

## Temporary Transvenous Pacemakers, Management of (Adult)

### Site Applicability

**VCH:** Critical Care Sites at LGH, RH, SH, PRGH and VGH

**PHC:** Critical Care & High Acuity areas

### Practice Level

RN: Advanced Skill

### Policy Statement

1. Patients with temporary transvenous pacemakers (TVPM) must be on continuous cardiac monitoring in critical care areas, including: ER, ICU, CCU, CSICU, Enhanced Critical Care Unit (ECCU), Post Anesthetic Care Unit (PACU) and Cardiac Cath Lab.
2. Critical care nurses **are** responsible for:
  - Assisting during TVPM insertion
    - assisting with deflation of TVPM wire balloon, during insertion procedure only
    - adjusting initial pulse generator settings, during insertion procedure only

**Note:** An MD order is **always** required to adjust pulse generator settings even when using the troubleshooting guide to adjust pacing functions in an emergency scenario
  - Adjusting pulse generator settings with MD orders:
 

**VCH:**

    - **Coastal:** Adjustments made by physicians only
    - **RH:** ER and ICU
    - **VGH:** CSICU, CCU, ER and Cardiac Cath Lab

**PHC:** CSICU and Emergency only
3. A physician (or advanced practice clinician) is responsible for:
  - inserting the TVPM wire
  - if a balloon-tipped TVPM wire: Ensuring the balloon is deflated and the balloon port and gate valve are secured, once wire positioned
  - adjusting pulse generator settings
  - performing capture and sensitivity threshold testing
  - repositioning or removing TVPM wires
  - discontinuing temporary pacing

### Need to Know

The TVPM is an invasive intervention option that may be selected:

1. To support patients with unstable, symptomatic bradyarrhythmias (e.g. heart blocks with inadequate ventricular response rates; sick sinus syndrome; junctional bradycardias) or asystole.
2. For patients who require longer periods of temporary pacing support (e.g. waiting permanent pacemaker insertion).
3. To prevent ventricular arrhythmias (e.g. Torsade de pointes) in patients with prolonged QT intervals.
4. To provide high-rate burst pacing for monomorphic ventricular and supraventricular tachyarrhythmias when drug therapy is ineffective.

### Pacing wire placement:

- The TVPM is a thin (e.g. 5Fr or 6Fr), bendable wire that is inserted through a percutaneous sheath introducer (e.g. Cordis). Commonly used insertion sites include the right internal jugular vein, the left subclavian, or the femoral veins.
- The operator threads the TVPM wire into the introducer sheath towards the right atrium, passes through the tricuspid valve, and places the wire at the right ventricular apex.
- Some types of TVPM wires have a balloon-tip that can be floated into position; stiffer wires are usually placed with fluoroscopy guidance.

### Pulse generator connection and function

- The TVPM wire connects to a pulse generator via a white connection cable. The TVPM wire is bipolar and has marked positive and negative electrode connections (see [Appendix A](#)). The positive (i.e. "proximal") and negative (i.e. "distal") connections must be attached together with positive to positive, and negative to negative.
  - **VCH:** see [Appendix B](#)
  - **RH and PHC:** see [Appendix C](#) and [Appendix D](#)
- Single-chamber pulse generators (e.g. Medtronic Model 5348) are usually used with temporary TVPMs because the TVPM wire is a single lead and only paces one chamber at a time and can be set-up quickly to deliver asynchronous (fixed) pacing, or synchronous (demand) pacing (see [Appendix D](#)).
- Dual-chamber pulse generators (e.g. Medtronic Model 5392) can also be programmed to pace a single lead (i.e. VVI).
- Pacing is initiated as soon as the pulse generator is turned on.
- The pulse generator has three settings: rate, output (mA), and sensitivity (mV).

### Safety

- **SPH only:** Battery charges in emergency pulse generators must be tested monthly.
- When pacing is being initiated, a fully charged battery (or batteries, per device) must be placed in pulse generator.
- Fully charged spare batter(ies) must be kept with the patient at all times (e.g. tape the spare battery to the pulse generator).
- **When changing the pulse generator battery in a pace-dependent patient, prepare a second pulse generator and have available on immediate stand-by.**
  - **VGH: Ensure MD is on the unit**
- Ensure the TVPM wire is well secured and completely immobilized against the patient to prevent dislodgment and inadvertent repositioning. Avoid taping over the contamination shield.
- If vascular access sheath is in the femoral site, nurse patient to avoid leg flexion and position head of bed no greater than 30°.
- Patients must remain on bed rest until cleared for mobility by physician.
- Check all connections and ensure junctions are securely tightened. If using shrouded pin adapters (e.g. Edwards balloon-tipped TVPM wire), tape any loose connections.
- Ensure the patient has a secondary IV site.

