



Insertion, Removal and Care of a Transvenous Pacing Wire (Floatation Catheter) Procedure

Effective: 11 September 2018

1. Guiding Principles

The Bunbury Hospital 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.

2. Definitions

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.

ICU	Intensive Care Unit
ED	Emergency Department
TPW	Temporary pacing wire / Transvenous pacing wire
TPM	Temporary pacemaker

3. Procedure

3.1 Safety information

- Electrical safety: A TPW provides an avenue through which 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 as needed (PRN)**.
- Replacement of battery or TPM generator must be performed by **two competent nurses**.

3.2 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.
 - **M7 Howard Wright trauma trolley** or **M8 Howard Wright Intensive Care bed**.

3.3 Procedure

- 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.
- An IV access must be inserted and connected to a 500ml bag of normal saline infusion.
- Monitor and record vital signs every 5-10 minutely. Ensure an electrocardiogram (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 permanent pacemaker (PPM) site, if required later).
- Ensure new battery is inserted into the pulse generator and functioning.
- Assist the doctor with the insertion and maintain aseptic technique.
- Administer analgesia or sedation as prescribed by the doctor.
- When instructed, connect the distal tip electrode to the V lead of the continuous ECG monitoring system. This can be achieved by using the modified “alligator” clip extension lead (kept in the **TPW box**). **See Appendix.**
- As the doctor is advancing the catheter into the superior vena cava through to the right ventricular endocardium, there will be specific ECG changes, which can be identified on the monitoring system. **Examples of these crucial changes are provided in the Appendix.**
- 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 Opsite 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 integrated notes.

3.4 Post Insertion Care

- Maintain continuous cardiac monitoring, ½ hrly cardiovascular observation for one hour, then hourly thereafter.
- Activate pace detect on cardiac monitoring and check alarm settings.
- CXR to be performed, and reviewed by the 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 bed rest unless otherwise stated by the Intensivist.
- All connections must be checked and secure.
- Sensitivity and pacing threshold must be checked daily and PRN. This can be done by the Intensivists/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 N/Saline (500ml) at 3ml/hour (confirms instruction from Intensivist, and ensures Normal Saline is prescribed).
- The dressing around the site must be changed as per WACHS [Vascular Access Devices Management Clinical Practice Standard](#).
- A spare generator and a spare battery are available at the bedside.

3.5 Potential Complications of Temporary Pacing Wire Insertion.

Assess patient 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.

3.6 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.
- 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** original settings.

3.7 Stimulation Threshold Testing

**Stimulation threshold 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).
- Please be aware that patient may experience haemodynamic instability. Loss of capture during testing may result in reduction in cardiac output.
- Increase output again till you gain capture. This is the **stimulation threshold**, the amount of current needed to initiate capture paced impulse.
- 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.

3.8 Removal of a Temporary Pacing Wire

Ensure balloon is deflated on balloon tipped TPW prior to removal

- Set up trolley with equipment (dressing pack, disposable scissors, sterile gloves, stitch cutter, chlorhexidine 0.5% in Alc)
- 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.
- 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. If there is any resistance please inform the doctor and do not attempt to remove it yourself.
- Observe for any arrhythmias during this procedure.
- 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 sterilization.
- Inspect the wire and ensure it is intact. Discard it or send to laboratory for bacterial culture and sensitivity if indicated.

4. Troubleshooting

4.1 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.

Management:

- Assess and monitor patient's 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 the 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.

4.2 Failure to capture

Pacing spike is evident but no corresponding ventricular stimulation. Usually due to wire displacement or increase in stimulation threshold.

- 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.

4.3 Undersensing

The pacemaker is not sensing the heart's intrinsic activity. Pacing spikes occur unrelated to spontaneous complexes.

- Check sensitivity and adjust appropriately.
- Replace battery.
- May need change of leads or generator.
- Inform the doctor immediately if the pacemaker spikes are causing R on T phenomenon which could lead to lethal arrhythmias.

4.4 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.

- Check sensitivity. May need to decrease sensitivity.
- 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.

4.5 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 the doctor and Shift Coordinator immediately. Resuscitation process may need to be initiated.

