CARDIAC PATIENT: POST OPERATIVE SURGICAL CARE ON THE WARD - CHW

PRACTICE GUIDELINE ©

DOCUMENT SUMMARY/KEY POINTS

- Negotiation of transfer to ward from Paediatric Intensive Care Unit (PICU), Close Observation Unit (COU), Neonatal Intensive Care Unit (NICU) or Recovery should take place between the team leaders in all units.
- All transfers should be reviewed by cardiac resident/ registrar on arrival to the ward, or if after hours, by the senior on site registrar.
- Record vital signs on the Between the Flags (BTF) chart, ensuring findings are within normal parameters for age group.
- Depending on cardiac defect, patient's oxygen saturations may not be within normal range on the BTF chart. Consult with cardiology team to establish target oxygen saturation for individual patient and administer oxygen with caution. If patient's vital signs are not within normal parameters, ensure altered criteria documented and reviewed every 48 hours.
- Establish preferred limb for blood pressure readings dependent on type of cardiac defect.
- Abide to fluid restriction and liberalise as per cardiology team.

Approved by:	SCHN Policy, Procedure and Guideline Committee	
Date Effective:	1st October 2023	**Review Period**: 3 years
Team Leader:	Clinical Nurse Educator	**Area/Dept**: Edgar Stephen Ward

Date of Publishing: 22 September 2023 11:14 AM Date of Printing: 22 September 2023

CHANGE SUMMARY

- Due for mandatory review – no major changes made however the entire document should be re-read as minor changes have been made throughout.

READ ACKNOWLEDGEMENT

- Training/Assessment Required – Clinical Nurse Educator to facilitate appropriate training and supervision in relevant ward.
- All clinical staff caring for post-operative cardiac patients are to read and acknowledge they understand the contents of this document.

TABLE OF CONTENTS

1 Introduction

The purpose of this document is to outline the optimal care and observation a postoperative cardiac patient requires after transfer to the ward. Regular assessment and clinical judgment is necessary in detecting possible complications and preventing adverse outcomes in this high risk group of patients.

Abbreviations

HR – Heart Rate

TPR – Temperature, Pulse, Respiratory rate

BP – Blood Pressure

CXR – Chest X-Ray

ECG – ElectroCardioGram

Echo – Echocardiogram

GCS – Glasgow Coma Scale

IV – Intravenous

NG – Nasogastric

MCT – Medium Chain Triglyceride

CNC – Clinical Nurse Consultant

PCA – Patient Controlled Analgesia

NP – Nurse Practitioner

2 Negotiating transfer to ward

The following process should be followed when negotiating for the transfer of the cardiac patient from the Paediatric Intensive Care Unit (PICU), Close Observation Unit (COU), Neonatal Intensive Care Unit (NICU) or Recovery.

- Negotiation regarding time of transfer should occur between team leader in PICU/NICU/ COU/Recovery and team leader on ward. Consultation may be required with the on-service cardiology consultant.
- When negotiating time for transfer from PICU, COU or NICU, information should also be obtained at this time regarding what equipment the child is requiring, eg. B. Braun Space Infusion pump, oxygen cylinder, PCA infusion pump etc. Once this is established an appropriate sized cot/ bed should be prepared with the equipment attached. A porter should then be paged to take this to PICU, COU or NICU.

3 Set up

Prior to transfer of the child to your ward, check that the following have been prepared and checked:

- Check that the room has been cleaned and set up appropriately depending on isolation precautions and requirements.
- Check that the oxygen flow meter (0-15L/min) is in place and working.

- If patient requires high flow oxygen see SCHN Humidified High Flow Nasal Cannula Therapy practice guideline
- Check that high flow suction gauge outlets are working.
- If patient has a chest drain, ensure low suction gauge is attached and working.