## Equipment & Supplies

VCH	SPH
<ul style="list-style-type: none"> <li>Central venous access device kit and all supplies needed for central line insertion – hospital specific</li> <li>Percutaneous sheath introducer (e.g. 7Fr Cordis)</li> <li>Contamination shield</li> <li>Pacemaker / pulse generator</li> <li>Alkaline batter(ies): one battery unit (or set) for pulse generator in use plus one battery unit (or set) for spare at bedside</li> <li>Connecting cable</li> <li>Hospital specific securement device</li> <li>NS to infuse through percutaneous sheath introducer side-arm via infusion pump</li> </ul> <p><b>VCH:</b> Dressing supplies as per Regional CPD: <a href="#">Non-Tunneled CVC (NT-CVC) – Basic Care &amp; Maintenance</a>, See Procedure Part 4: Dressing Change</p>	<ul style="list-style-type: none"> <li>Percutaneous sheath introducer (e.g. 7Fr Cordis, 6Fr Cordis)</li> <li>NS to infuse through percutaneous sheath introducer side-arm</li> <li>Infusion pump (to run NS at TKVO on side-arm)</li> <li>TVPM wire (e.g. St. Jude PACEL bipolar pacing catheter; Edwards bipolar pacing catheter)</li> <li>Contamination shield (e.g. Arrow cath-gard contamination shield)</li> <li>Pulse generator</li> <li>Connection cable</li> <li>Alkaline batter(ies): one battery unit (or set) for pulse generator in use plus one battery unit (or set) for spare at bedside</li> <li>Safety pin (to secure pulse generator)</li> <li>Fluoroscopy (if used for insertion)</li> <li>Lead jackets (if fluoro is used)</li> </ul> <p><b>PHC:</b> <a href="#">NCS5384: Central Venous Catheters (CVC) – Dressing Change, procedure for</a></p>

## Practice Guideline

### A. Initial Assessment

Initial Nursing Assessment	Intervention
1. Establish a baseline physical assessment	See PHC: <a href="#">NCS6074: Physical Assessment</a>
2. Prepare the pulse generator <ul style="list-style-type: none"> <li>A fully charged 9V battery must be placed in the pulse generator when pacing is being initiated.</li> </ul>	If battery tester is available, check battery charge.
3. Immediately following insertion of the TVPM wire, assess and document: <ul style="list-style-type: none"> <li>VS (BP, HR, RR, SpO<sub>2</sub> or SaO<sub>2</sub>, T)</li> <li>Hemodynamic monitoring parameters as applicable (CVP, PAP, PCWP, CO)</li> <li>Heart sounds (clarity)</li> <li>Breath sounds and respiratory qualities</li> <li>Cardiac rhythm <ul style="list-style-type: none"> <li>Ensure the bedside monitor is enabled to “pace detect”.</li> <li>Note intrinsic rhythm (if present), effective capture, and appropriate sensing.</li> </ul> </li> </ul>	<p>Assess patient’s response to pacing and observe for signs of decreased cardiac output (e.g. weakness, altered LOC, dizziness, syncope, chest pain, dyspnea, increasing supplemental oxygen requirements) or procedural complications (see <a href="#">Appendix E</a>).</p> <p>Notify the physician immediately if assessment findings reveal a poor response to pacing, or:</p> <ul style="list-style-type: none"> <li>Decreasing BP</li> <li>Arrhythmias</li> <li>Distant or muffled heart sounds</li> <li>Decreasing QRS amplitude</li> </ul>