5. Standards

[National Safety and Quality Health Service Standards](#) – Standard 1.2
[EQulPNational Standards](#) – Standard 12.3

6. References

1. Arrow International 1996. Central Venous and Swan Ganz Nursing Care guidelines.
2. Bunbury Hospital. 2010. Area Specific Guideline. 'Radiation Safety within Emergency Department'
3. Department of Health, Government of Western Australia. Area Specific Practice Guideline No: 23. CCU. Sir Charles Gairdner hospital. 2011. Temporary Pacemaker-Care of, Threshold Stimulation, replacing box/battery & removal of.

4. Department of Health, Government of Western Australia. Nursing Practice Standard, Critical Care Division. Royal Perth Hospital. 2013. Management of The patient requiring Temporary Transvenous Cardiac Pacing.
5. Mc.Cann, P. 2007 A Review of Temporary Cardiac Pacing Wires. Indian Pacing and Electrophysiology Journal, Jan-Mar 7 (1) 40-49.
6. Overbay,D.Criddle, L., Mastering Temporary Invasive Cardiac Pacing. Critical Care Nurse, June 2004, Vol 24, No 3. 25-32.
7. St John of God Bunbury 2012. Insertion, Removal, and care of a temporary transvenous pacing wire
8. Thompson, P. 2012 Coronary Care Manual, Churchill-Livingstone, Sydney. Page 373-374

7. Related Policy Documents

WACHS [Vascular Access Devices Management Clinical Practice Standard](#)

8. Appendices

Appendix 1: Modified “Alligator” clip extension lead

Appendix 2: Distal tip of the pacing electrode is connected to the “V” lead of the continuous ECG monitoring system using the modified Alligator clip extension lead.

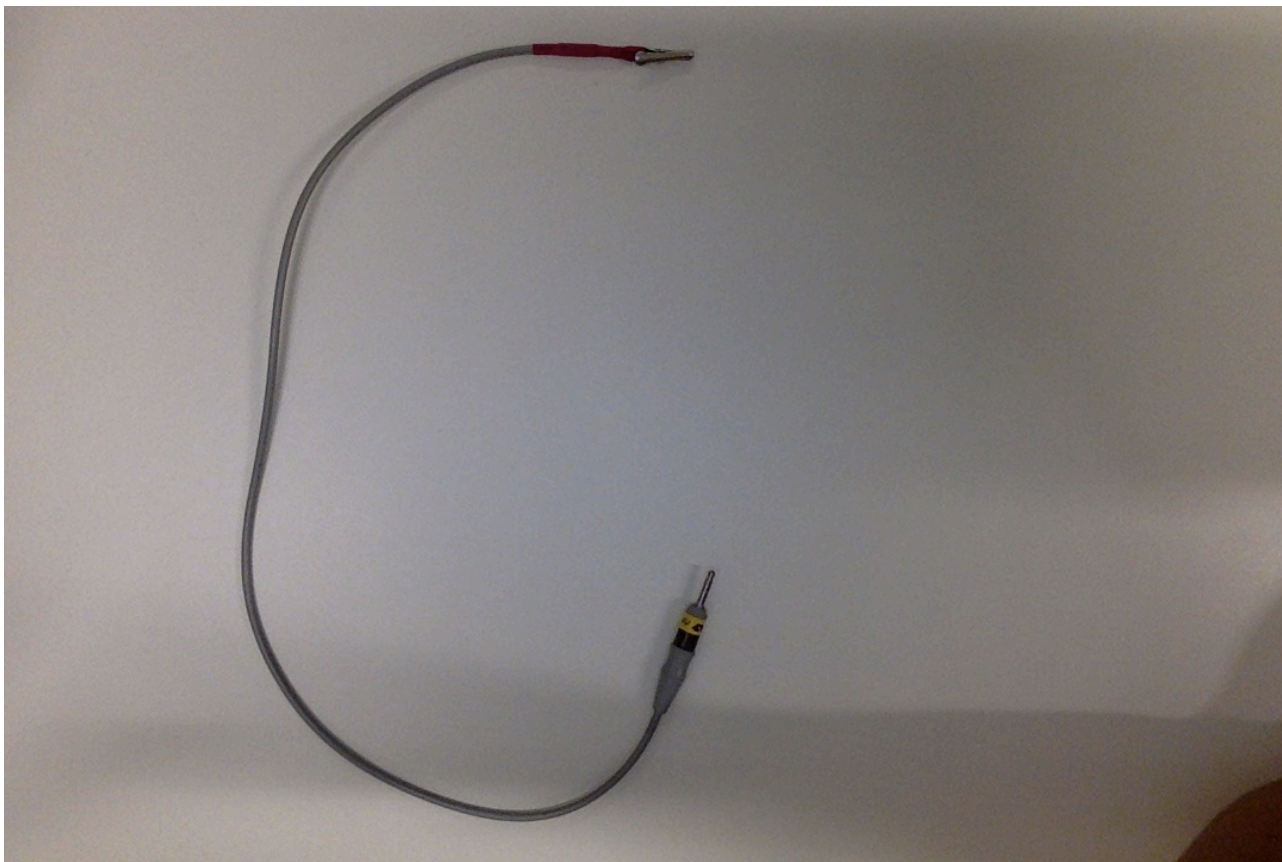
Appendix 3: ECG changes as the pacing catheter is advanced into the right atrium, right ventricle and finally as it meets the right ventricular endocardium

