Guideline Title: Cardiac Surgery Post-op Care

Summary:
Patients who have undergone cardiac surgery are at risk of developing bleeding, infection, pain, arrhythmias, respiratory failure, wound complications and fluid and electrolyte disturbances. This guideline outlines the prevention, assessment, monitoring and intervention to manage and care for patients in the post operative period.

Approved by: ICU Medical Director
Publication (Issue) Date: February 2016
Next Review Date: February 2019
Replaces Existing Guideline: Care of Post-op Cardiac Surgery Patient

Contents:
1 Background information and introduction
2 Abbreviations
3 Policy statement
4 Principles/Guidelines

Background Information:
The use of cardiopulmonary bypass distinguishes cardiac surgery from other types of surgery. It also introduces a unique set of potential postoperative complications. These include vasodilation, coagulopathies, vasospasm, altered platelet-endothelial cell interactions, and a generalised inflammatory response due to blood contacting the synthetic surfaces of the bypass equipment. The result is low flow in the microcirculation of the heart, brain, and other organs, which may lead to organ dysfunction. Therefore, patients who have undergone cardiac surgery will require continuous monitoring and interventions for mechanical ventilation, maintenance of cardiovascular and metabolic stability and other advanced levels of care.

1. Introduction:
The risk addressed by this policy:

Patient safety, treatment and management

The Aims / Expected Outcome of this policy:
Clinical staff will have the knowledge and skills to assess and care effectively and safely for a post operative cardiac patient in the intensive care unit.

Related Standards or Legislation
NSQHS Standard 1 Governance
Related Policies:
LH_ICU_PD2014 Emergency Resternotomy in the ICU
LH_ICU_PD2014 Pulmonary artery catheter Management
LH_ICU_PD2015 Epicardial Pacing
LH_ICU_PD2015 Transfer of cardiothoracic patient from ICU to cardiothoracic ward
LH_ICU_PD2015 Wound Management Post Cardiothoracic surgery
LH_ICU_PD2014 Airway Management
LH_ICU_PD2014 Bed Area Management
LH_ICU_PD 2015 Pain Assessment and Analgesia
LH_ICU_PD2014 Intercostal Catheter Insertion and management
LH_ICU_PD2014 Receiving a Patient into ICU

2. Abbreviations
CT – Cardiothoracic
MAP – Mean arterial pressure
NG – Nasogastric
CVP – Central venous pressure
PAP – Pulmonary artery pressure
ICU – Intensive care unit
PAC – Pulmonary artery catheter

ETT – Endotracheal tube
PA – Pulmonary artery
UWSD – Under water seal drain
PCA – Patient controlled analgesia
CI – Cardiac index
OT – Operating theatres

3. Policy Statement:
- All care provided within Liverpool Hospital will be in accordance with infection prevention/control, manual handling and minimisation and management of aggression guidelines.
- Priority of nursing care will be Airway, Breathing, Circulation, and Disability.
- There must be a nurse, an ICU doctor and an Anesthetist at the bedside to receive full clinical handover.
- The process for admitting a patient into the ICU will be followed: LH_ICU_PD2014 Receiving a Patient into ICU
- Check air entry, ETT position, cuff pressure
- Alarms on the monitor and ventilator must be set.
- Hourly observations and documentation of the ventilator parameters must occur:
- The pulmonary artery catheter must be managed by a registered nurse who has completed the appropriate education and competency or is supervised by an educator.
- If the PA catheter spontaneously wedges or will not wedge only staff who are accredited are able to “float” PAC into position.
- The PAP must be transduced and monitored at all times.
- Cardiac output studies must be attended post operatively and then as indicated by the patient’s haemodynamic status.
- Hourly haemodynamic observations and documentation must occur:
- All infusions must be checked
- If patient has epicardial pacing wires insitu observations must be attended and documented on the Pacemaker observation chart 2nd hourly
- The UWSD must be attached to 20cm H₂O suction
- Hourly observations and documentation of UWSD output and if over 100mL for one hour the ICU doctor must be informed.
- ICC connections must be checked for leaks and secured with brown tape
- ECG, CXR and pathology must be attended post operatively
- Patient must not be turned or suctioned unnecessarily for 4 hours post operatively
- Sternum must be supported at all times when patient moving or coughing
- Bandages to graft sites must be removed Day 1
- Arterial, CVP and PAP transducers will be leveled to the phlebostatic axis (4th intercostal space, mid axilla line)
4. Principles / Guidelines