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<ul style="list-style-type: none"> <li>• Characteristics of the percutaneous sheath introducer site: <ul style="list-style-type: none"> <li>○ Observe for signs of bleeding (blood at site, swelling or palpable hematoma, bruising) and infection (purulent drainage, redness).</li> <li>○ Apply clear occlusive dressing to insertion site (avoid taping over protective plastic guard).</li> </ul> </li> <li>• Characteristics of the TVPM wire: <ul style="list-style-type: none"> <li>○ Measure the TVPM wire placement using the black markings on the TVPM wire.</li> <li>○ Ensure the TVPM wire is well secured and completely immobilized against the patient. Coil the wire on either the patient's leg or neck (depending on insertion site).</li> <li>○ Check all connections and ensure all junctions are securely tightened. When using shrouded pin adapters, consider taping loose connections.</li> <li>○ For balloon tipped TVPM wire: Check that balloon is deflated once in position. The gate-valve should be secured in the "open" position to allow spontaneous deflation. The inflation syringe should be empty and attached to the balloon inflation port to prevent to prevent accidental inflation.</li> </ul> </li> <li>• Pulse generator settings: <ul style="list-style-type: none"> <li>○ Rate, output (mA), and sensitivity setting (mV).</li> <li>○ Close the cover on the pulse generator.</li> <li>○ Secure the pulse generator to the bed or hang from a bedside IV pole.</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>• Asymmetrical chest expansion</li> <li>• Tracheal deviation</li> <li>• Pain (breathing pain, shoulder pain)</li> <li>• Bleeding or hematoma at insertion site</li> <li>• Decreasing hemoglobin</li> </ul> <p>If failure to pace, failure to capture, or inappropriate sensing is observed, assess hemodynamic status and patient response. Check all connections of the pacing system, consider changing the battery or pulse generator, and call the MD.</p>
4. Arrange for a chest x-ray following the procedure as per MD order.	

## B. Ongoing Assessment

Ongoing Nursing Assessment	Intervention
<p>1. Assess and document:</p> <ul style="list-style-type: none"> <li>VS (BP, HR, RR, Temp, SpO<sub>2</sub> or SaO<sub>2</sub> and radial pulse to ensure capture)</li> <li>Cardiac rhythm</li> <li>Hemodynamic monitoring parameters if applicable (CVP, PAP, PCWP, CO)</li> <li>LOC and pain (if awake)</li> </ul> <p><b>VCH:</b> Assess and document <b>Q4H</b> and PRN</p> <p><b>PHC:</b> Assess and document HR and SpO<sub>2</sub> or SaO<sub>2</sub> <b>Q1H</b> until TVPM discontinued, and for 24 hours following removal. Assess and document BP Q1H to Q4H as per patient condition.</p>	<p>Assess cardiac rhythm for intrinsic activity, effective capture, and appropriate sensing. On the monitor, ensure the pace detect setting is turned on.</p>
<p>2. Assess and document <b>Q2H</b> and PRN:</p> <ul style="list-style-type: none"> <li>Pressure reduction interventions</li> </ul>	<p>Patients with a TVPM wire must remain on bed rest. Consider a pressure-reduction mattress to maintain skin integrity.</p> <p>If percutaneous sheath introducer is in the femoral vein, avoid leg flexion and position head of bed no greater than 30°; this prevents kinks or damage to TVPM. Reposition patient using log roll technique Q2H.</p>
<p>3. Assess and document <b>Q4H</b> and PRN:</p> <ul style="list-style-type: none"> <li>TVPM wire placement at the hub of the vascular access sheath. If balloon tipped TVPM wire: check that the balloon remains deflated.</li> <li>Sheath Insertion site <ul style="list-style-type: none"> <li>Observe for signs of bleeding (blood at site, swelling or palpable hematoma, bruising) and infection (erythema, edema, purulent or foul-smelling drainage, febrility, neutrophilia)</li> <li>Observe for signs and symptoms of infection (erythema, edema, purulent or foul-smelling drainage, febrility, neutrophilia)</li> <li>Ensure the side arm of the vascular access sheath is patent with normal saline running at a minimum of 10 mL/hr. (BD-00-12-40045: <a href="#">Non-Tunneled CVC (NT-CVC) – Basic Care &amp; Maintenance</a> or PHC: <a href="#">Central Venous Catheter (CVC) Care and Maintenance</a>)</li> </ul> </li> </ul>	<p>Check mechanical capture by palpating for radial pulses that correspond with QRS complexes – adequate blood circulation to affected limb.</p> <p>Measuring the black centimeter markings on the TVPM wire to ensure the TVPM wire has not moved.</p> <p>The gate-valve should be secured in the “open” position to allow spontaneous deflation. The inflation syringe should be empty and attached to the balloon inflation port to prevent accidental inflation.</p> <p>If a low battery indicator appears, change the battery as soon as possible. The pulse generator battery must be changed every 5 days.</p>