Check that the emergency drawer beside bed is stocked. See page 12 of the Cardiopulmonary Resuscitation and equipment**:** Practice Guideline

- Enter patient data on monitor.
- Ensure appropriate size blood pressure (BP) cuff, Phillips monitor leads and oxygen saturation probe is available at bedside.
- IV Pole
- Vomit bags if patient is transferred from Recovery
- Post op pack containing combine, gauze and gloves for patients post cardiac catheter or electrophysiological studies (EPS).
- Bedside handover should involve the nurse transferring patient, the nurse accepting care of patient and the nursing team leader of the ward (if available). Nurse transferring patient to handover using ISBAR tool. Both the nurse transferring patient and the nurse accepting care of patient to sign bedside handover checklist on PowerChart once handover is complete and accepting ward is satisfied with patient.

4 Monitoring

4.1 All Patients from PICU, COU, NICU and Recovery

- On arrival to ward commence continuous ECG, respiratory rate and oxygen saturation, and hourly BP monitoring.

  Note: If the patient has a permanent pacemaker insitu, set the monitor to pacing and turn the respiratory measurement off. Keeping the respiration measurement on may affect the execution of pacing.[2] Refer to the Cardiac Pacing: Patient Management practice guideline for further information.
- Perform a head-to-toe cardiac assessment on arrival to the ward
- Ensure to check vital signs prior to receiving a handover on patient when transferred to the ward. Record these findings on the SPOC chart, ensuring findings are within normal parameters for age group as per the SCHN Between the Flags document.
- If patient's vital signs are not within normal parameters, ensure altered criteria documented and reviewed every 48 hours. If Chronic – the altered calling criteria will not reset during the patient's encounter/hospital visit.

Note:

- Depending on cardiac defect, patient's oxygen saturations may not be within normal range on the SPOC chart. Consult with cardiology team to establish target oxygen saturation for individual patient.
- **L or R Blalock Taussig shunts:** Do not take BP reading from the arm on the same side as the shunt, as these patients may have decreased blood flow to the corresponding limb.
- **Un-repaired Coarctation of the Aorta:** These patients will have higher pressures in the upper limbs with blood supply proximal to the obstruction. BP readings on the right arm will be the most accurate and appropriate both pre-operatively and post.

- Change oxygen saturation probe second hourly; please refer to SCHN Oxygen Therapy and Delivery Devices Practice Guideline
- Where required, ensure patient has a valid Altered Calling Criteria entered on the BTF chart on PowerChart on transfer to the ward.
- All patients should have a baseline rhythm strip printed and included in notes when transferred to ward and then one printed each shift if cardiac monitored. Sticky tape the vertical sides of the rhythm strips to the Non eMR Results Mounting Form and ensure date, time and lead are visible.
- Cardiac monitoring ceased when patient deemed to be stable by cardiac team.

4.2 Patients from PICU

- Hourly observations (HR, respiratory rate, BP, and oxygen saturations) and 4th hourly temperature checks are to be attended for 24 hours which can then be weaned to 4th hourly as per the cardiology team.
- Neurological observations: Baseline neurological observations should be done on transfer to the ward. These should be performed 4th hourly for at least 48 hours post – bypass.
- Patient reviewed by resident /registrar on transfer or senior on site registrar after hours. It is the responsibility of nursing staff to notify the appropriate person of need for review.

4.3 Patients from recovery

Half-hourly observations (HR, respiratory rate, BP and oxygen saturations) and 4th hourly temperature checks for 6 hours, then hourly HR, respiratory rate and 4th hourly temperature and BP overnight.

4.3.1 Patients post Patent Ductus Arteriosus (PDA) ligation

- Check pulses of all four limbs 2nd hourly for the first 6 hours.

4.3.2 Patients post vascular ring repair via thoracotomy

A vascular ring refers to a group of abnormalities of the aorta and its branches. It can cause breathing and feeding problems in infants and children. A true or complete vascular ring occurs when abnormal blood vessels form a circle around the trachea and oesophagus.

Only patients meeting the following criteria, can be admitted to the ward from Recovery.

- Weight ≥5kg
- No comorbidities

- Documented clearance from the cardiothoracic team, the cardiology team, an anaesthetist, and the ear, nose and throat (ENT) team to be safely managed on the ward.

Any patients with pre-operatively known airway compression should be clearly identified during handover.

