



Insertion, Removal and Care of Temporary Transvenous Pacing Wire Procedure – Bunbury Hospital

Effective: 27 May 2022

1. Guiding Principles

The South West Health Campus is committed to providing safe and appropriate healthcare. All patients requiring a temporary pacing wire (TPW) can expect to have this procedure carried out safely and the TPW to be correctly inserted with minimal risk. The following document defines the role of the healthcare staff in providing this service and the procedure to be followed to facilitate a smooth safe process.

The procedure will be performed by the On-call Cardiologist at St John of God Healthcare Bunbury in the Interventional Cardiology Lab or in the Bunbury Hospital Emergency Department and Intensive Care Unit. Refer to [Appendix 1](#).

2. Procedure

In this procedure “transvenous pacing” refers to a method of temporary pacing. It is designed to maintain the patient’s heart rate in order to provide a satisfactory cardiac output. A bipolar wire is passed into the apex of the right ventricle via a venous access which is then activated by an external pacing generator. The recommended access sites are the internal jugular or the subclavian vein.

2.1 Safety information/guideline

- Electrical safety: A TPW provides an avenue through which a small but significant amount of current can be conducted directly to the heart which can potentially induce arrhythmias. For this reason, the following care should be taken:
 - the wires must be securely attached to a pacemaker lead or securely capped with insulating caps
 - gloves must be worn when handling wires directly to protect the patient from micro shock
 - patient should not shower or have a bath with a TPW insitu.
- Threshold testings must be performed by **a competent nurse or doctor**. It should be **tested daily and PRN**.
- Replacement of battery or TPM generator must be performed by two **competent nurses**.

2.2 Equipment

- Fully stocked **TPW box** (kept in ICU equipment room).
- Check **pacing generator** is operational prior to use. Insert a new 9V battery on every use.
- **Defibrillator and emergency trolley**. Apply and connect external pacing pads on patient if not already on.
- **Continuous cardiac monitoring**.
- Prepare **sedation** as requested and as prescribed.

2.3 Process

- Isoprenaline, Atropine, resuscitation trolley and Defibrillator (pacing capacity) at bedside.
- Explanation to patient and next of kin given, and consent taken by Doctor.
- Reassure patient throughout procedure.
- Connect patient to continuous cardiac monitoring.
- An IV access must be inserted and connected to a 500mls bag of normal saline infusion.
- Monitor and record vital signs every 5 -10 minutely. Ensure an ECG has been performed to confirm rhythm.
- Lie patient supine; shave subclavian and femoral area (Right and Left).
- Confirm chosen insertion site with Doctor (opposite side to intended PPM site, if required later).
- Ensure new battery is inserted into the pulse generator and functioning by turning it on. See instruction manual which is kept in the procedure box for guidance.
- Set pacing mode as prescribed by Doctor (VVI). Turn output to minimum.
- Assist the doctor with the insertion and maintain aseptic technique.
- Administer analgesia or sedation as prescribed by the doctor.
- Catheter contact with the right ventricular endocardial wall will show a Left Bundle Branch pattern.
- Notify the doctor of changes in the patient's cardiac rhythm. The presence of the pacing wire in the ventricles may initiate ventricular ectopic beats, ventricular tachycardia or ventricular fibrillation. Withdrawing the wire from the myocardial wall will usually terminate the rhythm (**exception – ventricular fibrillation will require emergency defibrillation**).
- Once the catheter position is confirmed, the doctor will advise the nurse to connect the pacing lead to the external generator. Confirm initial rate, output and sensitivity setting. Observe for pacing spikes on the ECG.
- Assist with the testing of pacing threshold and pacing sensitivity.
- Ensure wire is securely sutured to skin and apply large Tegaderm dressing over the site (loop the wire to prevent tension). **Do Not Tape over the junction box where pacing wire is attached and tightened. Observe rhythm throughout this procedure and ensure patient is pacing appropriately.**
- Reconfirm the pacemaker settings with the doctor and ensure they are documented in the ICU 24-hour flow chart (MR146A) and digitised medical record (DMR).