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<ul style="list-style-type: none"> <li>The battery indicator on the pulse generator.</li> <li>Pulse generator settings: rate, output and sensitivity. Ensure the pulse generator cover is secured (may need to be taped) and the pulse generator box is secured to the bed or hung on an IV pole.</li> <li>Assess skin color and warmth, breath and heart sounds, and other body systems as per unit protocol (<b>PHC</b>: see <a href="#">NCS6074 – Physical assessment</a>).</li> <li>Limb perfusion: peripheral pulses (pedal and radial); color, warm, movement, sensation.</li> </ul>	<p>To ensure battery is adequately charged as part of the safety check. Have an extra battery at the bedside.</p> <p>Check physician's orders to ensure the pacemaker settings match the orders.</p> <p>Securing the pulse generator will prevent accidental adjustments in settings. If the generator does not have a cover, hang it on the bed or IV pole.</p>
<p>4. Perform the following as per hospital policy and PRN:</p> <ul style="list-style-type: none"> <li>Change clear, occlusive dressing (e.g. tegaderm) to insertion site as per <b>PHC</b>: <a href="#">NCS5384 – Central Venous Catheters (CVC) – Dressing Change, procedure for</a></li> </ul> <p>Dressing supplies as per Regional BD-00-12-40045: <a href="#">Non-Tunneled CVC (NT-CVC) – Basic Care &amp; Maintenance</a> - see Procedure Part 4: Dressing Change</p> <ul style="list-style-type: none"> <li>Chest x-ray is usually performed daily (as per MD order)</li> </ul>	<p>Avoid taping over the pacing wire or contamination shield.</p>

**C. Troubleshooting** (see [Appendix F](#))

**D. Dressing change**

- VCH**: [BD-00-12-40045](#): Non-Tunneled CVC (NT-CVC) Basic Care & Maintenance - see Procedure Part 4: Dressing Change
- PHC**: [NCS5384](#): Central Venous Catheters (CVC) – Dressing Change, procedure for
- Dressing to be changed 24 hours post insertion and PRN.
- DO NOT tape over the pacing wire or contamination shield.
- If a dressing is applied by the physician to cover/secure the pacer wire and contamination shield, this should not be removed without a Physician's order.

**E. Battery Change**

- Battery Type**: Standard 9V Alkaline or Lithium or AA Alkaline (check for specific pulse generator)
- Battery Life**: Alkaline: 300 hours  
Lithium: 650 hours

**\*\*may need to change battery more frequently if patient is 100% paced\*\***

In ICU, tape the batter(ies) to the pulse generator.

Change batter(ies) every 5 days



## Patient/Family Education

- Briefly describe need for a temporary pacemaker. Answer questions patient or family may have regarding pacemaker.
- Explain the temporary pacemaker function in simple terms.
- Describe the restrictions including: bed rest and limited activity, the need to call for assistance with repositioning, not to handle the TVPM wire or pulse generator, and to not use an electric razor.
- Explain the importance of reporting pain.

## Documentation

### VCH:

- **Q4H on unit specific flowsheet / interdisciplinary progress notes / nurses notes**
  - Safety checks
  - Pacer settings
  - Sensing / pacing / capturing
  - If pacer is on standby
  - Vital Signs
- **Coastal:** Record on unit flow sheet
- **Richmond:** Document on the unit specific flow sheet
- **VGH:** Document as per unit policy

### PHC:

1. **Nurses Notes** (Form no. PHC-NF035) (or CSICU only: **Cardiac Surgery Clinical Pathway Documentation Tool** (Form no. NF117): Date, time, patient education, size and location of introducer sheath, type and size of TVPM wire placed, equipment used to determine TVPM positioning and placement, physician performing the procedure, patient response, and any unexpected outcomes and emergency interventions that were required during procedure.

Measure and record the TVPM wire placement using the centimeter markings on the TVPM wire; measurements are taken at the hub of the sheath introducer.

Document any changes made by the MD to the pacing settings on the pulse generator. If rate decreases are made, document patient response.

Document ongoing assessments of the intersection site and dressing changes. Record any reported pain, nursing interventions, and patient response.

2. (CSICU, CICU, PACU) **Critical Care 24-Hour Flow Sheet** (Form no. PHC-IC037): Pre- and post-procedure VS. Hemodynamic parameters as available. Record pulse generator settings: rate, output, sensitivity.

(ICU only) **ICU Flow Sheet** (Form no. PHC-IC049): Pre- and post- procedure VS. Hemodynamic parameters as available. Record pulse generator settings: rate, output, sensitivity.

3. (CICU only) **Coronary Care Unit Nursing Physical Assessment Record** (Form no. NF121): document presence of TVPM and record the pulse generator settings.

(PACU only) **Post Anesthetic Care Nursing Physical Assessment Record** (Form No. NF288): document presence of TVPM and record the pulse generator settings.

(CSICU only) **Department of Nursing CSICU Assessment Record** (Form No. NF072): document presence of TVPM and record the pulse generator settings.