4.3.3 Patients post insertion of permanent pacemakers (PPM) or implantable cardiac defibrillator (ICD)

- Please refer to the Cardiac Pacing: Patient Management practice guideline for specific guidelines.

4.3.4 Patient post EPS or cardiac catheter

- Please refer to the Cardiac Catheterisation: Interventional, Non-Interventional and EPS - CHW practice guideline for observation guideline and management.

Note:

A chest x-ray may be required post operatively as per cardiothoracic surgeon's orders. When receiving handover of the patient from recovery, ensure to discuss post-op orders and arrange for chest x-ray if required.

5 Provision of Pain Relief

- If patient is transferred to the ward with an opioid infusion, patient controlled analgesia (PCA), nurse controlled analgesia (NCA), regional and wound catheter infusions, or epidural infusions, the transferring nurse is to check the order, pump, and syringe/bag with the nurse receiving the patient during handover.
- Refer to CHW Pain Management Practice Guidelines.

6 Intake/ Output

- Abide to fluid restriction and liberalise as per cardiology team.
- Involve dietician, speech pathologist and/ or lactation consultant if there are concerns with feeding .
- If nasogastric tube in situ refer to CHW Enteral Feeding Tubes and Administration of Enteral Nutrition Practice Guidelines for nursing management.

- Daily weights are required for all cardiac patients unless told otherwise by cardiology team. Bare weight should be performed post diuretics, before feed/ breakfast, and before cardiology ward round where possible.

7 Oxygen Therapy

- Oxygen is a potent pulmonary vasodilator and can be detrimental to children with congenital heart disease, particularly those who have an unrepaired cardiac defect.[1] Oxygen should therefore be used with caution in conjunction with medical review.
- Refer to SCHN Oxygen Therapy and Delivery Devices Practice Guidelines

8 Chest drains

- Always ensure drains are secured to avoid possibility of dislodgement.
- Ensure ordered level of suction is maintained.
- Refer to SCHN Chest Drain Practice Guidelines

9 Temporary pacing wires

- Children who have an arrhythmia which compromises their cardiac output may require temporary pacing.
- Ensure children who are paced are on continuous cardiac monitoring and assessed hourly to check rhythm and cardiac output.
- The transferring nurse is to check the order against the pacing box with the nurse receiving the patient during handover.
- Hourly documentation on Temporary Pacemaker – Nursing on Interactive View and I&O.
- Secure wires effectively and check sites hourly to minimize the risk for dislodgement
- Rubber gloves should always be used when handling pacing wires to prevent static electricity passing down the wires and causing micro-shocks.
- Refer to SCHN Cardiac pacing: Patient management Practice Guidelines

10 Allied Health

10.1 Physiotherapy/ Ambulation

- Chest physiotherapy is important in the post-operative period to prevent postoperative pulmonary complications.[3]
- Ambulation with assistance and sitting upright out of bed is also important and should be encouraged as soon as possible.
- Patients should not be lifted under the arms for the first 6 weeks post operatively to minimise pain and to allow the sternum to mend. Sternal precautions should be cleared by the cardiothoracic NP and/or the cardiothoracic surgeon.
- Encourage patient to support the chest when coughing. This can be done by holding a folded towel, firm pillow, or soft toy to chest. The purpose of this is to stabilise the thoracic cage and reduce stress on the surrounding tissue.[4]
- The child should be assessed for analgesia requirements prior to physiotherapy.
- Referrals can be received via Power chart by the treating medical team.