2.4 Post Insertion Care

- Maintain continuous cardiac monitoring, half hourly cardiovascular observation for one hour, then hourly thereafter.
- Activate pace detect on cardiac monitoring and check alarm settings.
- Chest X-ray (CXR) to be performed and reviewed by Doctor to confirm correct placement and to exclude pneumothorax. Patient is to be kept nil by mouth till x-ray has been reviewed.
- Ensure the generator is hanging in view on an IV pole by the patient side and educate patient to move cautiously.
- Perform post insertion ECG and daily ECG thereafter.
- Check insertion site for signs inflammation/infection and bleeding.

- Patient to remain on bedrest unless otherwise stated by Intensivist/ Doctor.
- All connections must be checked and secure.
- Sensitivity and pacing threshold must be checked daily and PRN. This can be done by the intensivist/competent doctor or a competent nurse with a doctor present in the unit. Ensure this is recorded on the ICU flow chart.
- Connect the side port of the TPW sheath to an infusion of IV normal saline 0.9% (500mls) at 3mls/hour (confirm instruction from Intensivist/doctor and ensure N/Saline is prescribed).
- The dressing around the site must be changed as per WACHS [Central Venous Access Device \(CVAD\) and Long Peripheral Venous Catheter \(Long PVC\) Management – Clinical Practice Standard](#).
- Ensure a spare generator and a spare battery are available at the bedside.
- At commencement of each shift and PRN check:
 - all connections
 - battery life (battery indicator)
 - pacemaker settings against prescribed settings/parameters
 - backup pulse generator settings.

2.5 Potential Complications of Temporary Pacing Wire Insertion.

Assess patients for signs and symptoms of complication:

- Bleeding around insertion site
- Arterial puncture and haematoma formation
- Pneumothorax
- Cardiac tamponade
- Lead displacement
- Local and systemic infection
- Diaphragmatic pacing
- Arrhythmias
- Failure to pace
- Failure to capture
- Failure to sense
- Accidental disconnection/fracture of pacemaker lead.

2.6 Sensing Threshold Testing

**Sensing threshold must be performed by a competent nurse or doctor.
An experienced doctor must be present in the unit during this procedure.**

Note: The sensing threshold is the least sensitive setting at which the Pacemaker can detect a heartbeat. To find the ventricular threshold, monitor the patient's ECG as you follow the procedure below.

Caution: Pacemaker dependant patients will have limited or no intrinsic

rate/rhythm. Note if the patient is still pacing at a set rate of 40b/min. A Doctor may reduce the set rate to 30b/min to confirm if the patient is Pacemaker dependant. Do Not perform the sensing threshold testing if this is the case.

- Set rate at least 10b/min below patient's intrinsic rate. This ensures non-pacing. Sense indicator flashes.
- Set **V OUTPUT** to 0.1 mA. This prevents risk of competitive pacing.
- Press menu key until menu 1 is displayed. Then, press SELECT key to highlight **V SENSITIVITY**.
- Decrease sensitivity: Slowly turn MENU PARAMETER dial counter-clockwise (increase mV value) until pace indicator flashes continuously and the sense indicator stops flashing.
- Increase sensitivity: Slowly turn MENU PARAMETER dial clockwise (decrease mV value) until sense indicator flashes continuously. **This value is the sensing threshold.**
- Set sensitivity to half (or less) the sensing threshold value. This provides at least a 2:1 safety margin.
- Restore **RATE, V OUTPUT** to original settings.
- Record sensitivity threshold and sensitivity setting on ICU chart and DMR.

2.7 Stimulation (Pacing) Threshold Testing

**Stimulation threshold testing must be performed by a competent nurse or doctor.
An experienced doctor must be present in the unit during this procedure.**

Note: The stimulation threshold is the minimum output pulse needed to consistently capture the heart. To find this threshold, monitor the ECG as you follow the procedure below. **To reduce the risk of competitive pacing, find the sensing threshold first (if the patient's intrinsic rate is adequate).**

- Inform patient of the procedure.
- If the patient has an underlying rhythm and is not pacing (only sensing), temporarily increase the rate on the generator until the patient is consistently paced (at least 10b/min above patient's intrinsic rate). Otherwise, commence without increasing the rate as patient is paced.
- While observing the paced rhythm, slowly decrease the output setting on the generator until you lose capture (the output dial regulates the amount of electrical current (mA) that is delivered to the myocardium to initiate depolarisation)
- Pace and sense indicators will flash intermittently.
- **Please be aware that patient may experience haemodynamic instability. Loss of capture during testing may result in reduction in cardiac output.**