PREPARATION OF BED and BED AREA:

Bed preparation checklist
- MMS (Multi Measurement Module)
- Transport monitor
- 3 x pressure cables
- ECG cable
- \( \text{SpO}_2 \) cable and finger probe
- Pressure bag
- Transducer holder
- Laerdal bag
- Oxygen cylinder, full
- 2 x IV poles
- 4 x syringe drivers
- 1 infusion pump
- 2 bed poles
- ETCO\(_2\) monitoring

Bed Area Preparation:
- Ventilator checked and tuned on, set up with appropriate settings and ready to connect
- Emergency equipment checked and working
- 1Litre 4% glucose + 0.18% sodium chloride+20mmol MgSO\(_4\) (maintenance fluid)
- Cardiac Output module and cable
- 12 lead ECG cable
- Suction canisters, tubing and outlets x2
- Pathology tubes, for EUC, FBC, LFT, CMP, COAG, CKMB, Troponin
- Paperwork: flowchart, medication chart, pathology result chart
- Protamine 100mg IV ampoule
- Sodium nitroprusside 100mg IV (2 x 50mg vials)
- 0.9% sodium chloride for fluid boluses
- Chest clamps
- Notify ICU doctor when 20minute pre-admission call received

ASSESSMENT AND IMMEDIATE POST OP CARE^2
- There should always be two nurses, an ICU Doctor, Anaesthetist and Cardiothoracic surgeon at the bedside to receive a full clinical handover on the patient.
- Priority of nursing care is: Airway; Breathing, Circulation then Disability.

Role of the nurse:

Nurse 1
- Connect ECG, ART, PAP and \( \text{SpO}_2 \) modules and cables to bedside monitor
- Zero and level pressure transducers and modules
- Monitor and manage HR, BP, CVP, PAP, and \( \text{SpO}_2 \)
- Receive handover from anaesthetist and OT nurse
- Check alarms are on and limits set appropriately
- Check all infusions are correctly labelled and running via appropriate lumens and at desired rates
- Connect maintenance fluids, give protamine 100mg IV, if ordered (see pharmacology guidelines)
- Check Pulmonary artery catheter
  - Check position of PA catheter as per black markings at insertion site (usually between 50-60cms) and record on flowchart
  - Check catheter is wedging and secure catheter to patient’s chest
  - Check that PA trace on monitor is a pulmonary artery trace
- Check Pacemaker
  - Change pacemaker from Biotronic to Medtronic pacemaker
Check pacing wires are secured in the connector block and the lead pins are tight in the pacemaker
- Check correct polarity of lead pins, blue to blue and red to red
- 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
- Check pacemaker settings are on
  - Mode DDD,
  - Atrial Output : Double the threshold and add 1 as safety margin
  - Atrial sensitivity 0.2mV
  - Ventricular output : Double the threshold and add 1 as safety margin
  - Ventricular sensitivity 2.0mV
  - Thresholds can be done later if the patient is stable
  - If the patient has an underlying rhythm, perform 12 lead ECG when patient stable

- 12 lead ECG
- Cardiac output studies attended

**Nurse 2**
- Ensure ventilator is off standby
- Connect patient to ventilator after confirming ventilator settings with Anaesthetist and ICU Doctor
- Assess patient airway, ensure ETT secure and check cuff pressure
- Assess patient’s breathing, auscultate chest, attach ETCO₂ monitor
- Check ETT position and cuff pressure
- Attach suction to UWSD to 20cmH₂O, check drainage, bubbling and oscillation
- Attend to NG aspirate, insert anti reflux valve and place on free drainage
- Warming device e.g. Bair hugger, if temperature is less than 35°C
- Attend to pathology - ABG, UEC, LFT, CMP, FBC, COAG, CKMB, Troponin
- CXR
- Document observations
- Family in to visit when appropriate

**POST OPERATIVE OBSERVATIONS AND CARE**
All observations are attended hourly until extubation, then second hourly if stable.