10.2 Speech Pathology

- Patients who undergo an aortic arch reconstruction via sternotomy require an automatic referral to the Ear, Nose and Throat (ENT) team due to a risk of developing Vocal Cord Palsy (VCP) or feeding/swallowing issues. This includes severe coarctation with arch hypoplasia, interrupted aortic arch, Norwood procedure and Yasui procedure. These patients need a routine nasendoscopy when extubated, on minimal non-invasive support and clinically stable.
- Patients who undergo an aortic arch reconstruction via thoracotomy require a referral to the ENT team if they are symptomatic (e.g. weak cry, stridor).
- If VCP is identified by the ENT team or if other co-morbidities/complex medical course predispose the child to feeding/swallowing issues, a referral to Speech Pathology is required.
- If no VCP or other risk factors are identified, referral to Speech Pathology should be based on signs and symptoms of swallowing difficulty.
- Patients who undergo vascular ring repairs via thoracotomy do not qualify for an automatic referral to the ENT team or Speech Pathology. Patients with vascular ring often have feeding issues that persist postoperatively. Nursing staff should closely observe feeding and have a low threshold for escalation of feeding difficulties to Speech Pathology to review if deemed necessary.
- Referrals can be made via Power chart by the treating medical team.
- Refer to the Algorithm for Assessment and Management of Neonatal Vocal Cord Dysfunction after Cardiac Surgery.

10.3 Dietitian

- The dietitian's role is to assess the patient's feeding tolerance, feed regimen, weight gain, oral intake, growth and clinical progress before and/or after surgery. Dietitians will implement feed plans that includes the volume, frequency, duration, route and concentration of feeds based on the patient's total fluid restriction approved by the cardiology team.
- Referrals are received via Power chart by the treating medical team. Please page your Dietitian to inform them of the referral.
- A weight and height measurement of children – or weight, length and head circumference measurement of younger children – should be performed on a regular basis as part of providing good clinical care as per the Growth Assessment in Children Guideline. It is mandatory that patients have their weight and height measured and documented on admission and then weight measured weekly.
    - SCHN Height and Weight - Measurement of Infants, Children and Adolescents (2016-9007)
    - NSW Ministry of Health guideline Growth Assessment in Children and Weight Status Assessment in Adults [GL2017_021]
    - SCHN Nutrition Care (2012-9038)
- Nutrition screening is key to early identification of patients with nutritional problems which may go unrecognised and therefore remain untreated. The Nursing Nutrition Screening form on PowerChart is completed by nursing staff on admission to the ward and patients are rescreened weekly. Patients whose score is 'at risk' on a validated screening tool or whose clinical condition is such that their treating team identifies them as at nutritional risk should be referred to a dietitian for a full nutrition assessment and nutrition support as appropriate.
    - NSW Ministry of Health Nutrition Care [PD2017_041]
- A dietitian referral must be made for all patients with chylothorax to ensure optimal nutrition delivery for appropriate growth, development and recovery. The dietitian will provide nutrition education on how to eliminate fat from the diet and obtain adequate protein from fat free foods or supplements will be provided by dietitian.
- Refer to the Chylothorax Management – CHW Practice Guideline

10.4 Child Life Therapy

- Child Life Therapists promote positive coping in the post-operative period through the provision of opportunities for play and education
- The role of the Child Life Therapist includes the provision of:
    - Developmentally appropriate preparation for procedures
    - Procedural support and education around coping strategies
    - Therapeutic play sessions to support emotional wellbeing and encourage self-expression

- Developmental play sessions to promote continued growth and development and encourage mobilisation

- Child Life Therapists should be utilised for procedure support when available.
- Referrals are to be received via Powerchart by the treating medical team. In the case of urgent referrals for procedures, nursing staff can contact the Child Life Therapist on their pager or via Medtasker. Refer to the Child Life Therapy: Procedure Support Practice Guideline

Occupational Therapy

- Occupational therapists are best placed to provide comprehensive holistic developmental assessment and management of children at risk of developmental delay within the multidisciplinary team. This contribution includes consideration of the environment, collaboration with the child and family, developmental considerations and utilises a range of frameworks.
- Parental education and preparedness regarding developmental care, positioning and handling need, incorporating post-operative precautions.
- Parental education around supporting early attachment and bonding.
- Equipment prescription to support seating, self-care, and functional mobility.
- Upper limb review and management including splinting requirements.
- Referrals can be received via Power chart by the treating medical team.
- Patients may also be identified through ward or team meetings as requiring occupational therapy inputs.
- Refer to the Standardised Developmental Assessment Guidelines for Occupational Therapy – CHW Practice Guideline.