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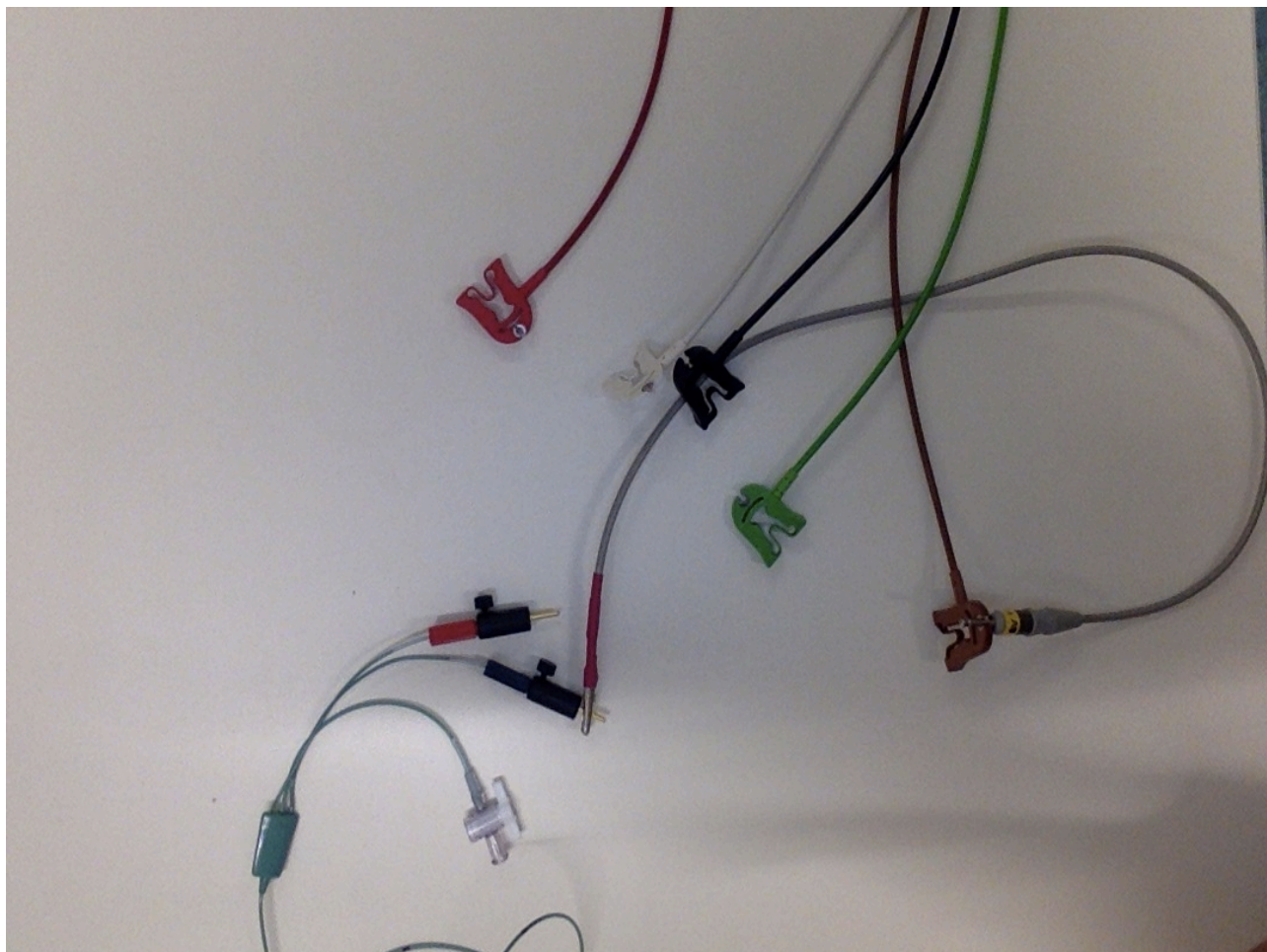
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Appendix 1:



