

## CRITICAL CARE AREAS PROCEDURE

**CATEGORY:** System-Level Clinical  
**ISSUE DATE:** October 22, 2003  
**SUBJECT:** **ADJUSTING TEMPORARY PACEMAKERS –  
MANAGEMENT OF PATIENT**

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### PURPOSE

To outline the responsibilities of the certified Perfusionist, Perfusion Assistant and Registered Nurse (RN) in the Intensive Care Unit/Step Down Unit (ICU/SDU), Cardiac Medical Unit (CMU), Cardiac Catheterization Lab and Perfusion Department for the care and management of the patient post temporary transvenous or transthoracic pacemaker insertion.

### PROCEDURE

#### Equipment

- Medtronic 5392 (**Appendix A**) or Medtronic 5388 (**Appendix B**) pacemaker generator
- Primary IV pump tubing
- Maintenance IV solution (e.g. Normal Saline 0.9%, Ringers Lactate as ordered by the physician)
- Transparent dressing
- Grey pacemaker cable
- Elastic tensor bandage (for femoral vein insertion site)
- Safety pin

#### Special Instructions

- This procedure focuses on adjusting, determining sensitivity and stimulation thresholds for temporary transvenous and transthoracic pacemakers.
- The act of adjusting temporary transvenous and transthoracic (transmyocardial/epicardial) pacemakers using a generator box is a controlled act transferred from physicians to certified Perfusionist, Perfusion Assistant and RNs under the medical directive MD CCP 12 – Adjusting Temporary Pacemakers, in the aforementioned departments.

#### Method

##### Post-Insertion Care and Documentation

1. Ensure the patient has a patent peripheral IV in situ.

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2. Monitor the patient ECG in Lead V1 whenever possible.
3. Monitor and document the assessment of the sheath insertion site for signs and symptoms of redness, inflammation, bleeding and hematoma formation.
4. Ensure the pacemaker wire and pacing port is secured to the patient with a transparent dressing.
5. Assess the pacemaker wire at the beginning of every shift, Q4H and PRN to ensure the sutures are intact and the catheter is secured with a transparent dressing with no potential for catheter migration.
6. There must be a minimum of 30 mL/hr IV infusing through the side port of the sheath at the pacemaker site to maintain line patency.
7. Assess and document the pacemaker generator settings, efficacy (sensing and capturing) and battery level:
  - A. Q4H
  - B. Post turning and repositioning
  - C. PRN to ensure ordered physician parameters are maintained and to check for “low battery” signal
  - D. Daily assessment of atrial and/or ventricular output threshold(s). **A physician must be present in the unit to perform a threshold assessment.**
8. Pacemaker adjustments by a certified Perfusionist, Perfusion Assistant or RN will be made in accordance with MD CCP 12 and documented on the critical care flow sheet.
9. The patient is to be maintained on bed rest during temporary transvenous pacing. **Exception:** Transcatheter aortic valve implantation (TAVI) patients may ambulate with a temporary transvenous pacemaker in situ via the internal jugular (IJ) route only with a physician order.
10. Change the batteries with every new patient, daily when using Medtronic 5388 or when the battery is low when using Medtronic 5392. This is done during day shift when a physician is present in the unit (unless unpredicted battery failure). Two RNs should be present at the bedside when battery changes take place.

#### Pacemaker Insertion Site Considerations

##### *Antecubital (Brachial), Jugular, Subclavian Veins*

- Limit use of the arm, as extension of the arm may displace the pacing wire and thus affect the capture and pacing of the pacemaker.
- Head of the bed elevation should not exceed 45°.

##### *Femoral Vein*

- Keep the leg straight during patient care activities.
- Wrap an elastic tensor bandage around the knee (same extremity as the pacemaker site) to help avoid bending. Secure the pacemaker generator to the tensor using safety pins.
- Log roll when turning to avoid bending the knee during repositioning.
- Remind the patient to keep the leg straight. Restrain the ankle as necessary, with an order from the physician, to ensure patient safety.
- Do not raise the head of the bed higher than 10°, as this may change the pacemaker wire positioning and affect the cardiac rhythm. Reverse Trendelenburg position may be used to ease the discomfort of continuous bed rest as well as propping with pillows behind the back and between the legs for meals.

#### Care of Generator Post Patient Use

1. Remove the battery and dispose of it in the appropriate receptacle in the dirty utility room.
2. Clean the generator box with 70% Isopropyl Alcohol.
3. Return the generator to the designated storage bin.

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4. Wipe the pacemaker cable with Virox or Clorox wipes and place it in the SPD bin in the dirty utility room for reprocessing.

