

### 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.

#### Hydration C

- C1 • IV solution\* D5% NS 0.45% KCL 20 mEq/L at 100 cc/h (Use isotonic saline for hyponatremia)

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

#### Minimal Monitoring Requested and Targeted Goals D

- |  |   |
|--|---|
| D1 • Cardiac monitoring  | D4 • Central Venous Pressure (CVP): Monitor Q1h, target 5-10 mmHg         |
| D2 • Arterial line: Monitor blood pressure (BP) Q1h, target: <ul style="list-style-type: none"> <li>➢ Mean arterial pressure (MAP) 65-90 mmHg</li> <li>➢ Systolic BP 100-160 mmHg</li> <li>➢ Heart rate (HR) 60-120 bpm</li> </ul> | D5 • Urinary catheter: Monitor intake and output Q1h, target 0.5-3cc/kg/h |
| D3 • Continuous O <sub>2</sub> saturation: monitor Q1h, target ≥ 95%   | D6 • Nasogastric tube on free drainage (if no gavage)                     |
|  | D7 • Blood glucose* Q1h, target 4-8 mmol/L                                |
|  | D8 • Body temperature Q4h, target 36.0-38.0°C                             |

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

#### Mechanical Ventilation E

- |   |  |
|---|--|
| E1 • Assist control mode  | E4 • If possible, adjust the respiratory frequency to obtain arterial PaCO <sub>2</sub> between 35-45 mmHg |
| E2 • Tidal volume (TV): 6 to 8 cc/kg of ideal weight                              | E5 • Oxygen concentration: Minimal FiO <sub>2</sub> to maintain SaO <sub>2</sub> ≥ 95%                     |
| E3 • Positive end expiratory pressure (PEEP): Minimum 5 to 10 cm H <sub>2</sub> O |  |

#### Eye Care F

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

#### Prophylaxis G

- G1 • Heparin 5000 units s/c Q12h (or low molecular density heparin as per hospital protocol) and (or) use intermittent sequential pneumatic compression therapy

#### Donor Evaluation H

##### H1 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

##### H2 Retrieval Center\*

- Blood type and screen, crossmatch for 4 units of PRBC's
- Height and weight
- Urinalysis and urine culture
- Chest X-ray and EKG \*
- Gram stain and endotracheal tube aspirate culture
- Blood cultures X 2
- Abdominal ultrasound for donor ≥ 50 years old

Initially		
H3	Q4h	CBC, PTT, INR, Na, K, glucose, urea, creatinine, lactate, mixed venous oxygen saturation (SVO <sub>2</sub> ): If pulmonary artery catheter is in place; refer to section 6 and for <b>arterial</b> blood gases (ABG'S) Q 2-4 h; refer to section X
H4	Q8h	Cl, Mg, Ca, PO <sub>4</sub> , AST, ALT, ALP, total and direct Bilirubin, GGT, LDH, CK, CKMB, Troponin I or T, amylase and lipase
H5	Q12h	Urinalysis
H6	Q24h and PRN	Chest X-ray, EKG, protein, albumin

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

### Criteria and Management Goals

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

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#### Hemodynamics

**1.1 Baseline monitoring**  
Arterial line  
Central line (CVP)

**1.2** D5% NS 0.45%\*  
+ KCL 20 mEq/L at 100 cc/h

**1.3** V/S and CVP Q1h  
EKG Qday

**1.4 General Goals**

- MAP ≥ 65 mmHg
- Systolic BP ≥ 100 mmHg
- HR 60-120 bpm
- CVP 5-10 mmHg
- Target normovolemia

**1.7** NS 0.9% bolus 500 cc  
(or colloids\*\*) PRN

**1.6** CVP < 5 mmHg

**1.9 Persistent hypotension**  
Consider pulmonary artery catheter (Swan-Ganz)

1<sup>st</sup> choice: Vasopressin ≤ 2.4 u/h or 0.04u/min  
2<sup>nd</sup> choice: Norepinephrine < 0.2 µg/kg/min  
Other choices: Epinephrine < 0.2 µg/kg/min  
Phenylephrine < 0.2 µg/kg/min  
Dopamine ≤ 10 µg/kg/min

