



# IMMEDIATE CARE OF THE ADULT POST-OPERATIVE CARDIOTHORACIC PATIENT

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## Abstract:

Cardiothoracic surgery includes all surgical procedures that involve the heart, lungs and great vessels. including mechanical and tissue valve replacement or repair, Coronary Artery Bypass Grafts, lobotomies, and aortic repair. The post-operative management and care of patients undergoing cardiothoracic surgery has significant implications on their recovery. Management first 4 hours post-operatively preparation of bed and bed area **Ventilator** Servo ventilator pre-checked with dry circuit, HME filter, closed suction system, sterile water 500mL. Set up on the left side of the patient. **Role of the ICU Nurses:** Check patient ID Take ventilator off standby and confirm settings with anaesthetist and ICU doctor, connect patient to ventilator, Ensure adequate ventilation and ETCO2 trace. **CONCLUSION:** The post-operative management and care of patients undergoing cardiothoracic surgery has significant implications on their recovery. This clinical guideline has been developed in accordance with recent recommendations from American and European Cardiothoracic surgery societies and covers the initial handover, assessment, and immediate care of a post-operative cardiothoracic patient in Intensive Care, as well as their follow up care on the ward.

**KEY WORDS:** post operative, intensive care, guideline, staff nurse

## MANAGEMENT FIRST 4 HOURS POST OPERATIVELY PREPARATION OF BED AND BED AREA:

The cardiac bay bed areas must always be kept ready to accept a patient at short notice.

### Bed preparation checklist:

#### Back of the bed

- Yankauer sucker and Y-suction catheter (12)
- Airway basket
- Guedel airway (size 2, 3, 4)
- Air Cushion Mask (S, M, L)
- PEEP valve
- Eye Protection
- Hudson mask with O2 tubing
- Nasal Prongs
- Arm Board.
- Detergent wipes, Teri wipes and Redi wipes.
- Ensure the 'patient card' is on the back wall.
- Check that the Activated Clotting Time (ACT) machine is on and remove old sample tube if present.

**Monitor:**

- If patient details are available, enter them into the monitor.
- MMS (Multi Measurement Module).
- 3 x pressure cables.
- ECG cable and ECG dots.
- SpO<sub>2</sub> cable and finger probe.
- NIBP cuff and cable.
- Temperature cable and probe.

**Ventilator:**

- Servo ventilator pre-checked with dry circuit, HME filter, closed suction system, sterile water 500mL. Set up on the left side of the patient.
- ETCO<sub>2</sub> cable and cuvette.
- Settings: SIMV, FiO<sub>2</sub> 50%, tidal volume 500mL, rate 12. Leave ventilator in standby mode. Settings will be adjusted at handover.
- Set appropriate alarm settings (adjusted at the time of the handover).
- On top of the ventilator the following items must be placed to allow for easy access for accepting nurse to complete his/her head-to-toe assessment:
  - Cuff manometer
  - Pre-cut Blenderm tape to secure ICC's and pacemaker wires
  - Gauze
  - Neuro torch
  - Stethoscope
  - Bladder Syringe and Spigot

**IV Therapy:**

- 2 x IV poles.
- IV Pole No 1: B-Braun syringe pumps x4 /Volumetric pumps x4.
- IV Pole No 2: With PCA, transducer manifold and Tubigrip stocking for pacemaker
- PCA giving set and 50mL syringe.
- Maintenance fluid + additives (5% Dextrose 500mL with 30mmols KCL + 20mmols MgSO<sub>4</sub>) burette and infusion set.
- Propofol 1g/100mL infusion primed and ready.
- Noradrenaline 6mg/100mL in 5% dextrose, primed and entered into Braun pump. Place Noradrenaline at the top of the tower for easy visualisation.
- Plasmalyte 1000 mL X 2 bags available in bedside trolley.
- Rapid infuser drip set in bedside trolley.
- 4% Albumin X 2 (to be ordered by Pod 3 medical team pre-arrival of patient).
- PCA Fentanyl primed and ready to go.

**Suction:**

- High wall suction x3 attached to canisters and suction tubing
- High wall suction x1 connected directly to extra-long 3m suction tubing
- Howard Kelly clamps x2.

