Remote Monitoring for Patients with Cardiac Implantable Electronic Devices (CIED)

Site Applicability

St. Paul's Hospital (SPH) Heart Rhythm Device Clinic

Practice Level

Specialized:

Care of the patients with CIEDs is limited to **Registered Nurses and Device Technologists** who have received specialized education and training**.** Health professionals responsible for interpretation of remote monitoring (RM) transmissions are required to have the same qualifications, training and experience as those performing in-person (clinic) assessments.

Need to Know

- Included in this guideline: permanent pacemakers (PPM), implantable cardioverter-defibrillators (ICD), cardiac resynchronization therapy (CRT), and implantable loop recorders/implantable cardiac monitors (ILR or ICM).
- Practice guidelines in Canada recommend that patients who have received a pacemaker (PM), implantable cardioverter-defibrillator (ICD) or cardiac resynchronization therapy (CRT) (collectively referred to as CIEDs) undergo routine follow-up assessment of their cardiac device at regular intervals (annually for pacemakers, every 6 months for ICDs and CRTs).
- Traditionally, this care was provided at a designated device follow-up clinic however, all current CIEDs are now manufactured with remote monitoring capability which allows for device assessment and interrogation from any patient location accessible by a landline or mobile telephone.
- The 2023 HRS Expert Consensus Statement on Practice Management for Remote Monitoring (RM) recommends patients be enrolled prior to discharge or within two weeks of implantation.
- Remote monitoring is considered standard of care and ought to be incorporated into routine scheduling of CIED follow-up when clinically appropriate (e.g. In-person visits alternating with RM transmissions).
- The 2023 HRS Expert Consensus Statement reports an estimated 3.0 FTEs are required to support the care of 1000 CIED patients (RM combined with in-clinic visits) with varying proportions of the type of personnel (clinical vs nonclinical) depending on individual clinic workflows and mix of devices being followed.

- A CIED RM Clinical Staffing Calculator was developed by the authors of the 2023 HRS Expert Consensus Statement using data that supports their staffing recommendations. Calculator Link: https://www.hrsonline.org/guidance/CIED-RemoteMonitoringStaffCalculator?utm_source=informz&utm_medium=email&utm_campaign=guidance&utm_content=calculator_launch

Guideline

1. **Patient selection for RM**

The following patients will be prioritized for RM:

- All Implantable Cardioverter Defibrillator (ICD)
- Cardiac resynchronization ICD (Pacemaker and Defibrillator)
- Implantable Loop Recorder/Cardiac Monitors
- CIED's under advisory
- Pacemakers (priority for those living in nursing homes and rural/remote areas)

2. **Enrollment and consent process**

- Patient suitability for RM enrollment should be a collaborative decision among care-providers based on clinical indications (as above), and practical issues such as type of phone (land-line compatibility, cell-phone), location of phone jack, WIFI and cell-phone coverage, technical familiarity and potential language barriers.
- Enrollment and informed consent for new implants will occur after implant or at the patient's first follow-up visit.
- The patient is required to sign the PHC consent form HH058 (Consent for follow-up and collection of information about your cardiac implantable electronic device using a remote monitoring system). This consent form includes acknowledgement of the storage of patient data and the use of de-identified information for non-clinical purposes by manufacturer and hospital-based research teams.
- The method of receiving the RM monitor varies between the device vendors (by mail, courier or from Device Clinic consignment).
- Patients with new ILR/ICM implants are provided with a monitor by the vendor at the time of implant. The vendor will inform clinic staff when an ILR/ICM is being implanted in order for patient information and device serial number to be entered in the appropriate RM platform ready for transmissions.

3. **Clinic operations and scheduling**

Routine transmissions

- All routine RM transmissions will be scheduled by the Device Clinic Nurse or Technologist and will be entered into the clinic scheduling system.