- **If this occurs, immediately increase the output to > 2.5 times. This will ensure immediate restoration of cardiac output.** Otherwise, if stable and well tolerated please continue with the prompts below.
- Increase output again until ECG shows consistent capture. This is the **stimulation threshold**, the amount of current needed to initiate capture paced impulse.
- The pace indicator flashes continuously, and the sense indicator stops flashing.
- Ensure the patient is stable throughout this procedure and the rate on the generator is returned to the original setting.
- The output must then be set 2-3 times the threshold to provide a safety net.
- **Please Note: If the patient does not have an underlying rhythm and is pacing at the time of threshold testing, then reduce the rate to 40b/min. Slowly reduce the output to half the set current (mA) and note if pacing still occurs. If this still initiates capture, this is sufficient. Always return to original setting after the check.**

2.8 Removal of a Temporary Pacing Wire

Ensure balloon is deflated on balloon tipped TPW prior to removal.

Do not remove TPW unless patient has been reviewed by doctor and documented.

Inform doctor and shift coordinator prior to removing the TPW.

- Set up trolley with equipment (Dressing pack, disposable scissors, sterile gloves, stitch cutter, cleaning solution, occlusive dressing).
- Inform patient of procedure.
- Strict aseptic technique to be maintained.
- Check TPW wire position on latest CXR for any signs of kinking or coiling. If there is evidence, the removal must be done by a Doctor.
- Ensure the generator is turned off or the exposed connectors/pins are capped.
- Position the patient on a supine in Trendelenburg position, if tolerated.
- Using gloves loosen the old dressing and discard.
- Using aseptic techniques, don sterile gloves, clean insertion site and cut the stitches
- Instruct patient to inhale and hold breath, remove the TPW using constant, smooth, uninterrupted, pulling tension through the sheath. If there is any resistance, please inform Doctor and do not attempt to remove it yourself.
- Observe for any arrhythmias during this procedure.
- The TPW must be removed first prior to removal of the sheath.
- Apply firm pressure with a gauze until bleeding has ceased, then apply an occlusive dressing over it (remove after 24hrs).
- Dispose of equipment and reposition patient.
- Send pacing unit extension lead to CSSD for sterilisation.
- Inspect the wire and ensure it is intact. Discard it or send to laboratory for bacterial culture and sensitivity if indicated.

2.9 Troubleshooting

2.9.1 Failure to pace

There is no evidence of pacing spike on the cardiac monitor and no electrical stimulation even though the patient's heart rate is lower than the set pacing rate. Can be due to disconnection of the pacing circuit, pacing generator not turned on, flat battery, malfunction of the generator, fibrosis of the myocardial tissue or inappropriate inhibition of pacing. Refer to [Appendix 2](#).

Management:

- Assess and monitor patients' vital signs and rhythm
- Check that the pacemaker is turned on
- Replace battery
- Replace pulse generator
- Check all connections, leads and wires are intact
- Decrease sensitivity
- Change patient position i.e. turn patient to left side
- Inform Doctor and Shift Coordinator immediately
- If patient is compromised, press **emergency asynchronous pacing button and prepare for external pacing. MET call may need to be activated**
- Patient may need a CXR and manipulation/re-insertion of TPW.

2.9.2 Failure to capture

Pacing spike is evident but no corresponding ventricular stimulation. Usually due to wire displacement or increase in stimulation threshold. Refer to [Appendix 3](#).

- Increase output.
- Assess patient's vital signs and rhythm.
- Turn patient to the left side to promote better electrode contact.
- Inform doctor and Shift Coordinator immediately.
- MET call may need to be initiated if patient is compromised. Commence external pacing
- Patient may need CXR to confirm wire position and prepare for the possibility of catheter manipulation/re-insertion.

2.9.3 Undersensing

The pacemaker is not sensing the heart's intrinsic activity. Pacing spikes occur unrelated to spontaneous complexes. Can be sign of flat battery, and can lead to potentially life-threatening arrhythmias. Refer to [Appendix 4](#).

- Check sensitivity and adjust appropriately by increasing sensitivity (decreasing millivolts).
- Replace battery.
- May need change of leads or generator.
- Inform Doctor immediately if the pacemaker spikes are causing R on T Phenomenon, which could lead to lethal arrhythmias.

