

Children's National Hospital  
Division of Nursing & Patient Services

**Nursing Practice Guideline**

**Chapter:** Cardiovascular 1

**Date Effective:** 04/93

**Last Updated:** 10/22

**External Pacemaker Management**

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**I. Definitions/Explanations**

- A. External Pacemaker: A device which transmits and senses electrical impulses from the atria and/or ventricles at selected rates through wires into the heart in order to stimulate the heart to contract.
- B. Use: Regulates heart rate in the presence of heart block or absence of normal function of the sinoatrial or atrioventricular node. External pacemaker can also be used to manipulate the heart rate and /or rhythm to optimize cardiac output.
- C. External Pacemaker Hardware:
  - 1. Internal pacing wires (inserted onto the epicardium)
  - 2. Cables (connections between pacemaker unit and internal pacing wires)
  - 3. Battery operated pacemaker unit (also called "pulse generator")
- D. Sensitivity: The ability of the device to detect the patient's intrinsic cardiac activity.
- E. Capture: Electrical current sent from pacemaker to stimulate depolarization and contraction of the ventricle and/or atria.
- F. Output: Amount of energy needed to consistently depolarize the heart to achieve capture of atria or ventricle.
- G. Pacing modes: See Table 1.

**II. Assessments/Interventions**

- A. Maintain emergency supplies at bedside/during transport (at all times)
  - 1. Extra pacemaker batteries – 2 AA
  - 2. Extra cardiac temporary pacing wire

- B. Assess at the beginning of the shift, Q 4 hours and PRN with pacemaker interventions (until external pacing is discontinued)**
- 1. Hemodynamic status with a focus on changes in cardiac output**
    - a. Pulses, capillary refill
    - b. Change in mentation, sensorium
    - c. Tachypnea
    - d. Decreasing urine output
    - e. Change in NIRS
  - 2. Patient on cardiorespiratory monitor and monitor is in “paced mode”.**  
Visualize the capturing of the QRS complex on the monitor. Assess heart rate to determine if patient heart rate corresponds to the set rate on the pacemaker or is within the heart rate range as set on the pacemaker.
  - 3. Heart Rate & Rhythm (capture/non-capture, appropriate sensing)**
  - 4. Pacemaker status**
    - a. Ensure pacemaker is set at the appropriate ordered settings for: Pacing Mode (i.e., DDD, AAI, VVI), lower rate limit, output, sensitivity.
    - b. Check battery function indicator light and ensure battery date change: **Battery change date should be within 7 days or less than 3 bars, whichever comes first.**
    - c. Ensure that wires are tightly screwed into pacemaker cables and that cables are appropriately connected to pacemaker box
  - 5. Inspect pacing wire insertion site(s) for**
    - a. Condition of the skin
    - b. Presence of drainage
    - c. Placement/ Integrity of pacing wires
    - d. After pacer wires have been removed, cleanse sites-daily using **CHG wipes, per Care of the Sternotomy NPG. Gauze dressing should be removed after 48 hours**
  - 6. Safety precautions**
    - a. Assess need for additional measures to prevent accidental dislodgement of pacer wires or system
    - b. Check connections regularly for security to pacemaker/cable system
    - c. Tape pacing wires securely to skin; Label Atrial or Ventricular; Curl wires onto chest in opposite directions to create a “stress loop”; Leave pin and 2” of wire free from stress loop.
    - d. Wear gloves when handling pacing electrodes to prevent micro-shocks.
    - e. Cover ground electrodes or unused electrodes with the fingertip of a disposable glove or place inside a red top lab tube.
    - f. If patient is having hemodynamic instability and LIP is making significant changes to pacemaker setting, consider calling CICU Attending to bedside

**C. Change pacemaker battery if:**

1. Low battery indicator appears during device operation (Batteries are AA Alkaline batteries). Per Medtronic, pacing will be maintained at the current settings for a minimum of 30 seconds.
  2. External pacemaker is being applied to a new patient.
  3. **There are five bars to indicate battery life. The batteries should be changed every 7 days or less than three bars.** The device must be checked **EVERY SHIFT** to ascertain that the low battery indicator is not on (per Medtronic, battery life is typically 9 days, minimally 7 days).
- D. Verify settings after battery change.