- When possible, routine RM transmissions should not be booked near in-person device clinic appointments (i.e. within 1 month proximity)
- Each day, a dedicated member of the Device Clinic staff will be assigned to review and provide management to RM transmissions. When possible, the staff member will have a workstation off-site or, from home.
- One staff member will have dedicated/protected time each week to provide RM surveillance which includes: calling patients who have missed remote transmissions, missed appointments, and disconnected monitors.
- Review and management of RM will include triaging of urgent and/or semi-urgent events and any unscheduled transmissions.
- See **Appendix A for RM alert types** which include: Red (urgent/critical alerts) and Yellow (semi-urgent) (taken from the 2023 HRS Expert Consensus Statement).
- All routine transmissions are routed to the most responsible physician through Paceart for review and sign off. Reports require sign-off by the MRP within 90 days of transmission in order to be eligible for appropriate billing/reimbursement.
- Patients will be notified that their transmission was reviewed by a member of the Device clinic. Timing and mode of communication may depend on clinical relevance and action-ability of detected events.
- Actionable events should be communicated directly or by email, and clinical intervention performed with a timely plan (see below for unscheduled and/or actionable alerts management).

Unscheduled transmissions (alert management)

- Unscheduled transmissions can include: web alerts, patient initiated/patient error and urgent (red/critical) or semi-urgent (yellow) alerts.
- Red alert transmissions that require urgent review/ intervention will be provided by the EP working in the Device Clinic that day or the EP on call. (HRS recommends clinics review and react to high-priority alerts within 1 business day).
- Yellow alert transmissions that require review or investigation by an EP will be addressed within 2-3 business days.

4. **Billing and fee codes**

- The following billing codes will be used for all RM transmissions:
  - Single chamber devices (to be billed for ICMs, single chamber ventricular and single chamber atrial devices)
  - P33174 $45.56 Professional fee
  - P33175 $23.12 technical fee

- Dual Chamber devices (to be billed for dual chamber pacemakers, all ICDs, all CRTPs and all CRTDs)
- P33176 $68.33 professional fee
- P33177 $46.24 technical fee

- All technical fee codes will be processed and submitted to billing by the Device Clinic clerk. All professional fees will be submitted by the respective physician reviewing the RM transmission.

Documentation

- Document assessments and interventions in Paceart and Cerner.
- See **Appendix B** for required device setting and parameters documentation (completed as a Paceart template).
- Paceart notes require sign off from the most responsible physician before it flows into Cerner.
- If a Paceart note is deemed important to be visible in Cerner before physician sign-off, the staff member will cut/past the note into Cerner.

Patient and Family Education

- HRS recommends that patients and their caregivers be informed that automatic alerts transmitted by RM do not substitute for an emergency management system.
- A Cardiac Services BC developed resource titled *"Consider Remote Monitoring"* is available for patients at the time of decision-making for device implant. This patient resource will provide general information and is intended to introduce the concept and a basic understanding of RM.
- Patients will be provided with a Cardiac Service BC developed resource titled *"Remote Monitoring of a Heart Device"* and in-person verbal education at the time of enrollment.
- The above written resources will be provided by the Device Clinic Staff in addition to in-person education at the time of enrollment in RM and as needed during subsequent in-person appointments or phone calls.
- Written, on-line resources and information for technical support specific to the manufacturer of the device will also be provided to the patient at the time of enrollment.

Evaluation

Expected Outcomes:

In alignment with the strategic goal directed by Cardiac Services BC, remote monitoring will become standard clinical practice at the SPH Device clinic and provide optimal patient-centered care.

References

1. Glotzer, T. V., Huang, J. L., Ikeda, T., FJCS, D. B. K., David Lin, M. D., & Varosy, P. D. (2023). 2023 HRS/EHRA/APHRS/LAHRS Expert Consensus Statement on Practical Management of the Remote Device Clinic. Europace, 25, 1-44.

2. Simovic, S., Providencia, R., Barra, S., Kircanski, B., Guerra, J. M., Conte, G., ... & Boveda, S. (2022). The use of remote monitoring of cardiac implantable devices during the COVID-19 pandemic: an EHRA physician survey. EP Europace, 24(3), 473-480.
3. Seiler, A., Biundo, E., Di Bacco, M., Rosemas, S., Nicolle, E., Lanctin, D., ... & Van Heel, L. (2021). Clinic time required for remote and in-person management of patients with cardiac devices: Time and motion workflow evaluation. JMIR cardio, 5(2), e27720.
4. Cheung, C. C., & Deyell, M. W. (2018). Remote monitoring of cardiac implantable electronic devices. Canadian Journal of Cardiology, 34(7), 941-944.
5. Yee, R., Verma, A., Beardsall, M., Fraser, J., Philippon, F., & Exner, D. Canadian Cardiovascular Society/Canadian Heart rhythm Society Joint Position Statement on the Use of Remote Monitoring for Cardiac Implantable Electronic Device follow-up. Canadian Journal of Cardiology2013; 29: 644-651.
6. Varma N, Piccini JP, Snell J, Fischer A, Dalal N, Mittal S. The relationship between level of adherence to automatic wireless remote monitoring and survival in pacemaker and defibrillator patients. Journal of the American College of Cardiology. 2015 Jun 23;65(24):2601-10.
7. Ploux S, Varma N, Strik M, Lazarus A, Bordachar P. Optimizing Implantable Cardioverter-Defibrillator Remote Monitoring: A Practical Guide. JACC: Clinical Electrophysiology. 2017 Apr 30;3(4):315-28.