11 Wound Care

- Wound and dressing condition and observations should be assessed on each shift and accurately documented.
- Obtain wound swab if the site displays signs of infection and contact the cardiothoracic team for consultation.

11.1 Dressings

Sternotomy/ Thoracotomy dressings

- All sternotomy/ thoracotomy dressings are to be removed 7 days post operatively or on day of discharge whichever occurs first. The site should be cleansed with 0.9% sodium chloride or 0.1% chlorhexidine irrigation solution and left uncovered.

Permanent Pacemaker (PPM)/ Implantable Cardiac Defibrillator (ICD) dressings

- These dressings are to be removed 7 days post operatively. In the event that patient is discharged prior to this, contact cardiac CNC for discharge dressing plan.
- The incision site for an implantable device will be covered immediately with a dressing. This dressing can be removed on day 5 post-op. Once removed the wound should be cleaned in accordance with the Wound Assessment and Management Practice guideline.

11.2 Chest drain sites

- On transfer to the ward establish when the chest drains were removed. Assess chest drain sites each shift and change steri strips every 24 hourly.
- If chest drains remain insitu on arrival to the ward, refer to Chest Drain Practice Guidelines for dressing management.

12 Documentation

Documentation required when patient transferred to ward:

- History and diagnosis
- Airway
- Breathing
- Circulation
- Neurological
- Input/output
- Skin integrity and wound assessment
- Plan of care
- Social
- Other

- The transferring nurse is to check medication chart with the nurse receiving the patient during handover, ensuring all medications are charted and last dose given clearly documented in the Medication Administration Record (MAR).
- After arrival to the ward, use patient's current weight to print out a resuscitation drugs doses chart.

13 Possible complications

See table below for identification and management of possible complications post cardiac surgery. *This table does not presume to replace clinical judgement of management following complications. Always get a patient reviewed if patient is deteriorating.*

PROBLEM	SIGNS/ SYMPTOMS	POSSIBLE MANAGEMENT	RISK FACTORS
Pleural effusion	↑Respiratory Rate, ↓oxygen saturation, respiratory distress – head bobbing, nasal flaring, recession, tracheal tug	Medical review as per the Between the Flags (BTF) criteria Chest x-ray Monitor observations, including oxygen saturations and respiratory rate Cardiothoracic review - chest drain insertion	Post chest drain removal
Chylothorax	↑Respiratory Rate, ↓ oxygen saturations, respiratory distress, cloudy fluid draining from chest drain	Medical review as per the BTF criteria Monitor observations and Chest x-ray Drain specimen to pathology Dietician: Monogen/ MCT diet Medications Eg. Octreotide	Prior chylothorax or repeat sternotomy Elevated venous pressure Right heart dysfunction Venous thrombus Cavopulmonary anastomosis Genetic syndromes (e.g. Noonan's syndrome, Turner's syndrome) Post vascular ring repair
Cardiac tamponade	↑ HR, ↓BP, cool extremities, delayed capillary refill, reduced level of consciousness, arrhythmia, compensatory posture of sitting and forward, cardiac arrest	Medical emergency 2222 Contact cardiothoracic surgical team Tap drains vigorously (if insitu) Chest x-ray and Echocardiogram Do not leave patient Insertion of drain Cardiac monitoring	Non-patent thoracic drainage Sudden cessation of moderate chest drainage Bleeding
Congestive cardiac failure	↑HR, ↑Respiratory Rate, respiratory distress, sweaty, lethargic, poor feeding	Medical review Monitor observations Fluid restrict Rest - NG feeds Medications eg. Diuretics, inotropes	
↓ Cardiac output	↑ HR, ↓BP, slow capillary refill, pallor, cool extremities, mottled skin, weak peripheral pulses, lethargy	Notify team leader/ medical officer Cardiac monitor Bloods – watch for acidosis or ↑ lactate Echo	It is typically the result of impaired contractility during the first 12hrs postoperatively.
Stroke/ cerebrovascular accident	Altered level of consciousness, agitation, weakness, increasing headache	Notify team leader/ medical officer as per the BTF criteria Neuro observations – monitor GCS	The total duration of bypass time Cooling intra-operatively Duration of circulatory arrest
Pyrexia/Infection	↑temperature, ↑HR, redness/ pus at incision/ insertion site, poor feeding, lethargy	Blood cultures and IV antibiotics Wound swab Chest x-ray Urine culture Paracetamol	A temperature of > 37.5˚C is common after cardiac surgery. Pyrexia may be present because of: Low cardiac output and an inability to dissipate heat due to peripheral vasoconstriction Sepsis and/or pulmonary atelectasis
Arrhythmias	Abnormal rhythm/ rate, irregular rate, pallor, poor perfusion	Notify team leader and medical officer as per the BTF criteria *Cardiac monitor – assess rhythm. If medical emergency call 2222* 12 lead ECG/ Holter monitor Bloods – monitor electrolytes	Sinus tachycardia • Pain / agitation / fever • Low cardiac output • Hypovolaemia • Anaemia