4. **Heart Centre Care Map** (Form no. NF279): document presence of temporary pacing

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5. **ECG Strip Flowsheet** (Form no. PHC-IC004): Pre- and post- procedure cardiac rhythm strips. Repeat a rhythm analysis with any changes to patient rhythm, and if the settings on the pulse generator are changed.
6. **MAR** (Form no. PH464-MA): Medications administered during procedure

## Related Documents

- **VCH-PHC:** [Non-Tunneled CVC \(NT-CVC\) Basic Care & Maintenance \(Adult\)](#)
- **PHC:** [Central Venous Catheter \(CVC\), Care and Maintenance: Critical Care Areas – ICU, CICU, CSICU, Emergency and PACU, Self-Directed Learning and Information Package](#)
- Medtronic [5348 Single Chamber Temporary Pacemaker Technical Manual](#)
- Medtronic [5392 Dual Chamber Temporary Pacemaker Technical Manual](#)

## References

Becker, D. E. (2011). Temporary transvenous pacemaker insertion (perform). In D. Lynn-McHale Wiegand (Ed.), AACN procedure manual for critical care (6th ed., pp. 421-428). St. Louis, Missouri: Elsevier Saunders.

Gibson, J.A. (2014). Keeping pace: Understanding temporary transvenous pacemakers. *Nursing Critical Care*, 9(5), 20-27.

Hayes, D. (2015). Temporary cardiac pacing. In: UpToDate, Post TW Ed, UpToDate, Waltham, MA. (Accessed April 13, 2016)

Lau, R. (2011). *Temporary Transvenous pacemaker*. PolicyNet. Vancouver Coastal Health, Richmond General Hospital.

Medtronic, Inc. (2009). Medtronic 5348: Single chamber temporary pacemaker (AAI/VVI): Technical manual. Minneapolis, MN: Medtronic, Inc. Available online: [http://manuals.medtronic.com/wcm/groups/mdtcom\\_sg/@emanuals/@era/@crdm/documents/documents/198137001\\_cont\\_20080311.pdf](http://manuals.medtronic.com/wcm/groups/mdtcom_sg/@emanuals/@era/@crdm/documents/documents/198137001_cont_20080311.pdf)

Spotts, V. (2011). Temporary transvenous and epicardial pacing. In D. Lynn-McHale Wiegand (Ed.), AACN procedure manual for critical care (6th ed., pp. 429-442). St. Louis, Missouri: Elsevier Saunders.

Vancouver Coastal Health – PolicyNet VA (PCG P-010). (2005, August). *Adjust settings of and/or change temporary pacemaker pulse generator and/or pulse generator batteries*.

## Revised by

CPD Developer Lead(s):  
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Clinical Nurse Educator, ICU, RH  
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## Endorsed by

VCH: (Regional SharePoint 2<sup>nd</sup> Reading)

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Health Authority Profession Specific Advisory Council Chairs (HAPSAC)  
Health Authority & Area Specific Interprofessional Advisory Council Chairs (HAIAC)  
Operations Directors  
Professional Practice Directors

PHC: Professional Practice Standards Committee

### **Final Sign-off & Approved for Posting by**

Vice President Professional Practice and Chief Clinical Information Officer – VCH