**Bedside trolley:**

- To be restocked according to ICU trolley checklist.
- New appropriate battery (AA for Medtronic 5392, 9V for Medtronic 5388) for pacemaker box (spare pacemaker – red boxes in cardiac bay). Ensure that it is not close to a magnet
- Pathology bag: blood tubes, ABG syringe, ACT tube and 20mL syringe.
- Cardiac hug pillow.
- Slide sheets.
- Bair hug

**Intravenous Fluid**

- 5% Dextrose 500mL with KCl 30mmols and MgSO<sub>4</sub> 20mmols
- 4% Dextrose 1/5 0.9% sodium chloride 1000mL with KCl 30mmols
- 4% Dextrose 1/5 0.9% sodium chloride 1000mL
- 4% Albumin 500mL x2 (with medical review)
- Plasmalyte 1000 mL bag X 2

**ROLE OF THE ICU NURSES:****Accepting Nurse**

- Check patient ID.
- Take ventilator off standby and confirm settings with anaesthetist and ICU doctor.
- Connect patient to ventilator.

- Ensure adequate ventilation and ETCO<sub>2</sub> trace.
- Receive “hands off” handover from the theatre nurse, anaesthetist and the surgical team. Confirm all infusions co-signed.
- Assess patient airway, ensure ETT secure, check position and cuff pressure.
- Assess patient’s breathing, auscultate chest.
- Secure ICC connections with pre-cut Blenderm tape, drains and ICC tubing.
- Inspect graft harvest site – check peripheral pulses.
- Don gloves and check epicardial pacemaker details:
- Check pacing wires are secured in the connector block and the lead pins are tight in the pacemaker.
- Secure pacing wires to the patients’ chest using gauze and tape (see below).
- Check correct polarity of lead pins, blue to blue and white to white.
- Check that the leads are connected to the correct chamber, atrial to right of the patient’s sternum, ventricular to left of the patient’s sternum.
- Note the original epicardial pacemaker settings from the anaesthetist and optimise the settings in accordance with ICU medical team. Usual settings:
  - DDD mode
  - Rate at 70-90bpm
  - AV delay at 170 mS (default – based on rate set on pacemaker)
  - Atrial sensitivity at 0.4 – 10mV. Adjusted according to patients’ sensing threshold
  - Atrial output at 5-10 mA
  - Ventricular sensitivity at 0.8-2.0mV
  - Ventricular output at 5-10 mA
- Other common modes used in ICU are DDD, AAI and VVI. Pacing modes must only be changed after consulting with ICU specialist or senior registrar.
- Threshold testing to be done later if the patient is haemodynamically stable (see Temporary Epicardial Pacemaker Clinical Procedure).
- Check Battery icon and ensure spare new battery available.
- For details of epicardial pacing management and troubleshooting, please refer to Clinical Procedure: Management of a patient with Temporary Epicardial Pacing.
- If the patient does not require pacing, perform 12 lead ECG 12/24.
- Check with medical team as to regularity of Cardiac output studies.
- Aspirate nasogastric tube and spigot. Aspirate 4/24.
- Complete full head to toe assessment of patient and document all observations.

#### Airway and Breathing

- Assess and document position of ETT at teeth and on CXR.
- Check cuff pressure each shift and more regularly if required.
- Assess patient ventilator settings which are routinely set at:
  - Mode: SIMV PRVC
  - FIO<sub>2</sub>: 50%
  - TV: 6-8 mL/Kg
  - RR: 12 per min
  - PEEP: 5 cmH<sub>2</sub>O
  - PS: 10 cmH<sub>2</sub>O
  - I Time: 1.2 Sec
  - Flow trigger: 1.6 L/min
- Check and set all ventilator alarms.
- Airway pressure limit 10cmH<sub>2</sub>O above patient’s airway pressure to a maximum of 35 cmH<sub>2</sub>O.
- Respiratory rate 10 bpm above patient’s respiratory rate to a maximum of 35 per minute.
- Apnoea alarm on, set at 20secs.
- Aim to wean FiO<sub>2</sub> and change from PRVC to Pressure Support when appropriate.
- Check ABG on return from OT, then hourly for 4 hrs and when clinically indicated.
- Perform suctioning as clinically indicated.
- All patients that are haemodynamically stable with no bleeding can be considered for extubation in the first 6 hours of ICU admission.

