

5.1	5.2	5.3	5.4	5.5
Indicated if Cardiac ultrasound with EF < 50% or Hemodynamic instability Unresponsive shock despite re-establishment of normovolemia requiring vasoactive support ≥ 10 ug/kg/min of dopamine or equivalent Repeat cardiac ultrasound 6-12h after correcting hemodynamic instability	• Methylprednisolone & • Vasopressin & • Tetraiodothyronine (Synthroid®)	15 mg/kg IV (maximum 1gm) Q24 h	0.0003-0.0007 U/kg/min IV bolus followed by 2.4U/h max IV infusion	20 ug IV bolus followed by IV infusion 10 ug/h* or 50-100 ug bolus followed by repeat boluses of 25-50 ug IV Q12h

* **Synthroid infusion:** Syntroid 250ug in 250 cc of D5W, utilize a polyolefin bag and tubing or a glass bottle

6 Electrolytes

6.1			6.2
Goals	K 3.5-5.0 mmol/L	PO_4 0.74-1.52 mmol/L	Correct electrolyte abnormalities
Na 130-150 mmol/L	Mg 0.65-1.05 mmol/L	Ca 2.2-2.6 mmol/L	

7 Glycemia

7.1	7.2	7.3
Goals 6-10 mmol/L	Blood glucose Q1 h*	Insulin infusion PRN

* If capillary glycemia within normal range and stable monitor Q2h, then Q4h

8 CBC and Coagulation

8.1	8.2
Goals • Optimal hemoglobin > 80g/L • Administer platelets and fresh frozen plasma if clinical signs of hemorrhage or coagulopathy are present CMV-negative blood is not required	**ATTENTION!** Communicate with Transplant Québec before administrating blood products wich may interfere with the following: • Tissue typing • Serology and virology

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Appendix (Recruitment)*

The following are recommendations only and are not intended to replace clinical judgement.

Lung Donor

X

X1 • Perform ***lung challenge test*** *

X2 • Arterial blood gases (ABG'S) ± Q2h and pulmonary recruitment PRN
(With approval of the thoracic surgeon and intensivist)

X3 • Avoid fluid overload

X4 • Methylprednisolone 15 mg/kg IV (max 1 gm IV per dose)
Administer following the first declaration of neurological death then qday (extra dose 1 h pre-op)

X5 • Bronchoscopy as early as possible (with gram stain and culture)

X6 • Chest X-ray daily and PRN

*** Lung Challenge Test**

- Ventilate with 100% FiO_2, PEEP of 5 cm H_2O and tidal volume at 10cc/kg of ideal weight
- Draw an arterial blood gases (ABG'S) after 20 minutes (bench mark blood gases)

Heart Donor**

Y

Y1 • Perform EKG

Y2 • Troponin I or T Q12h, CK, CKMB Q8h;

Y3 • Cardiac ultrasound every 6 -12h after fluid and hormonal resuscitation or as requested by cardiac surgeon

Y4 • Avoid high doses of Inotropes

Cardiac Recruitment

Y1.1 If ejection fraction (EF) < 50%, begin hormonal therapy as per the cardiac surgeon and with the approval of the intensivist (refer to section 5)

Y1.2 Cardiac resuscitation will last a minimum of 24 hours (unless cardiac function is normalized beforehand)
Repeat cardiac ultrasound every 6-12h.

* Organs considered suboptimal may require recruitment manoeuvres to recover their function

** A filter will be needed to administer solutions if the donor presents a foramen oval or an ASD (Atrial Septal Defect)

Reference: Canadian Council for Donation and Transplantation. (2004). *Medical management to optimize donor organ potential: A Canadian forum.* Author.

The Transplant Québec Educational Committee would like to thank everyone who collaborated in the creation of this document.

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