Professional Practice Standards Committee – PHC

### **Date of Approval/Review/Revision**

Approved: August 12, 2014

Posted: August 14, 2014

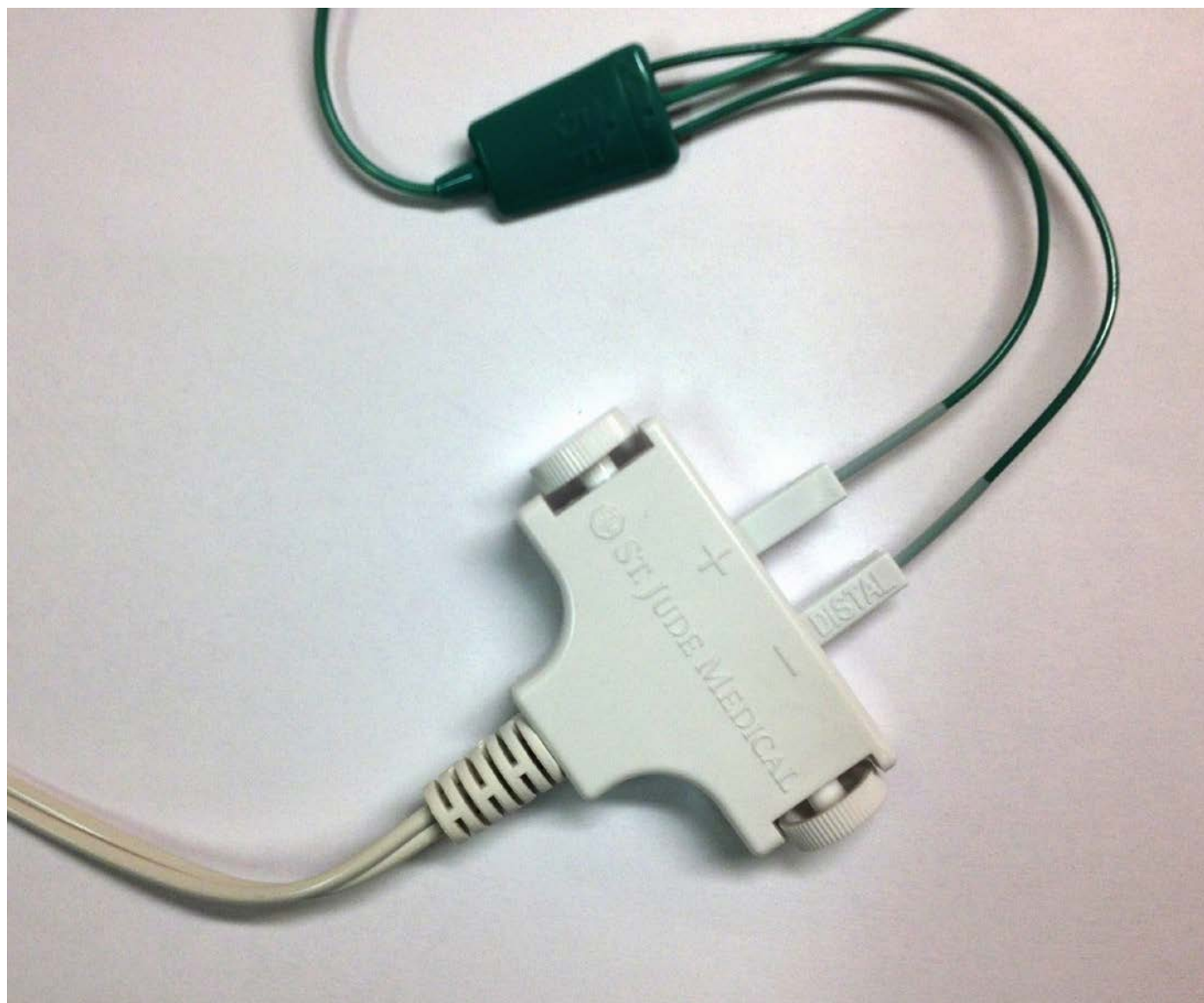
Revised: September 21, 2016 (minor revision)

## Appendix A: Pulse generator and connection wire



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## Appendix B: Bipolar TVPM wire connection



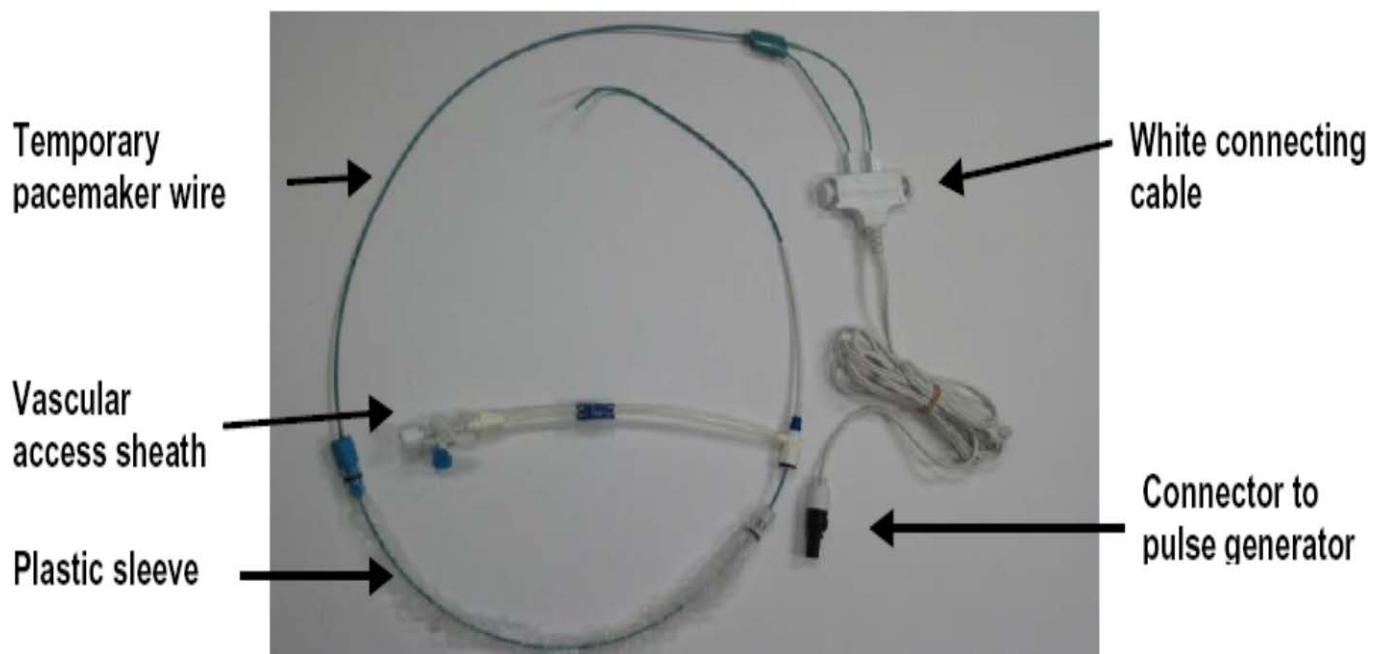
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## Appendix C: Single Chamber Temporary Transvenous Pacemaker and Connection System