**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 / Pressure Support
  - FiO₂ 50% (Titrated to saturation above 95%)
  - TV 6 - 8mL/kg
  - RR 12 bpm
  - PEEP 5cm H₂O
  - PS 10cm H₂O
  - I. Time 1.7secs
  - Rise Time 0.2secs
  - Flow Trigger 1 L/min

- Check and set all ventilator alarms
  - Airway pressure limit – 10cmH₂O above pt’s airway pressure
  - Respiratory rate – 10bpm above patient’s respiratory rate
  - Apnoea – alarm on, set at 20secs

- Check ABG on return from OT and when clinically indicated
- Perform suctioning as clinically indicated. Avoid suctioning in the first 4hrs due to increased intra thoracic pressures which could dislodge grafts
- All patients that are haemodynamically stable with no bleeding can be considered for extubation 4-8 hours post operative
**Circulation:**
- All observations attended hourly until extubated then second hourly if stable.
- Limb observations of the graft site limb should be performed and documented hourly.

**Heart Rate:**
- 12 lead ECG post op, when rhythm changes and when ST segment alarms sound. If stable then daily @ 0600hrs.
- Maintain heart rate 70 - 90 bpm
- Check ST segment settings and ST alarms are turned on
- Monitor for arrhythmias and manage according to ICU protocols and ARC Resuscitation guidelines
- Monitor electrolytes and replace as indicated keeping MgSO$_4$ >1.0mmol/L and K+ >4.0mmol/L
- If patient is paced, check connections, rate, mode, AV delay, and sensitivity and output thresholds. Document settings on pacemaker observation chart.
- If patient is paced and not haemodynamically compromised, 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
- If pacing wires not in use, then wrap in gauze.

**Blood Pressure:**
- Monitor systolic, diastolic and MAP via arterial line
- Maintain MAP between 70 – 90 mmhg
- Use fluid boluses, inotropes and vasopressors (as prescribed) as indicated by patient’s clinical status and cardiac output studies
- May consider using anti-hypertensives or sodium nitroprusside if MAP persistently > 90mmhg
- GTN 50mg in 500mL 5% glucose at 10mL/hr used to prevent vasospasm of new grafts (not indicated for control of BP).

**Pulmonary Artery Catheter (PAC):**
- Check position of PA catheter at insertion site and on CXR (1-2cm left of mediastinal border).
- PA alarms always on: set systolic alarm 10mmHg above pt’s systolic and diastolic to detect catheter wedging.
- Maintain normal pulmonary pressures according to each patient as those with valve surgery or stenosis or pulmonary disease may be elevated.
- Perform PAWP as clinically indicated, to assess patient’s filling status.
- Perform cardiac output studies on return from OT as a baseline.
- Repeat when there is a change in clinical status, inotropic requirements and fluid status to assess contractility, systemic vascular resistance and stroke volume
- Secure PAC to patient’s chest with clear occlusive dressing
- Regularly observe trace to ensure the catheter has not migrated and become wedged
- If trace indicates spontaneous wedging or will not wedge only staff who are accredited are able to “float” PAC into position; a wedged PAC requires immediate intervention.
- For further PAC information see Pulmonary Artery Catheter learning package and Guideline
- THE PULMONARY ARTERY CATHETER MUST BE TRANSDUCED AND MONITORED AT ALL TIMES
PULMONARY ARTERY CATHETER

**Limb Observations**
- Hourly circulation observations on legs and/or arms that were used for graft sites
- Colour, warmth, movement, strength, capillary return, sensation

**Neurological status**
- GCS, limb strength and pupillary assessment attended when vital signs are assessed.
- Immediately report variances from pre-operative status for further investigation as the incidence of embolic stroke increases with older patients and those with co-morbidities following cardiac surgery.
- Patients presenting post-operatively with new confusion and agitation/delirium/post-pump psychosis/combative ness should be investigated for neurological compromise and followed-up appropriately by a neurological team.