**1.8** CVP > 5 mmHg

**1.5 Hypotension**  
Systolic BP < 100 mmHg  
or MAP < 65 mmHg

**1.11 Heart rate > 80 bpm**  
Esmolol 100-500 µg/kg IV bolus  
followed by 100-300 µg/kg/min  
**Other suggested medications**  
Labetolol: 5-20 mg IV Q 5-10 min  
Metoprolol: 1-5 mg/h IV infusion

**1.10 Hypertension**  
Systolic BP ≥ 160 mmHg or MAP > 90 mmHg  
⇕  
Wean vasopressors / inotropes

**1.12 Heart rate < 80 bpm**  
Nitroprusside 0.5-5.0 µg/kg/min IV  
**Other suggested medication**  
Nitroglycerin (IV infusion)

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

\*\* In case of renal failure, it is recommended to avoid using hydroxyethylamide colloids.

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#### Mechanical Ventilation

**2.1 Goals**

- Minimal FiO<sub>2</sub> to keep SaO<sub>2</sub> ≥ 95% (PaO<sub>2</sub> ≥ 80 mmHg)
- pH 7.35-7.45
- PaCO<sub>2</sub> 35-45 mmHg
- Tidal volume (TV) 6 to 8 cc/kg of ideal weight
- PEEP of 5 to 10 cm H<sub>2</sub>O
- Peak inspiratory pressure (PIP) ≤ 30 cm H<sub>2</sub>O

**2.2**

- Continuous pulse oximetry to monitor saturation
- Semi-Fowler's position: 30°
- Pulmonary auscultation
- Routine ETT suctioning Q1h and PRN
- Respiratory physiotherapy PRN
- Turn and position Q2h

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#### Diuresis

**3.1 Goal**  
0.5-3.0 cc/kg/h

**3.2 Oliguria**  
If urine output < 0.5 cc/kg/h

**3.3** CVP > 5 mmHg

**3.4** Rule out low cardiac output and/or hypovolemia  
(Despite CVP >5 mmHg)  
Consider inserting a pulmonary artery catheter (Swan-Ganz)  
Rule out secondary causes (i.e.: postrenal obstruction)

**3.6** NS 0.9% (500 cc) bolus

**3.5** CVP < 5 mmHg

**3.8** DDAVP 1-4 µg IV followed by 1-2 µg IV Q6h  
or  
If hemodynamic support required,  
use vasopressin as first choice  
(IV infusion 1-2.4 u/h )

**3.7 Polyuria**  
If urine output > 250 cc/h x 2 h  
or 500 cc/h x 1 h  
Rule out diabetes insipidus\*

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

# Criteria and Management Goals (Cont'd)

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## Temperature

- 4.1 **Goal**  
Core T° 36.0-38.0 °C
- 4.2 Monitor T° Q4h
- 4.3 < 36.0°C • Warming blanket. • **Cover the head**
- 4.4 > 38.0°C • Septic profile: Antibiotics for confirmed or suspected infections

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## Combined Hormonal Therapy

- 5.1 **Indicated if**  
Cardiac ultrasound with EF < 50%  
or  
Hemodynamic Instability  
  
Unresponsive shock despite re-establishment of normovolemia requiring vasoactive support ≥ 10 µg/kg/min of dopamine or equivalent
- 5.2 • Methylprednisolone &  
• Vasopressin &  
• Tetraiodothyronine (Synthroid®)
- 5.3 15 mg/kg IV (maximum 1gm) Q24h
- 5.4 1 u IV bolus followed by 2.4 u/h max IV infusion
- 5.5 20 µg IV bolus followed by IV infusion 10 µg/h\*  
or  
100 µg bolus followed by repeat boluses of 50 µg IV Q12h

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

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## Pulmonary Artery Catheter (Swan-Ganz)

- 6.1 **Indicated if**  
Cardiac ultrasound with EF < 50%  
or hemodynamic instability
- 6.2 **Target values**
  - Pulmonary capillary wedge pressure (PCWP) 8-12 mmHg
  - Cardiac index ≥ 2.4 L/min/m<sup>2</sup>
  - Systemic vascular resistance (SVR) 800-1200 dynes/sec/cm<sup>5</sup>
  - Mixed venous oxygen saturation (SVO<sub>2</sub>) ≥ 60% (from distal port of the pulmonary artery catheter)