Single chamber

### Pacemaker wire and connecting cable set-up:



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## Appendix D: Edwards Life Sciences, Balloon-tipped Bipolar TVPM wire

If using Edwards Life Sciences, Balloon-tipped Bipolar TVPM wire, ensure red pins are placed and secured into each black-colored leads (see Fig 1).

**Place the black-colored lead marked “DISTAL” into the “—” (i.e. negative) lead.**

**Place the black-colored lead marked “PROXIMAL” into the “+” (i.e. positive) lead (see Fig 2).**

Fig 1

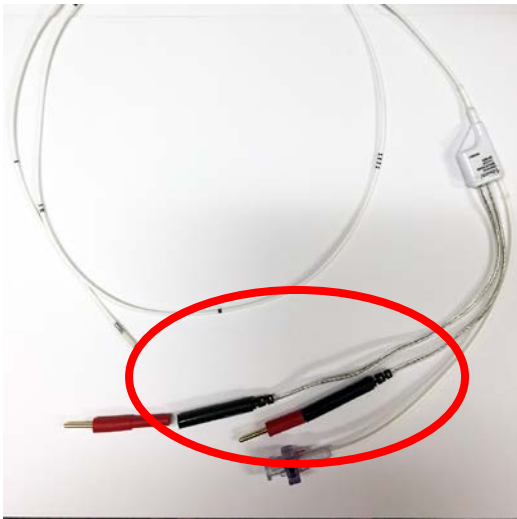
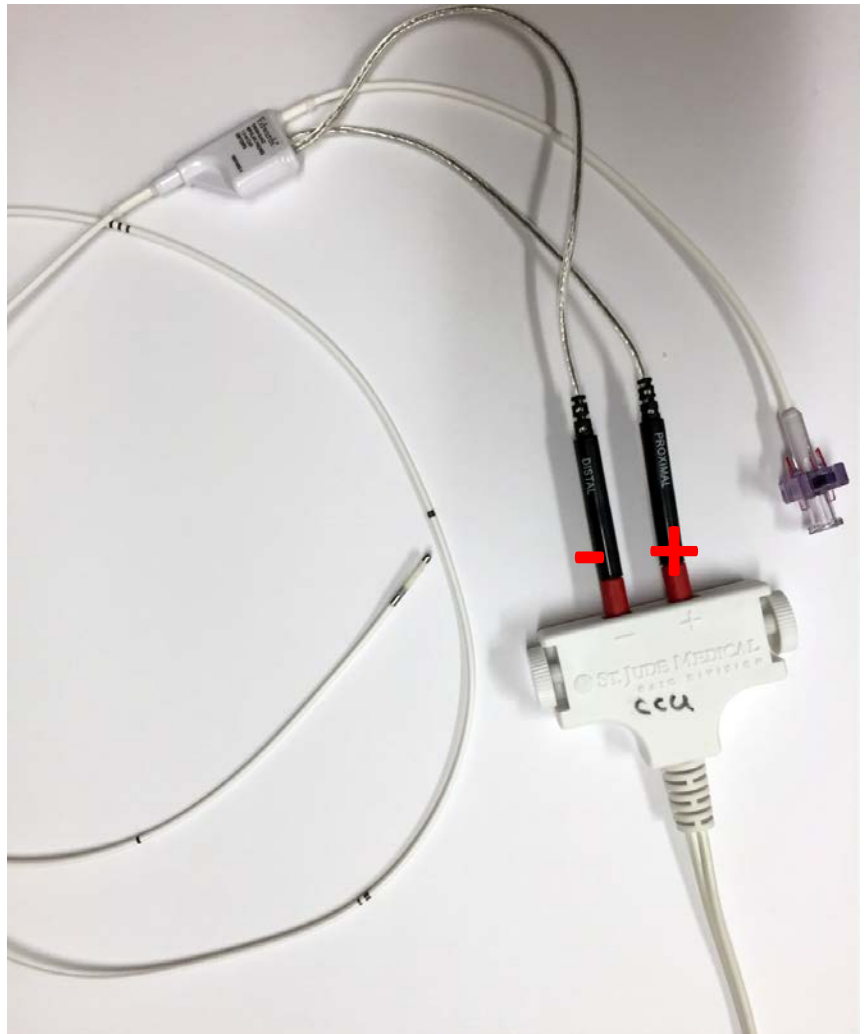