**Chest Drains**
- ICC should be secured to the patient and all connections secured with brown tape
- Connect ICC to the UWSD with suction of –20cmH₂O
- Observe for oscillation, bubbling and drainage
- Drainage should not exceed 100mL/hr, if so inform ICU medical team and CT team
- Assess drainage for clots, if drainage ceases and patient haemodynamically unstable patient may be tamponading. Inform ICU and CT teams urgently.
- Can be removed Day 1 provided drainage is less than 100mL over 4 hours
Fluid Input  
- Maintenance fluid of 4% glucose & 0.18% sodium chloride solution & 20mmol MgSO4 at 1mL/kg/hr.
- GTN (50mg/500mL 5% glucose) at 10mL/hr used to prevent vasospasm of the new grafts. This is weaned at 05.00hrs on Day 1 - 8mL/hr at 05.00hrs, 5mL/hr at 06.00hrs, 3mL/hr at 07.00hrs and off at 08.00hrs.
- Fentanyl infusion for analgesia, reduce rate on return from OT and titrate according to pain score: use a visual score (faces) for patients able to cooperate and respond or use the behavioural score in patients unable to cooperate.
- Propofol infusion, decrease rate on return from OT.
- Hourly total of all infusions
- Administration of fluid boluses is dependant on:
  - CVP, PAP, PAWP, CI
  - BP
  - Temperature
  - Left Ventricular function
  - Urine output

Fluid Output  
- Measure and document hourly urine output, maintain at 0.5mL/kg/hr to 1.5mL/kg/hr; if not report to ICU Doctor
- NGT on free drainage, removed on extubation
- Hourly ICC output
- Perform hourly total of all fluid loss

Analgesia  
- Assess patient’s pain and sedation score and aim for score of 0-1 (RASS scale) to wake, wean and extubate
- For those patients that are unable to self-report, the Behavioural Pain Scale (BPS) and the Critical-Care Pain Observation Tool (CPOT) are the most valid and reliable behavioural pain scales for monitoring pain in adult ICU patients.
- The Numerical Rating Scale (NRS) (1 to 10) and the Faces Pain Scale (0 to 10) have been validated for acute pain only and not in mechanically ventilated patients in the ICU. They 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
- Once patient extubated commence Paracetamol, Oxycontin and PRN oxycodone. If oral analgesia is inadequate commence PCA as prescribed by ICU Medical officer or pain team

Diet  
- NBM till extubated then ice to suck
- Day 1 patient commenced on clear fluid with 1500mL fluid restriction
- Day 2 commenced on low saturated fat no added salt diet and maintain fluid restriction.

Positioning  
- Position patient head up at least 30 degrees after CXR
- Patient may be turned 4 hours post op if stable and no bleeding
- Pressure area care 2-4th hourly, including heels
- Patient must support sternal wound when moving, coughing by folding arms across chest and limit arm movements to maintain sternal stability
Wound Care\textsuperscript{2, 3, 6}
- Sternal wound and graft sites dressed with hydrocolloid dressing and remains intact unless oozing blood
- Bandages and drains on leg graft sites removed day1 and where prescribed; TEDS applied. Limb observations must be performed and documented
- Drawings to CVC and PA sheath sites to remain dry and intact
- ICC drains dressing to remain dry and intact. Occlusive dressing applied to ICC sites post drain removal
- Pacing wires to be wrapped in gauze if not in use
- For detailed wound care see Guideline: Wound management Post Cardiothoracic Surgery

Intravenous Lines
- Arterial, pulmonary artery catheter, CVC, large bore cannulas: All lines to be dry and intact and dress PRN second daily
- Large bore CVC for blood products and fluid boluses
- Side arm off PAC sheath for maintenance fluid

Medications\textsuperscript{2, 3, 6}
- Protamine 100mg in 100mL maintenance fluid over 1 hour given to all on pump patients to reverse heparin. Consult Anesthetist on return from OT as to whether routine dose to be given
- Antibiotics – cephazolin 1g 8th hourly IV until drains removed. Vancomycin 1g IV twice daily if in hospital patient or from another hospital till drains removed
- Anticoagulation – aspirin 150mg given in evening of Day 0 for off bypass patients. On bypass patients commenced on heparin and aspirin Day 1. Warfarin commenced on valve patients Day 1 or as per surgeon
- Vasodilators – sodium nitroprusside (SNP) used if MAP consistently over 90mmHg to prevent dislodgment of grafts (see cardiac pharmacology at end of cardiac surgery package)
- Glyceryl Trinitrate (GTN) 50mg in 500mL 5% glucose @ 10mL/hr used to prevent vasospasm, not for BP control
- Vasopressor – noradrenaline 4mg in 50mL 5% glucose to maintain MAP above 70mmHg.
- Milronone is used commonly as an inodilator to increase cardiac output in patients with impaired ventricles to give a cardiac output greater than 2.0L/minute.
- Verapamil: (Dr Dignan patients only Radial and BIMA grafts): Verapamil at 0.2mcg/kg/min on arrival from OT. Maintained until Day 1 unless BP low or noradrenaline required. Day 1: Diltiazem 30mg TDS if SBP < 120mmHg or Diltiazem CD 180mg if SBP > 120mmHg, commenced at 0800 and Verapamil infusion ceased

