# Temporary Transvenous Pacing Guideline

**Classification:** Clinical Guideline  
**Lead Author:** Dr Peter Woolfson  
**Additional author(s):**  
Dr Alan Fitchet  
Sister Joanne Hughes,  
Matron Julie Winstanley  
**Authors Division:** Division of Salford Health Care

**Unique ID:** TWCG31(12)  
**Issue number:** 2.2  
**Expiry Date:** January 2021

## Contents

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Title and contents page</td>
<td>1</td>
</tr>
<tr>
<td>Who should read this document</td>
<td>2</td>
</tr>
<tr>
<td>Scope of the Guideline</td>
<td>2</td>
</tr>
<tr>
<td>Background</td>
<td>2</td>
</tr>
<tr>
<td>What is new in this version</td>
<td>2</td>
</tr>
<tr>
<td><strong>Guideline</strong></td>
<td>3</td>
</tr>
<tr>
<td>1 Indication &amp; Procedure</td>
<td>3</td>
</tr>
<tr>
<td>2 Personnel and Equipment</td>
<td>3</td>
</tr>
<tr>
<td>2.1 Personnel</td>
<td>3</td>
</tr>
<tr>
<td>2.2 Equipment</td>
<td>4</td>
</tr>
<tr>
<td>3 Transfer of Patients</td>
<td>4</td>
</tr>
<tr>
<td>3.1 Transfer of patients to and from the designated area</td>
<td>4</td>
</tr>
<tr>
<td>3.2 On return to the critical care environment</td>
<td>4, 5</td>
</tr>
<tr>
<td>3.3 Equipment required at the bedside/available on ward</td>
<td>5</td>
</tr>
<tr>
<td>4 Daily Management</td>
<td>5</td>
</tr>
<tr>
<td>4.1 Pacing threshold Testing Procedure</td>
<td>6</td>
</tr>
<tr>
<td>5 Troubleshooting</td>
<td>6 - 9</td>
</tr>
<tr>
<td>6 Desirable chest X-Ray appearance</td>
<td>10</td>
</tr>
<tr>
<td>7 Roles and Responsibilities</td>
<td>11</td>
</tr>
<tr>
<td>8 Explanation of Terms and Definitions</td>
<td>11</td>
</tr>
<tr>
<td>9 Appendix - Pathway for patients with temporary pacing wires</td>
<td>12</td>
</tr>
<tr>
<td>10 Document control information (Published as separate document)</td>
<td>13</td>
</tr>
<tr>
<td>Document Control</td>
<td>13</td>
</tr>
<tr>
<td>Policy Implementation Plan</td>
<td>13</td>
</tr>
<tr>
<td>Monitoring and Review</td>
<td>14</td>
</tr>
<tr>
<td>Endorsement</td>
<td>14</td>
</tr>
<tr>
<td>Equality analysis</td>
<td>15 - 17</td>
</tr>
</tbody>
</table>
Who should read this document?

This guideline is for use by all medical or nursing staff caring for patients with a temporary pacing wire. This could apply to patients on HCU/ICU/NHDU/MHDU/SHDU or any other ward with a patient with temporary pacing wire.

Key Practice Points

- Temporary transvenous pacing may be required for the urgent management of bradyarrhythmias and of some tachyarrhythmias

- Temporary transvenous pacing is a specialist cardiology procedure and cardiology advice and assistance should be sought in all cases

Scope of the Guideline

1. Indications for temporary pacing
2. Personnel and Equipment
3. Transfer of patients with or requiring temporary pacing
4. Daily management of temporary pacing wire
5. Troubleshooting

Background

Temporary cardiac transvenous pacing may be required for the management of bradyarrhythmias, and also of some tachyarrhythmias causing, or potentially causing, haemodynamic compromise. The requirement may be urgent or more elective depending on the circumstances.

Temporary cardiac transvenous pacing is a specialist cardiology procedure and if it is required, the cardiology team should be contacted directly. Cardiology advice and availability for temporary pacing is provided on a 24/7 on call basis.

What is new in this version?

Change of approval date
1. Indications and Procedure

Temporary pacing wire (TPW) insertion should be considered for:

- bradycardia with haemodynamic compromise
- ventricular arrhythmia suppression
- termination of tachyarrhythmia by overdrive pacing
- prophylactic temporary pacing preoperatively

The procedure will be carried out by cardiology middle-grade or consultant staff.

Patients in Ladywell block will have TPW performed in the HCU pacing room and thereafter remain on HCU until arrhythmias have been adequately resolved.