Fig 2



## Appendix E:

### Potential Complications related to Insertion of Temporary Transvenous Pacemakers

- Air Embolism
- Asystole
- Bleeding
- Catheter knotting
- Infection
- Lead dislodgement and disconnection
- Perforation
- Pericardial Tamponade
- Pneumothorax
- Pulmonary Embolism
- Subdiaphragmatic stimulation
- Thrombophlebitis
- Various Arrhythmias including ventricular tachycardia and ventricular fibrillation

**Notify Physician immediately if any of the above complications are suspected.**



## Appendix F: Trouble Shooting Guidelines

**Begin resuscitation efforts and call a CODE BLUE if unable to troubleshoot pacemaker problems and the patient becomes unstable**

- A. **FAILURE TO PACE** occurs when the pulse generator fails to deliver a pacing impulse. On the cardiac monitor, failure to pace is noted by the absence of pacing spikes.

CAUSES	INTERVENTIONS
1. Pulse generator failure	Rule out any cause for disruption of the basic operational function (e.g. replace battery, replace pulse generator, check connections, examine the TVPM wire to look for inadvertent displacement). Initiate resuscitation if patient unstable and notify MD stat.
2. Rate set too low Patient exhibiting symptoms of low HR (e.g. weakness, altered LOC, dizziness, syncope, chest pain, dyspnea, increasing supplemental oxygen requirements) at set rate	Notify MD. Anticipate MD to increase rate setting on pulse generator
3. Pulse generator oversensing Pulse generator not delivering pacing impulses because intrinsic artifact is inhibiting the device	Notify MD. Expect oversensing to be corrected with an adjustment on pulse generator. Pulse generator should be made less sensitive by <b>increasing</b> the mV (e.g. from 2mV to 4mV)



**Figure 1: Failure to Pace**

- B. **FAILURE TO SENSE** occurs when the pacemaker fails to detect intrinsic electrical activity and discharges paced impulses, thus competing with intrinsic activity. Failure to sense can result in R on T phenomenon and can induce ventricular arrhythmias.

CAUSES	INTERVENTIONS
1. Oversensing The pulse generator is being inhibited by intrinsic artifact and is <b>not pacing enough</b>	Notify MD. Expect oversensing to be corrected with an adjustment on pulse generator. Pulse generator should be made less sensitive by <b>increasing</b> the mV (e.g. from 2mV to 3mV).
2. Undersensing Pulse generator not “seeing” enough intrinsic electrical activity and is <b>pacing too frequently</b>	Notify MD. Expect undersensing to be corrected with an adjustment on pulse generator. Pulse generator should be made more sensitive by <b>decreasing</b> the mV (e.g. from 2mV to 1mV).



The pulse generator is failing to sense the intrinsic electrical activity and is delivering impulses on intrinsic complexes

**Figure 2: Failure to sense**

- C. **FAILURE TO CAPTURE** occurs when a pacing impulse is delivered, but the paced chamber fails to depolarize. On a cardiac rhythm strip, failure to capture is noted by the presence of ventricular pacing spikes without corresponding QRS complexes.

CAUSES	INTERVENTIONS
1. Output set too low	Notify MD. Expect failure to capture to be corrected by adjusting the output setting. Often failure to capture can be corrected by raising the output (e.g. from 2mA to 4mA) to increase the strength of the paced impulse being delivered to the myocardial tissue.



Note, pacemaker spikes are not immediately followed by a QRS complex, thus the pacing impulse has failed to depolarize the ventricle.

**Figure 3: Failure to capture**