		Administer medications as ordered Assess need for cardioversion/ pacing	• Seizures • Tamponade • Catecholamines (chronotropic effects) JET (Junctional Ectopic Tachycardia) • Usually early postoperatively • Temperature-sensitive; it is more likely to develop with a fever AV Block • Surgical injury • Peri-bundle oedema Slow Junctional Rhythm • May relate to oedema around conducting tissue Sinus Node Dysfunction • May result from surgical trauma, especially atrial surgery

Contact PICU Liaison service Page # 6664 if concerned about deteriorating child.
See SCHN **Cardiopulmonary Resuscitation and equipment** Practice Guideline and follow appropriate CERS Response related to patient observations as per **Between The Flags (BTF): Clinical Emergency Response System (CERS)** procedure.

14 Discharge Planning

- Discharge planning should be initiated as soon as patient is transferred to ward.
- If multidisciplinary team is involved in care of patient or ongoing community follow up or transport is required, the complex care team should be involved in discharge planning.
- If on medication(s), ensure internal and external scripts are written. Fax internal scripts to pharmacy and ensure parents collect medications prior to discharge. If patient is on numerous medications, ward pharmacist should be contacted to provide medication education to parents on the ward.
- The nurse discharging the patient needs to check the medications on the day of discharge and evaluate parents understanding.
- See table below for tests required prior to discharge based on surgery:

Test	Open Heart Surgery (bypass)	Closed Heart Surgery (non-bypass)	PDA Ligation/ Vascular Ring
ECG	☑		
Echo	☑	☑	☑
CXR	☑	☑	☑
Blood test	☑	☑	☑

- All sutures and dressings should be removed prior to discharge unless told otherwise. Parents should be educated on wound care if necessary. Notify cardiothoracic NP if further dressing is required. Parents should be advised to email the cardiac CNC SCHN-CardiacCNC@health.nsw.gov.au with a photo of the wound, their child's name and date of birth, if they have any questions or concerns about the wound.
- Follow-up appointments are to be made and details explained to parents.
- Assess the families' needs for home support.
- Nursing discharge summary completed and explained to parents.
- Medical discharge completed and given to parents or if not completed, will be posted to family.
- Parents given discharge information sheet / referred to Your child's cardiac surgery admission: Information Manual for Parents.

15 References

1. Walsh B. Smallwood C. Paediatric oxygen therapy: A review and update. Respiratory Care. 2017 Jun; 62(6): 645-661.
2. Philips. IntelliVue patient monitor MP20/30, MP40/50, MP60/70/80/90. Germany.
3. Odor P. Bampoe S. Gilhooly D. Creagh-Brown B. Perioperative interventions for prevention of postoperative pulmonary complications: Systematic review and meta-analysis. BMJ. 2020 Mar; 368: 540.
4. Ahmad A. Essentials of physiotherapy after thoracic surgery: What physiotherapists need to know. A narrative review. The Korean Journal of Thoracic and Cardiovascular Surgery. 2018 Oct; 51(5): 293-307.