2.9.4 Oversensing

The pacemaker senses other electrical activity or movement resulting in inappropriate inhibition or triggering of pacing. This can be caused by abdominal / chest muscle tension due to pain, shivering or electrical mechanical interference. Refer to [Appendix 5](#).

- Check sensitivity. May need to decrease sensitivity by increasing millivolts.
- Ensure patient has adequate pain relief and warming therapy if patient is shivering due to hypothermia.
- **Press Asynchronous pacing** if patient is compromised despite trouble shooting.

2.9.5 Perforation of the right ventricle

- This can be indicated by loss of capture, ECG changes from Left Bundle Branch pattern to Right Bundle Branch pattern.
- Diaphragmatic pacing may cause visible contraction of the chest and hiccoughs.
- Patient will be symptomatic, showing signs of shock (cardiac tamponade).
- Emergency attention needed. Alert Doctor and Shift Coordinator immediately. Resuscitation process may need to be initiated.

3. Definitions

ICU	Intensive Care Unit
ED	Emergency Department
TPW	Temporary Pacing Wire
TPM	Temporary Pacemaker
VVI	Ventricular paced, Ventricular sensed and Inhibited

4. Roles and Responsibilities

All Staff are required to work within policies and guidelines to make sure that WACHS is a safe, equitable and positive place to be.

Please Note: The Procedure will be performed by an experienced cardiologist from St. John of God Bunbury Hospital under contract WACHSRQ14006 with WA Country Health Service. Please refer to TPW - Patient flow chart ([Appendix 1](#)) for guidance.

5. Compliance

Failure to comply with this procedure may constitute a breach of the WA Health Code of Conduct (Code). The Code is part of the [Integrity Policy Framework](#) issued pursuant to section 26 of the [Health Services Act 2016](#) (WA) and is binding on all WACHS staff which for this purpose includes trainees, students, volunteers, researchers, contractors

for service (including all visiting health professionals and agency staff) and persons delivering training or education within WACHS.

WACHS staff are reminded that compliance with all policies is mandatory.

6. 6. Records Management

All WACHS clinical records must be managed in accordance with [Health Record Management Policy](#).

7. Evaluation

Monitoring of compliance with this document is to be carried out as required by the Critical Care Directorate team.

8. Standards

[National Safety and Quality Standards](#) - 1.27, 3.1; 3.8, 3.9, 3.10, 5.1, 6.3, 6.5, 6.6, 8.4, 8.6.

9. Legislation

[Disability Services Act 1993](#) (WA)

[Equal Opportunity Act 1984](#) (WA)

[Equal Opportunity Regulations 1986](#) (WA)

[Health Practitioner Regulation National Law \(WA\) Act 2010](#) (WA)

[Occupational Safety and Health Act 1984](#) (WA)

[Occupational Safety and Health Regulations 1996](#) (WA)

[Privacy Act 1988](#) (Commonwealth)

[State Records Act 2000](#) (WA)

10. References

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 8. Thompson, P. 2012 Coronary Care Manual, Churchill-Livingstone, Sydney. Page 373-374
 9. WACHS. Central Venous Access Devices (CVAD) and Long Peripheral Venous Catheter (PVS) Management-Clinical Practice standard.

11. Related Forms

WACHS [MR176 Intravenous Fluid Treatment](#)

12. Related Policy Documents

WACHS [Aseptic Technique Policy](#)
WACHS [Central Venous Access Device \(CVAD\) and Long Peripheral Venous Catheter \(Long PVC\) Management – Clinical Practice Standard](#)
WACHS [Documentation Clinical Practice Standard](#)
WACHS [Infection Prevention and Control Policy](#)
WACHS [Patient Identification Policy](#)
WACHS [Imaging Clinical Practice Standard](#)

13. Related WA Health System Policies

MP 0053/17 [Clinical Alert Med Alert Policy](#)
MP 0122/19 [Clinical Incident Management Policy](#)
WA Health [Consent to Treatment Policy](#)

14. Policy Framework

[Clinical Governance, Safety and Quality Policy Framework](#)

15. Appendices

- Appendix 1: [Temporary Pacing Wire \(TPW\) Insertion – Patient Flow Chart](#)
Appendix 2: [Failure to Pace](#)
Appendix 3: [Failure to Capture](#)
Appendix 4: [Undersensing](#)
Appendix 5: [Oversensing](#)