Appendices

- Appendix A: Remote Monitoring Alerts
- Appendix B: Paceart Charting Template

Appendix A: Remote Monitoring Device Alerts

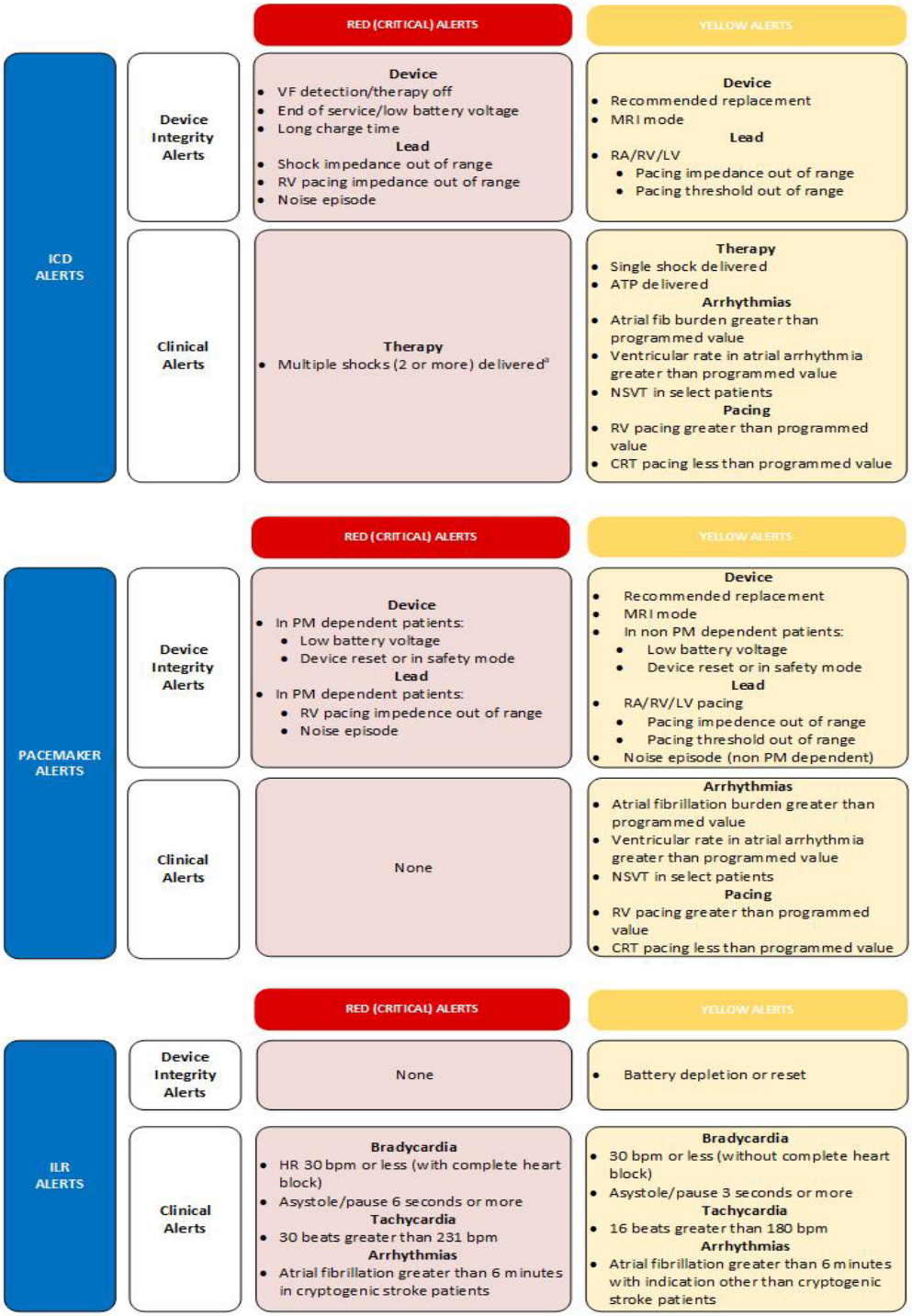

Figure 7: Red and yellow alerts for pacemakers and implantable cardioverter-defibrillators. Red alerts are defined as critical alerts requiring urgent review. Yellow alerts are those that, with early review, may lead to an action that impacts patient outcomes. [a]Multiple shocks could demonstrate clinical deterioration or be ineffective. ATP 5 anti-tachycardia pacing; bpm 5 beats per minute; CRT 5 cardiac resynchronization therapy; LV 5 left ventricular; ICD 5 implantable cardioverter-defibrillator; ILR 5 implantable loop recorder; MRI 5 magnetic resonance imaging; NSVT 5 nonsustained ventricular tachycardia; PM 5 pace-maker; RA 5 right atrial; RV 5 right ventricular; VF 5 ventricular fibrillation.

From: https://www.heartrhythmjournal.com/article/S1547-5271(23)02011-8/fulltext

Appendix B: Paceart Charting Template

PPM, ICD, CRT Charting

Location of Device: Device site is well healed: Yes/No

Presenting Rhythm: Percentage Paced: Underlying Rhythm:

Histogram: PVC counter:

Battery Longevity: Charge time: Magnet Rate:

Lead Impedance: RA: RV: LV: SIC count:

Sensing: P wave R wave Wavelet:

Threshold testing:

Observations:

Program Settings:

Follow up Plan:

Report by:

Loop Recorder/Insertable Cardiac Monitor Charting

Location of Device: Device site is well healed: Yes/No

Presenting Rhythm:

Battery Capacity:

Histogram:

R wave:

Observations: Symptom episodes. No tachy, brady, pause, asystole, or AT/AF auto recorded episodes.

Follow up Plan:

Report by:

S-ICD Charting

No alerts: Yes/No