#### Circulation:

- All observations documented hourly and any concerns must be communicated to ICU medical staff immediately.
- Limb observations of the graft site limb should be performed and documented hourly for 4 hours and then 4<sup>th</sup> hourly.
- Aim MAP 65-75 mmHg or any targets suggested by ICU medical staff or cardiothoracic surgical team. Common targets include the following:
  - Post CABGs aim MAP 70-80
  - Post valve surgery aim Systolic pressure 100-110
  - Fluid resuscitation with Plasmalyte or 4 % albumin as required.
  - Commence vasopressors (Noradrenaline) after adequate optimisation of preload and discussion with ICU medical staff.
  - All the cardiac output study results to be discussed with ICU medical staff for interpretation and commencement of vasopressors/inotropes.
  - Check ICC drainage 15 minutely for first hour then hourly. Inform ICU Registrar and Cardiothoracic Registrar if drainage volume is >200mls in the first hour or >100mls per hour for two consecutive hours thereafter.
  - Routine ABG/formal bloods:
  - ABG’s – 1 hourly for first 4 hours then PRN



- Formal bloods on admission, 6 hours post admission then AM

#### **Pulmonary Artery Catheter (PAC):**

- Check position of PA catheter at insertion site and on CXR (1-2cm left of mediastinal border) and document length in MetaVision.
- PA alarms always on: set systolic and diastolic alarms 10mmHg above patient's pulmonary artery systolic and diastolic to detect inadvertent catheter wedging.
- Normal pulmonary pressures may differ between patients and must be maintained depending on their condition. Those with stenosis, pulmonary disease or post valve surgery may have elevated pulmonary pressures.
- Use Pulmonary Artery Diastolic Pressure (PADP) as a measure for preload rather than Pulmonary Capillary Wedge Pressure (PCWP).
- Wedging syringe must be emptied of air and remain attached and unlocked. PCWP to be performed only by the ICU specialist. Nurses are not to wedge.
- Perform cardiac output studies on return from OT as instructed by the treating medical team. Please refer to PAC Guideline for further clarification.
- A mixed venous blood gas, obtained from PAC, may also be requested alongside cardiac output studies.
- Repeat as requested by ICU specialist or when there is a change in clinical status, inotropic requirements or fluid status to assess contractility, systemic vascular resistance and stroke volume.
- Regularly observe trace to ensure the catheter has not migrated and become wedged.
- If trace indicates spontaneous wedging or will not wedge, only appropriately accredited staff are able to "float" PAC into position. A wedged PAC is an emergency and requires immediate intervention by ICU specialist.

### **THE PULMONARY ARTERY CATHETER MUST BE TRANSDUCED AND MONITORED AT ALL TIMES.**

#### **Other supportive measures:**

- Position patient to 30 degrees upright
- Sedate as required with IV Propofol and boluses as required until patient stable, allow patient to wake to assess neurological status.
- Assess pain level; commence Fentanyl PCA (over-ride bolus if required to control pain and maintain BP parameters) remembering that pain is often under-treated in the post-operative cardiac patient.
- Commence PRN antiemetic alongside analgesia.
- Commence IV maintenance according to body weight (documented on perfusionist's chart).
- Actively warm patient to 36 degrees with Bair Hugger.
- Monitor and replace K+ as per ICU protocol. K+ target is 4.5 – 5mmol/L (prescribed on MetaVision under PRN medications).
- If creatinine >150umol/L remove K+ from maintenance fluid.
- Hourly ABGs for first 4 hours, adjust ventilation accordingly and wean to Pressure Support ventilation as soon as possible.
- Check all medications and infusions have been prescribed and signed by the ICU medical team.
- Extubate according to Cardiothoracic extubation criteria (see Section 6).
- Complete pressure area care 2nd hourly and document repositioning on MetaVision.