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## Electrolytes

- 7.1 **Goals**

K 3.5-5.0 mmol/L	PO <sub>4</sub> 0.74-1.52 mmol/L
Na 130-145 mmol/L	Ca 2.2-2.6 mmol/L
Mg 0.65-1.05 mmol/L	
- 7.2 Correct electrolyte abnormalities

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## Glycemia

- 8.1 **Goals**  
4-8 mmol/L
- 8.2 Blood glucose Q1h\*
- 8.3 Insulin infusion PRN

\* If glucose within normal range and stable monitor Q2h, then Q4h

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## CBC and Coagulation

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

### Appendix (Recruitment)\*

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

X

#### Lung Donor

- X1 • Perform **lung challenge test**\*
- X2 • Arterial blood gases (ABG'S)  $\pm$  Q2h and pulmonary recruitment\*\* PRN (with approval of the thoracic surgeon and the 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 1h 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<sub>2</sub>, PEEP of 5 cm H<sub>2</sub>O and tidal volume at 10 cc/kg of ideal weight
- Draw an arterial blood gases (ABG'S) after 20 minutes (bench mark blood gases)

##### \*\* Pulmonary Recruitment Manoeuvres

1. Pre oxygenate with 100% FiO<sub>2</sub> and PEEP of 10 cm H<sub>2</sub>O, then apply continuous inspiratory pressure of 30 cm H<sub>2</sub>O during 30 seconds without ventilating. *If mean arterial blood pressure drops < 50 mmHg or if SaO<sub>2</sub> drops < 85% for 5 seconds, stop the test.*
2. Ventilate for 2 minutes while keeping the PEEP at 10 cm H<sub>2</sub>O and 100% FiO<sub>2</sub>
3. Repeat alveolar recruitment once more, as per step 1
4. Ventilate for 1 hour with initial baseline parameters (TV 10 cc/kg), keeping the PEEP at 10 cm H<sub>2</sub>O
5. After 1 hour, return the PEEP at 5 cm H<sub>2</sub>O and 100% FiO<sub>2</sub> then repeat the **lung challenge test**

Y

#### Heart Donor

- Y1 • EKG and cardiac ultrasound
- Y2 • Coronarography if cardiac ultrasound is normal and if criteria justify it
- Y3 • Avoid high doses of Inotropes
- Y4 • Troponine I or T, CK, CKMB Q8h
- Y5 • Administer N-acetylcysteine (Mucomyst®) or HCO<sub>3</sub> according to hospital protocol in order to preserve renal function

##### Cardiac Recruitment Protocol

- Y1.1 • Eligible donor  $\leq$  55 years old with initial ejection fraction < 50%
- Y1.2 • Ensure that the following parameters are within normal limits:
  - Ph 7.40-7.45, PaO<sub>2</sub>: > 80 mmHg, Saturation > 95%, MAP  $\geq$  65 mmHg
  - Correct anemia: target Hb  $\geq$  100g/L, Hematocrit  $\geq$  30%
- Y1.3 • Insert a pulmonary artery catheter (Swan- Ganz); refer to section 6
- Y1.4 • Hormonal resuscitation; refer to section 5
- Y1.5 • Insulin infusion to maintain glycemia between 4.0 and 8.0 mmol/L
- Y1.6 • Hormonal resuscitation will last a minimum of 12 hours (unless cardiac function is normalized beforehand) and a second cardiac ultrasound should then be repeated

\*Previously considered unacceptable organs may require recruitment manoeuvres to recover their function

**Reference:** Canadian Council for Donation and Transplantation. (2004). *Medical Management to Optimize Donor Organ Potential: A Canadian Forum*. Author. Zaroff J.G. and All. (2002). Consensus Conference Report: *Maximizing use of organs recovered from cadaver donor: Cardiac recommendations*. *Circulation*, Aug 2002; 106: 836-841

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