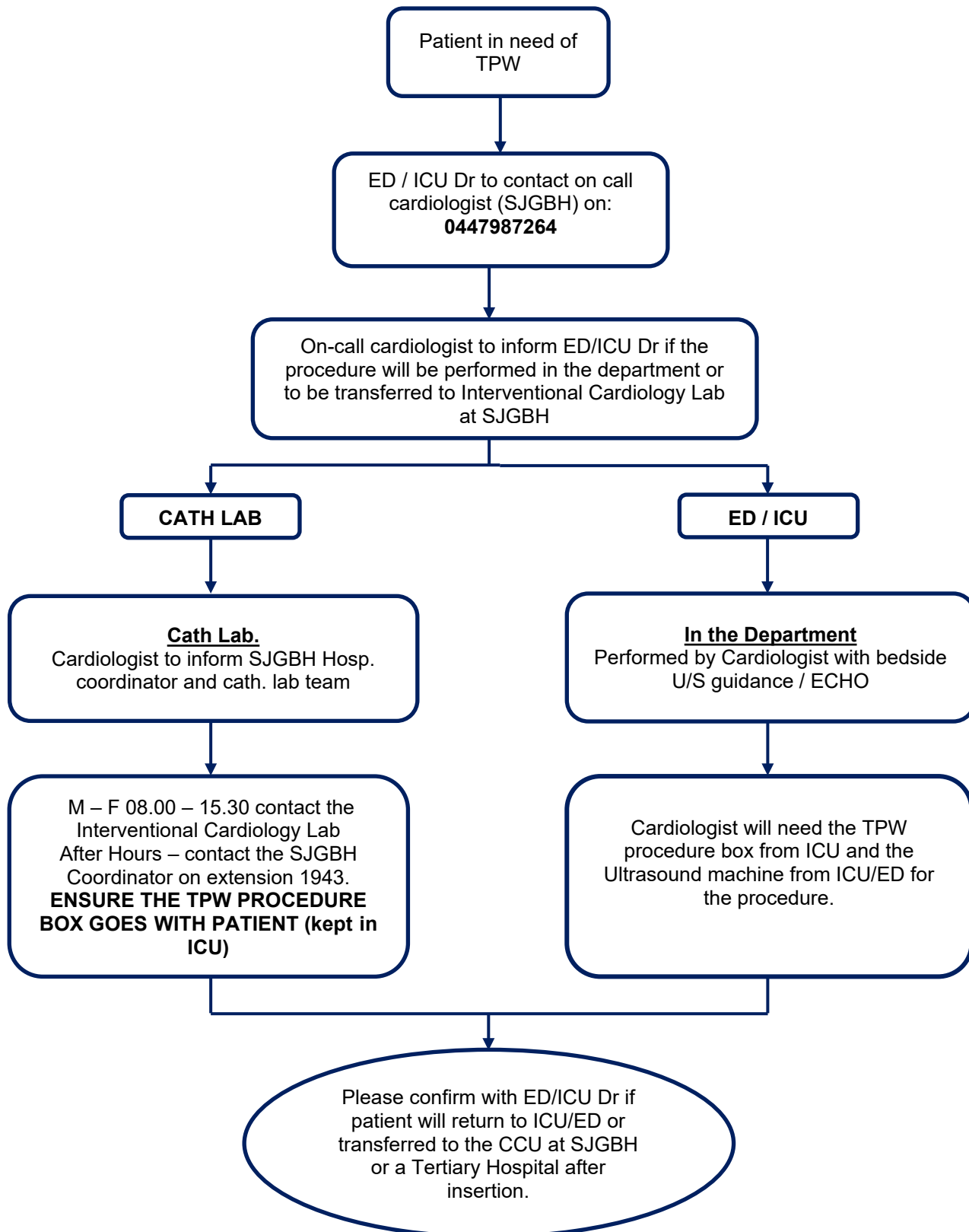
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Contact:	Critical Care Directorate Clinical Nurse Specialist		
Directorate:	Bunbury Hospital	EDRMS Record #	ED-CO-16-36504
Version:	3.00	Date Published:	27 May 2022

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Appendix 1: Temporary Pacing Wire (TPW) Insertion – Patient Flow Chart



Appendix 2: Failure to Pace



Appendix 3: Failure to Capture



Appendix 4: Undersensing



Appendix 5: Oversensing