Electrode and Generator sites are well healed: Yes/No

Presenting Rhythm:

Battery at _____% to ERI. Lead Impedance is ____ ohms

S-ECG acquired in all 3 vectors with appropriate sensing. Sensing Configuration: _____

Observations: Tachy, AF, or treated episodes

SMART Charge __ sec, SMART Pass ON, AF monitor ON. Beeper Audible and ON. Post Shock Pacing OFF

Follow up Plan:

Report by:

Pre MRI Charting

Pt has an MRI conditional/non-conditional system.

Location of Device: Device site is well healed.

Presenting rhythm: Percentage Paced: Underlying Rhythm:

Patient (IS/IS NOT) pacer dependent

Battery Longevity: Charge time: Magnet rate:

Lead Impedance: Sensing: P wave R wave

Threshold testing:

No diaphragmatic stimulation at 5V @ 1.0ms

No programming changes today

Orders for MRI: Dr. _____ authorized the scan and ordered the device to be programmed to ___ at 10 bpm above sinus for the scan.

MRI Scan scheduled for: date

Report by:

Day of MRI Charting

Pre-MRI: Presenting rhythm: Underlying rhythm:

The lead sensing, thresholds and impedances are satisfactory.

Battery estimated years (min years, max years).

Lead impedance:

Sensing: P wave mV, R wave mV. Thresholds:

No diaphragmatic stimulation at 5.0 V @ 1.0 ms.

Device programmed to ___@ ___bpm prior to MRI scan.

Post-MRI Charting

Device checked and reprogrammed to mode and rate ppm post scan.

Pt tolerated scan well.

Lead parameters within acceptable limits post scan.

Battery: Lead Impedance:

Sensing: P wave mV, R wave mV. Thresholds:

Follow-up plan:

Report by:

Persons/Groups Consulted:

Device Clinic Staff

Electrophysiology Physicians

Developed By:

Clinical Nurse Specialist, SPH Heart Rhythm Program

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