### III. Reportable Conditions (to Cardiology or CICU Fellow)

- A. Change in rhythm or pacing pattern “looks different”
- B. Pacing wire:
  1. Becomes disconnected from pulse generator/cable. Reconnect wire then report to physician.
  2. Falls out
  3. Breaks
- C. Unexplained change in patient’s cardiac output or cardiovascular status.
- D. Pacing wire insertion site appears infected or otherwise abnormal.

### IV. Documentation

- A. Complete pacer information on the flowsheet under the cardiovascular assessment section (pacemaker and pacemaker setting sections) every shift.
- B. Document pacemaker setting changes.
- C. Document date and time of battery change on a sticker placed on the pacemaker generator. **Sticker should indicate when the battery needs to be changed.**
- D. Document any changes in pacemaker settings or mode under Significant Events/Comments in vital signs flowsheet AND in the temporary pacemaker settings section of the assessment flowsheet.

<b>Table 1: Pacemaker Codes used to describe various temporary pacing modes 1<sup>st</sup> Letter Chamber Paced</b>	<b>2<sup>nd</sup> Letter Chamber Sensed</b>	<b>3<sup>rd</sup> letter Response to a sensed electrical signal</b>
A	A	I
V	V	I
D (A+V)	D (A+V)	D (I+T)
O	O	O

A= Atrium, V=Ventricle, D= Dual (both chambers) O= None  
 T=Triggered (causing pacemaker to fire) I= Inhibited (demand)

The first letter describes the chamber that is paced; the second, the chamber that is sensed; and the third, the pacer’s response to sensing (i.e., AAI). The letter “I” indicates if the response is inhibited (demand). The letter “T” indicates if the response is triggered (causing the pacemaker to fire). And the letter “D” indicates whether the response was inhibited and/or triggered.

## V. Patient and Family Education

Explain clinical indications for temporary pacing and length of therapy. Discuss the procedure and ongoing monitoring required. Discuss activity restrictions for the patient during temporary pacing. Discuss clinical indications for discontinuing therapy. Use teach back when appropriate. (Verger & Lebet, 2008).

## VI. References

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- Park, M.K. (2014). *Pediatric Cardiology for Practitioners, 6<sup>th</sup> edition. Mosby.edition. St. Louis, MO*
- Medtronic Model 5392 Temporary External Pacemaker Tip Card. (2013, September). Retrieved October 20, 2016, from [http://www.kentuckyonehealth.org/documents/nursing/5392\\_TipCard.pdf](http://www.kentuckyonehealth.org/documents/nursing/5392_TipCard.pdf)
- Skippen, P., Shubhayan, S., Froese, N., & Gow, R. M. (2010). Pacemaker therapy of postoperative arrhythmias after pediatric cardiac surgery. *Pediatric Critical Care Medicine*, 11(1), 133-138. Level V
- Verger, J. T. & Lebet, R.M. (Eds.). (2008). *AACN Procedure Manual for Pediatric Acute and Critical Care*. St. Louis, MO: Saunders.

## VII. Reviewers

- A. Department of Cardiology
- B. CICU Safe Practice Council
- C. CICU Medical Leadership
- D. Shared Nursing Leadership Practice Council – Systems Level

## VIII. Legal Statement

The nursing practice guidelines are intended to serve as a reference for the nurses in their practice. The compilation of information provided is drawn from relevant literature research from juried, reliable and respected sources. The guidelines are not intended to replace individual judgment but instead to inform decision making. The material is updated approximately every 12- 24 months.

## IX. Approval

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Senior Vice President & Chief Nursing Officer

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Date

Original Date: 04/93

Revised Date: 11/97, 10/01, 08/03, 12/06, 06/08, 06/09, 12/10, 3/12, 1/13, 11/14, 11/16, 3/19, 10/20, 10/22