Patients in intensive care will have TPW performed in Theatre and then return to ICU.

Patients on other wards will either be transferred to HCU or have TPW in Theatre depending on which is decided to be more appropriate. Patients from MHDU, SHDU, NHDU may return to these wards post TPW insertion, patients from other wards should be transferred to HCU.

Patients with prophylactic preoperative TPW may be returned to base ward post procedure.

2 Personnel and Equipment

2.1 Personnel:

- Cardiology consultant or cardiology middle-grade (1st operator)
- Cardiology nurse trained in TPW insertion (for HCU insertions)
- Critical care nurse/theatre staff trained in level 2/3 (for theatre insertions)
- Anaesthetist if appropriate
- Radiographer
- Medical & nursing personnel should be ALS trained
2.2 Equipment:

- C-arm image-intensifier
- Temporary pacing box
- 5F temporary pacing wire
- 5F or 6F introducer sheath
- External pacemaker / defibrillator
- Cardiac monitor with non invasive / invasive monitoring facilities
- Oxygen and air inlet
- Wall-mounted suction
- TPW insertion will be performed via internal jugular or femoral or subclavian vein as deemed most appropriate by the team.

- Insertion will be performed with full sterile technique according to Trust protocol.

3.1 Transfer of patients to and from the designated area

- All patients requiring TPW insertion in HCU or Theatre will be transferred with external pacemaker/defibrillator immediately available and with an ALS provider.

- Transferring staff will follow the Trust transfer policy.

3.2 On return to the critical care environment:

- Bedside handover will be given to the nursing and medical staff by the cardiology staff / nurse trained in TPW.

- Documentation completed by the cardiology team on the pathway – Appendix 1.

- Pacing safety checks will be completed by the receiving nurse and the cardiology staff and documented on the pathway.

- Patients will remain on continuous cardiac monitoring and baseline EWS completed and documented on EWS chart.
- Monitor alarm limits to be set according to TPW settings.
- Observation will be maintained as per EWS policy
- Post-implant CXR will be performed to document TPW position and exclude pneumothorax.

3.3 Equipment required at the bedside/available on ward:
- Temporary pacing box with spare set of batteries
- Continuous cardiac monitoring (excluding patients with prophylactic TPW)
- External defibrillator/pacer (excluding patients with prophylactic TPW)
- Immediate access to crash trolley and emergency drug box

4. Daily Management

HCU will keep a record of pacing box use across the trust.

Cardiology team will review TPW Mon - Fri, complete the safety checks with the medical and nursing staff from ITU/MHDU/NHDU/SHDU, and be available for advice/troubleshooting Sat/Sun

HCU nursing staff to contact ITU/MHDU/NHDU/SHDU on a shift basis, to coordinate the checking of the TPW threshold.

TPW safety checks to be completed by nursing staff on a shift basis (or every 8 hours) and documented on the pathway. Central line pathways should be completed every shift on EPR

The TPW wire will be removed when no longer required.

Cardiology will arrange an appropriate date and time for implantation of a permanent pacemaker if required.

4.1 Pacing threshold Testing Procedure

1. Set RATE at least 10 bpm above patient’s intrinsic rate. Green PACE light flashing

2. Decrease OUTPUT: Slowly turn Output dial anticlockwise until ECG shows loss of ventricular capture. Green PACE light stops flashing.
3. Increase OUTPUT: Slowly turn Output dial clockwise until ECG shows consistent capture. Green PACE light flashing. *This value is the stimulation threshold (Volts)*

4. Set OUTPUT to a value 2 to 3 *times greater* than the stimulation threshold value. *This provides x2-3 safety margin.*

5. Restore RATE to previous value.

**Ideally, the threshold should be <1.0V**

*The threshold will gradually rise day by day – ensure output is x2-3 greater than the threshold.*
5. Troubleshooting

Normal ventricular pacing

Ventricular pacing spikes followed by wide QRS complexes

5.1 Ventricular non-capture

Ventricular pacing spikes are not followed by QRS complexes

Causes of Failure to Capture:

- Insufficient output
- Low pacemaker battery
- Displaced or fractured lead
- Electrolyte abnormalities: acidosis; hypoxia; hypokalaemia

Management:

- Increase output on Output dial
- Seek cardiology advice – lead may need to be repositioned or replaced
- Check electrolytes
- View rhythm in different leads
- Change electrodes
- Check connections
- Change battery, cables, pacemaker box