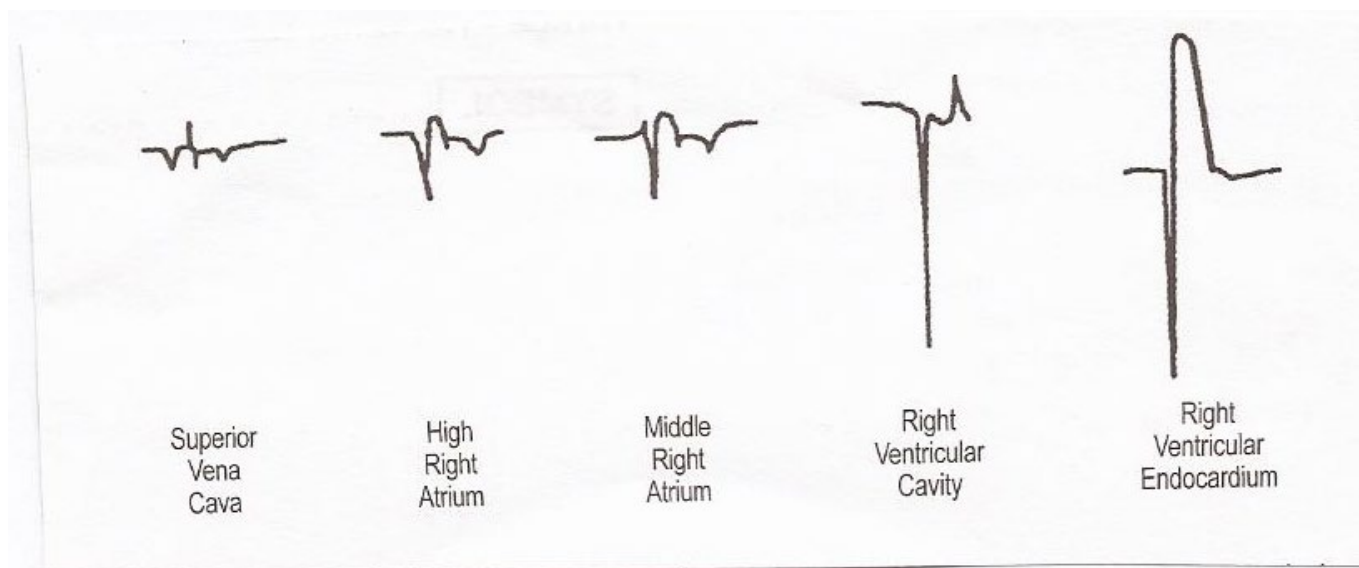
Modified “Alligator” clip extension lead

Appendix 2:



Distal tip of the pacing electrode is connected to the “V” lead of the continuous ECG monitoring system using the modified Alligator clip extension lead.

Appendix 3:



ECG changes as the pacing catheter is advanced into the right atrium, right ventricle and finally as it meets the right ventricular endocardium.