Hypothermia\textsuperscript{2, 3, 6}
- Causes post op shivering, a decrease in myocardial contractility, ECG changes, vasoconstriction and diuresis.
- Re warm patient slowly as warming too quickly may cause vasodilatation and decrease in SVR.
- Pethidine 25mg may be given to stop shivering.

Pathology\textsuperscript{6}
- ABG, FBC, Coag, UEC, CKMB, Troponin done immediately post-op and daily till Day 2 and results corrected as needed
- Troponin T can be as high as 300-600ng/mL post cardiac surgery. If it is >1000ng/mL should raise concerns unless that high pre-operative. (AF ablation may be as high as 2-3000ng/mL). Notify surgeons if greater than 1000ng/mL
- Maintain K+ above 4.0mmol/L to prevent arrhythmias and MgS04 above 1.0mmol/L to prevent atrial fibrillation
- 6-8 hourly bloods Day 1 then daily if stable
- **BGL** second hourly if on insulin infusion
- Mixed venous blood gas sample taken from PA lumen to assess the adequacy of the patient’s tissue oxygenation. Can be an early indicator that the patient’s condition is deteriorating. Should be greater than 65% $\text{SvO}_2$.

**Physiotherapy**

- Suctioning not attended until patient 4hrs post op to prevent unnecessary coughing which may dislodge new grafts
- Suctioning then done PRN
- Patients who are haemodynamically stable and have no bleeding can be considered for extubation 4-6 hrs post-op
- Once extubated deep breathing and coughing is encouraged 2nd hourly to re-expand the lungs and prevent atelectasis
- Always encourage patient to splint sternum with towel when coughing and moving to prevent sternal breakdown
- Education on not using arms to lift themselves
- Sit out of bed and mobilise on Day1
- Teds to both legs as prescribed.

**DAY 1 & DAY 2 Observations**

- On day 1, provided the patient is stable and after patient is decannulated, second hourly observations are recorded on the ICU flowchart or the ward observation chart and are as follows:
  - BP (mean, S/D)
  - HR and rhythm
  - Temperature, and
  - SpO2
  - GCS, limb strength and pupils
- Hourly recordings of urine output; blood loss/chest drainage; blood/colloid replacement; and auto-transfusion, are recorded on the ICU flowchart.
- Limb observations of the graft site limb should be performed and documented 2nd hourly.

**Fluids**

- Day 1- IV fluids continue at patient’s body weight.
- GTN is ceased as per ICU drug guideline
- Analgesia is changed to PCA, plus oral
- If still in ICU at midnight of Day 1, the IV maintenance fluid is ceased or decreased to 10mL/hr. This decrease in IV fluids is implemented only if the patient is tolerating oral fluids and their urine output is adequate.
- A fluid restriction of 1500mL is imposed on these patients for the first two days.
- Oral intake should be encouraged ensuring if oral intake increases that IV intake must be decreased.

**Chest Drains**

- Usually removed on day 1, provided the drainage is less than 100mL over a four hour period and the patient is sitting upright to promote chest drainage.
- Drains removed with 2 RNs - one pulling out the drain, the other tying the purse string suture. An occlusive dressing applied to site
- CXRs must be reviewed post drain removal by the Medical Officer.