## **EDUCATION AND TRAINING**

### **References and Related Documents**

Adjusting Temporary Transvenous Pacemakers Critical Care Certification

Medtronic 5388 Dual Chamber Temporary Pacemaker Technical Manual

Medtronic 5392 Temporary External Pacemaker Manual

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## APPENDIX A

### Medtronic 5392

#### Initial Set-Up

1. Determine which chamber has a pacing wire. I.e. Atrial, ventricular or both
2. Monitor the patient's ECG and blood pressure as you follow the procedure to determine thresholds.
3. Determine Sensing Thresholds
  - a. Turn on the temporary pacemaker without connecting it to the patient. **Do not connect the temporary pacemaker to the grey cable before decreasing the A and V OUTPUT to 0.1mA. Default settings are: 80 bpm, Atrial mA 10, Ventricular mA 10, Atrial sensitivity 0.5mV, Ventricular sensitivity 2.0mV.**
  - b. Select the appropriate pacing mode:
    - i. Using the arrow keys, highlight the appropriate mode, then press the enter key.
      1. DDD if the patient has both atrial and ventricular wires in place
      2. VVI if the patient only has ventricular wires in place.
  - c. Determine Ventricular Sensing Threshold
    - i. Set the RATE at least 10 below the patient's intrinsic rate.
    - ii. Set A and V OUTPUT to 0.1 mA. This prevents the risk of competitive pacing.
      1. If the pacemaker is set to VVI, the atrial output should remain OFF.
    - iii. Connect the pacemaker generator to the grey cable.
    - iv. Press the KEY button to display the menu.
    - v. **Ventricular:** Use the arrows to highlight V SENSITIVITY.
    - vi. Decrease SENSITIVITY: slowly turn the MENU PARAMETER dial counter clockwise (increase mV value) until the V sense indicator stops flashing. The V PACE indicator flashes continuously, but capture will not occur due to the low mA.
    - vii. Increase SENSITIVITY: slowly turn the MENU PARAMETER dial clockwise (decrease mV value) until the V sense indicator starts flashing. The V PACE indicator stops flashing. This value is the sensing threshold.
    - viii. Set SENSITIVITY to half the threshold value.
    - ix. Document the current setting in the Critical Care flow sheet.
  - d. If required, repeat the above steps to determine Atrial Sensitivity thresholds.
4. Determine Capture thresholds
  - a. Determining Ventricular Capture Thresholds
    - i. Set the RATE at least 10 above the patient's intrinsic rate. Verify the V pacing indicator is flashing.
    - ii. Slowly turn the V OUTPUT dial clockwise until ECG shows consistent ventricular capture. The V PACE indicator flashes continuously. The V Sense indicator stops flashing. This value is the capture threshold.
    - iii. Set the V OUTPUT to a value of 2 times greater than the capture threshold value.
    - iv. Restore the RATE as per physician order.
    - v. Document the current setting in the Critical Care flow sheet.
  - b. If required, repeat the above steps to determine atrial capture thresholds.



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### **Daily Output Assessment**

1. Monitor the patient's ECG and blood pressure as you follow the procedure to assess thresholds.
2. Verify the patient is connected to the temporary pacemaker and pacing mode (i.e. VVI, DDD).
3. Determine Ventricular Capture Threshold
  - a. Set the RATE at least 10 above the patient's intrinsic rate. The V PACE indicator flashes.
  - b. Slowly turn the V OUTPUT dial counter clockwise until the ECG shows loss of capture. The V PACE and V SENSE indicators flash intermittently.
  - c. Slowly turn the V OUTPUT dial clockwise until ECG shows consistent capture. The V PACE indicator flashes continuously, the V SENSE indicator stops flashing. This value is the capture threshold.
  - d. Set the V OUTPUT to a value 2 times greater than the capture threshold value.
  - e. Restore the RATE as per physician order.
  - f. Document the current setting in the Critical Care flow sheet.
4. If required, repeat the above steps to determine atrial capture thresholds.

### **Battery Change**

#### **Equipment**

- 2 AA batteries
- 2 RNs (one of which must be certified in adjusting transvenous/transthoracic temporary pacemakers)

#### **Special Instructions**

- **The battery should be changed on day shift when the battery icon becomes low (one bar remaining) and the red backlight begins flashing.**
- The external demand pulse generator will continue to operate for 30 seconds under the following conditions:
  - Settings of VVI
  - Rate of 80 ppm or less
  - Ventricular output of 10 mA or less
- If the patient is pacemaker-dependent, consider setting up a second generator box with the current settings and switching them out.

#### **Method**

1. Open the battery drawer by pressing the button at the bottom of the device.
2. Slide the battery drawer open from the pulse generator.
3. Remove the batteries from the drawer and replace. Observe the voltage polarity markings on the batteries and drawer.
4. Slide the battery drawer back into the pulse generator.
5. Ensure the battery icon displays full charge.
6. Document the battery change in the Critical Care flow sheet.