#### **Heart Rate:**

- 12-lead ECG post op, when rhythm changes or when ST segment alarms sound. Once stable, ECGs are to be done daily at 0600, unless patient being paced.
- Maintain heart rate 70 - 90 bpm or as stipulated by the medical team.
- Check ST segment settings daily and ensure ST alarms are turned on.
- Monitor electrolytes and replace as indicated keeping MgSO<sub>4</sub> >1.0mmol/L and K+ 4.5 to 5.0mmol/L.
- If patient is paced, check connections, rate, mode, AV delay, and sensitivity and output thresholds. Document settings on pacemaker observation chart. See Epicardial Pacing Guideline for further information. If patient is paced and haemodynamically stable, an ECG can be done by turning the rate on the pacemaker down slowly then doing a 12 lead ECG to determine the patient's underlying rhythm. Ensure medical team are notified of this plan in advance. To check patients underlying rhythm, please refer to CHS Clinical Procedure: Management of a patient with Epicardial Pacing.
- If pacing wires not in use, wrap in gauze and secure. For more information see CHS Clinical Procedure: Management of a patient with Epicardial Pacing.

#### **Neurological status:**

- Assess GCS and document.
- Report any changes from pre-operative status to ICU medical team immediately. Incidence of embolic stroke after cardiac surgery is increased in older patients and those with multiple comorbidities.
- Patients presenting post-operatively with new confusion, agitation, delirium, post-pump psychosis or combativeness should be assessed by the ICU medical team.

#### **Limb Observations:**

- Hourly circulation observations on legs and/or arms graft sites.
- Document limb colour, warmth, movement, strength, capillary return and sensation MetaVision.

#### **Chest Drains:**

- Mediastinal drains should be secured to the patient and all connections secured with clear Blenderm tape.

- Connect the chest drains to the Under Water Seal Drain with suction of -10cmH<sub>2</sub>O–20cmH<sub>2</sub>O (as prescribed).
- Observe for oscillation, bubbling and drainage. Document findings in Meta Vision.
- If drainage exceeds 100mL/hr, inform ICU and Cardiothoracic teams.
- Monitor chest drains for any significant decrease in output and/or presence of clots. Accompanied by haemodynamic instability, this could be a sign of cardiac tamponade, which is an emergency situation.
- Chest drains can be removed on day 1 provided drainage is less than 100mls over 4 hours. Removal must be documented on Meta Vision by the Cardiothoracic team.
- Drains must be removed with 2 RNs - one pulling out the drain, the other assisting with pinching the wound shut and applying steri strips. An occlusive dressing is applied to site. Refer to CHS procedure Intercostal Catheter Management.
- CXRs must be performed immediately post ICC removal and reviewed by the Medical Officer.

#### Fluid Input

- Maintenance fluid at 1mL/kg/hr of:
- 5% Dextrose with 30mmol KCL & 20Mmol MgSO<sub>4</sub>
- 4% Glucose & 0.18% Sodium Chloride with 30mmol KCL
- 4% glucose & 0.18% Sodium Chloride solution
- Fentanyl PCA for analgesia. Clinician override bolus to be used to treat pain until the patient is able to cooperate and respond. Document boluses on pain management tab on MetaVision.
- Propofol infusion, decrease rate on return from OT, aiming for extubation within 4-6 hours.
- Administration of fluid boluses is based upon on patients' clinical condition and hemodynamic parameters and end organ perfusion.

#### Fluid Output

- Measure and document hourly urine output. Maintain at 0.5mL/kg/hr to 1.5mL/kg/hr. Notify ICU medical team if urine output drops.
- NGT on free drainage, removed on extubation.
- Hourly ICC output.
- Monitor fluid balance hourly.

#### Analgesia

- Assess patient's pain and sedation score and aim for score of 0-1 (RASS scale) to wake, wean and extubate.
- The Numerical Rating Scale (NRS) (1 to 10) can be used for the awake patients in ICU who can self-report their pain.
- Administer adequate analgesia to keep patient comfortable and to enable adequate deep breathing and coughing.

#### CONCLUSION:

Cardiothoracic surgery includes all surgical procedures that involve the heart, lungs and great vessels. including mechanical and tissue valve replacement or repair, Coronary Artery Bypass Grafts, lobotomies, and aortic repair. The post-operative management and care of patients undergoing cardiothoracic surgery has significant implications on their recovery. This clinical guideline has been developed in accordance with recent recommendations from American and European Cardiothoracic surgery societies and covers the initial handover, assessment, and immediate care of a post-operative cardiothoracic patient in Intensive Care, as well as their follow up care on the ward.

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