**Decannulation**

- Routinely performed on Day 1 after the Intensivist and Surgical rounds, providing the patient is haemodynamically stable
- Arterial line: removed prior to transfer to ward (day 1 or day 2) if ABGs are satisfactory and after all routine bloods have been taken.
• Pulmonary Artery Catheter and sheath are removed Day 1, providing the patient no longer requires monitoring. The introducer sheath remains in place until Day 2 and is then removed.
• Triple lumen catheter: removed before the patient goes to ward unless otherwise requested by ICU Doctor.
• Left peripheral line: removed Day 1 if not required for IV access.
• Right peripheral line is removed if the GTN infusion has been weaned and ceased.
• If patient has only the sheath in with an infusion going then ensure that a peripheral line is left in for IV access.
• IDC removed Day 2, 06.00hrs.

Wounds
• Dressing to chest to remain intact with hydrocolloid dressing unless oozing.
• Bandages to legs to be removed and re-dressed with comfeel if oozing.
• Teds to both legs if patient ambulant (and if requested/prescribed by ICU Doctor/Surgeon). If patient in bed for prolonged periods use calf compressors.
• Pacing wires wrapped in gauze if not in use. Removed day 2-5.

General
• Education is given to the patient on the importance of physiotherapy to re-expand lungs, supporting chest when coughing and moving, document education provided.
• Pressure area care if patient in bed or sitting in chair.
• Pt to sit out of bed Day1.
• Clear fluids day 1, light diet day 2, 1500mL fluid restriction.

CPR on a post – op Cardiothoracic patient
• See management of Arrhythmias Guideline for detailed management of arrhythmias.
• MET call and CTOT.

EJCTS guideline for resuscitation of a patient who arrests after cardiac surgery
• Commence Advanced Life Support techniques as per ARC guidelines
• Defibrillate patient if in Shockable rhythm
• Commence Cardiac compressions on patient with no output
• Sternotomy patients need less pressure to generate cardiac output and should be done gently using arterial pressure trace as a guide
• Continue Advanced Life Support techniques as per ARC guidelines

CPR on Post op Cardiothoracic patient with an Open Sternotomy
• MET call and CTOT
• Commence Advanced Life Support techniques as per ARC guidelines
• Defibrillate patient if in Shockable rhythm
• Prepare patient and equipment for Medical staff to open sternal wound dressing
• Internal cardiac massage should only be delivered with a two- hand (“clapping”) technique
• The wrists of the Medical Officer are placed together at the apex of the heart, and the heart is squeezed together between the two open palms in a rhythmic motion. The thumb of each hand is maintained adjacent the first finger to avoid inadvertently pushing them into the heart. (See Figure 1 below)
• Internal cardiac defibrillation is performed with the defibrillator initially set at 10joules
• Repeat defibrillation is performed, as needed, at 10 to 50 joules.
• One of the internal paddles is placed on the anterior (ventral) surface of the heart and the other is placed on the posterior (dorsal) surface of the heart. See Figure 2
• As with external defibrillation, all personnel should be well away from the patient prior to defibrillation to prevent inadvertent electric shock and avoid blood splatter
• Continue as per ARC guidelines until Cardiothoracic team arrive

Figure 1: Open chest cardiac massage is performed with the heart compressed between the palms of both hands. Cardiac compression with one hand should be avoided because the pulmonary outflow tract is vulnerable to penetration by the thumb.

Figure 2: wjes.org
One internal paddle is placed on anterior surface and one on posterior surface of heart
5. **Performance Measures**

All incidents related to management and care of the post op cardiac patient will be documented using the hospital electronic reporting system: IIIMS and managed appropriately by the NUM and staff as directed.

6. **References / Links**

3. Postoperative Critical Care of the Adult Cardiac Surgical Patient: Part II: Procedure Specific Considerations, Management of Complications, and Quality Improvement
4. R. Scott Stephens, MD; Glenn J. R. Whitman, MD. [www.ccmjournal.org](http://www.ccmjournal.org) September 2015, Volume 43, Number 9
5. LH_ICU_PD2014 Intercostal Catheter Insertion and management Guideline
6. LH_ICU_PD 2015 Pain Assessment and Analgesia Guideline
7. Clinical Pathway Coronary Artery Bypass Graft. SWSLHD. CR122.86

**Author:** ICU – CNE (P. Nekic)

**Reviewers:** ICU – CNC, CNE, NM, NUM, Staff Specialists, CNS’s, Cardiothoracic Surgeons

**Endorsed by:** ICU Medical Director – Prof Michael Parr