Sensitivity threshold

Minimum level of intrinsic electric activity generated by the heart detectable by the pacemaker
Ventricular pacing spikes occur regardless of QRS complexes
Pacemaker is not “seeing” intrinsic activity

- potential for paced ventricular beat to land on T wave – with potential for inducing ventricular fibrillation:

Management:

Increase sensitivity (reduce mV on Sense dial)
Seek cardiology advice – lead may need to be repositioned or replaced

View rhythm in different leads
Change electrodes
Check connections
Change cables, battery, pacemaker box
Check electrolytes
5.3 Ventricular oversensing

Pacing does not occur when intrinsic rhythm is inadequate

![ECG waveform](image)

Causes:

- Pacemaker inhibited due to sensing of “QRS” complexes that do not exist
- Pacemaker too sensitive
- Possible lead displacement
- Pacemaker failure

Danger of heart block, asystole

Management:

Reduce sensitivity (increase mV on Sense dial)
Seek cardiology advice – lead may need to be repositioned or replaced
View rhythm in different leads
Change electrodes
Check connections
Change cables, battery, pacemaker box
Check electrolytes

3.4 Sensitivity threshold testing procedure:

1. Set Rate 10 bpm slower than patient’s HR (Green SENSE light flashing).
2. Increase sensitivity to chamber being tested to minimum level (0.2mV)
3. Decrease sensitivity of the pacer (turn Sense dial anticlockwise, ↑mV) until pacer stops sensing patient (green SENSE light stops flashing)
4. Increase sensitivity of the pacer (turn Sense dial clockwise, ↓mV) until the pacer senses the patient (green SENSE light begins flashing). This is the threshold for sensitivity.
5. Set the sensitivity at ½ the sensitivity threshold value.
6. Example: Set sensitivity at 1mV if the sensitivity threshold was 2mV
Pacing lead appearance from R subclavian vein approach
The pacing lead tip (arrow) is at the right ventricular apex

Pacing lead appearance from femoral vein approach.

The pacing lead tip (arrow) is at the right ventricular apex.
7. Roles and responsibilities

All staff involved in the management of patients with temporary pacing wires should adhere to this guideline.

The Cardiology Department is responsible for ensuring this guideline is up to date.

8. Explanation of terms & Definitions

Temporary Pacing Wire (TPW):
A temporary wire positioned within the right ventricle of the heart for the purpose of assisting in the control of the cardiac rhythm. It is positioned percutaneously under fluoroscopic guidance with venous access via the femoral, internal jugular or subclavian vein.

Pacing threshold:
The minimum voltage delivered by the temporary pacing wire with which the ventricle is consistently paced. Ideally this should be <1.0V, although this not always possible.

Sensitivity threshold:
Minimum level of intrinsic electric activity generated by the heart detectable by the pacemaker

Ventricular non-capture:
Explained in document

Ventricular undersensing:
Explained in document

Ventricular oversensing:
Explained in document
9. Appendix

Pathway for patients with temporary pacing wires

Name:  Hospital Number:
Date of birth:  Ward/Unit:

<table>
<thead>
<tr>
<th>Date/Time of insertion</th>
<th>Screening time (mins)</th>
<th>Threshold (mV)</th>
<th>Output set @ mV</th>
<th>Demand rate</th>
<th>Underlying rhythm</th>
</tr>
</thead>
</table>

Complete the SRFT Central Line Flowsheet
1. Continuous cardiac monitoring & record EWS
2. Set cardiac monitor alarm limits 10 beats below pacing box rate and 10 beats above the pacing box rate.
3. Check threshold of TPW every 24 hours and document (cardiology staff will also perform daily).
4. Ensure safety of pacing box at all times.
5. Check TPW connections are securely attached.
6. Observe insertion site for any signs of infection.
7. Ensure site is dry and clean – change dressing in line with SRFT central line policy
8. Assess pain control and administer analgesia as prescribed.
9. Complete all central line pathways on daily shift on iSOFT
10. Liaise with cardiology team regarding management plan.

Pacing Record

<table>
<thead>
<tr>
<th>Date/time</th>
<th>Threshold</th>
<th>Output</th>
<th>Demand rate</th>
<th>Underlying rhythm</th>
<th>Signature</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Date/time</th>
<th>Threshold</th>
<th>Output</th>
<th>Demand rate</th>
<th>Underlying rhythm</th>
<th>Signature</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Date/time</th>
<th>Threshold</th>
<th>Output</th>
<th>Demand rate</th>
<th>Underlying rhythm</th>
<th>Signature</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>