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## APPENDIX B

### Medtronic 5388

#### Initial Set-up

1. Determine which chamber has a pacing wire. I.e. Atrial, ventricular or both
2. Monitor the patient's ECG and blood pressure as you follow the procedure to determine thresholds.
3. Determine Sensing Thresholds
  - i. Turn on the temporary pacemaker without connecting it to the patient. **Do not connect the temporary pacemaker to the grey cable before decreasing the A and V OUTPUT to 0.1mA. Default settings are: 80 bpm, Atrial mA 10, Ventricular mA 10, Atrial sensitivity 0.5mV, Ventricular sensitivity 2.0mV**
  - ii. Select the appropriate pacing mode:
    - i. Press the MENU key until Menu M is displayed.
    - ii. Use the MENU PARAMETER dial to highlight the appropriate mode, then use the SELECT key to activate the mode.
      1. DDD if the patient has both atrial and ventricular wires in place
      2. VVI if the patient only has ventricular wires in place.
  - iii. Determine Ventricular Sensing Threshold
    - i. Set the RATE at least 10 below the patient's intrinsic rate.
    - ii. Set A and V OUTPUT to 0.1 mA. This prevents the risk of competitive pacing.
      1. If the pacemaker is set to VVI, the atrial output should remain OFF.
    - iii. Connect the pacemaker generator to the grey cable.
    - iv. Press the MENU key until Menu 1 is displayed.
    - v. **Ventricular:** Press the Select key to highlight V SENSITIVITY.
    - vi. Decrease SENSITIVITY: slowly turn the MENU PARAMETER dial counter clockwise (increase mV value) until the V sense indicator stops flashing. The V PACE indicator flashes continuously, but capture will not occur due to the low mA.
    - vii. Increase SENSITIVITY: slowly turn the MENU PARAMETER dial clockwise (decrease mV value) until the V sense indicator starts flashing. The V PACE indicator stops flashing. This value is the sensing threshold.
    - viii. Set SENSITIVITY to half the threshold value.
  - iv. If required, repeat the above steps to determine Atrial Sensitivity thresholds, ensuring to highlight A SENSITIVITY.
  - v. Document the current setting in the Critical Care flow sheet.
4. Determine Capture thresholds
  - i. Determining Ventricular Capture Thresholds
    - i. Set the RATE at least 10 above the patient's intrinsic rate. Verify the V pacing indicator is flashing.
    - ii. Slowly turn the V OUTPUT dial clockwise until ECG shows consistent ventricular capture. The V PACE indicator flashes continuously. The V Sense indicator stops flashing. This value is the capture threshold.
    - iii. Set the V OUTPUT to a value of 2 times greater than the capture threshold value.
    - iv. Restore the RATE as per physician order.
    - v. Document the current setting in the Critical Care flow sheet.
  - ii. If required, repeat the above steps to determine atrial capture thresholds.



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### **Daily Output Threshold Assessment**

1. Monitor the patient's ECG and blood pressure as you follow the procedure to assess thresholds.
2. Verify the patient is connected to the temporary pacemaker and pacing mode (i.e. VVI, DDD).
3. Determine Ventricular Stimulation Threshold
  - a. Set the RATE at least 10 above the patient's intrinsic rate. The V PACE indicator flashes.
  - b. Slowly turn the V OUTPUT dial counter clockwise until the ECG shows loss of capture. The V PACE and V SENSE indicators flash intermittently.
  - c. Slowly turn the V OUTPUT dial clockwise until ECG shows consistent capture. The V PACE indicator flashes continuously, the V SENSE indicator stops flashing. This value is the capture threshold.
  - d. Set the V OUTPUT to a value 2 times greater than the capture threshold value.
  - e. Restore the RATE as per physician order.
  - f. Document the current setting in the Critical Care flow sheet.
4. If required, repeat the above steps to determine atrial capture thresholds.

### **Battery Change**

#### **Equipment**

- 9-Volt battery
- 2 RNs (one of which must be certified in adjusting temporary transvenous/transcutaneous pacemakers)

#### **Special Instructions**

- **The battery should be changed on day shift every 24 hours when the pulse generator is in use.**
- The external demand pulse generator will continue to operate for 15 seconds under the following conditions:
  - Rate of 70 ppm or less
  - Atrial and ventricular output of 10 mA or less
  - Backlight off and lower screen blank
- If the battery is removed while the backlight is on or the lower screen is active, the device may shut down immediately depending on the battery level.
- If the patient is pacemaker-dependent, consider setting up a second generator box with the current settings and switching them out.

#### **Method**

1. To install or replace the battery, press the battery release button until the drawer opens.
2. Remove the old battery and replace it with a new 9-Volt battery. Ensure the drawer clicks shut.