Remote Monitoring and Alert-Based Care

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Learning Objectives

- Describe the 2023 HRS/EHRA/APHRS/LAHRS expert consensus statement on practical management of the remote device clinic.
- Recall basic features of remote monitoring sites designed to support efficient clinical workflows.
- Discuss reasons for customizing remote alert parameters.
- Implement strategies to reduce unnecessary alert burden in daily clinical practice.

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2023 HRS/EHRA/APHRS/LAHRS expert consensus statement on practical management of the remote device clinic

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Key Points Of 2023 Consensus Statement

Practical Management of the Remote Device Clinic

1. Remote monitoring is the standard of care for CIED patients.
2. Patient enrollment immediately after implant & consistent connectivity is essential.
3. Remote monitoring requires appropriate patient-to-staff ratios for both clinical and non-clinical workflow needs.
4. All clinical staff involved in the care of patients via remote monitoring need to be properly trained and/or certified and participate in routine education to support high quality care.
5. Remote monitoring alerts should be set according to device type and indications to help improve clinical relevancy of the alerts and decrease clinical burden.
6. All communication of patient data related to remote monitoring results should be done securely and confidentially with the patient, their clinical team and be available in their electronic medical record.

Ferrick AM, et al. 2023 HRS/EHRA/APHRS/LAHRS expert consensus statement on practical management of the remote device clinic. Heart Rhythm. 2023 Sep;20(9):e92-e144. doi: 10.1016/j.hrthm.2023.03.1525. Epub 2023 May 19. PMID: 37211145.

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Key Points Of 2023 Consensus Statement (Cont.)

Practical Management of the Remote Device Clinic

7. Device manufacturers and clinicians must have bidirectional communication related to staff training, patient education, and patient care services needed for the management of safety advisories and device recalls.
8. It may be beneficial to clinics to partner with a 3rd party remote monitoring service to adequately meet the increased clinical demands.
9. Remote monitoring schedules for pediatric patients are like adults but may have special considerations.
10. ILRs/ICMs require immediate activation for remote monitoring & specific programming based on indications.
11. Remote monitoring that is alert-based will require continuous connectivity and can support extended times between in-person device interrogations.

Ferrick AM, et al. 2023 HRS/EHRA/APHRS/LAHRS expert consensus statement on practical management of the remote device clinic. Heart Rhythm. 2023 Sep;20(9):e92-e144. doi: 10.1016/j.hrthm.2023.03.1525. Epub 2023 May 19. PMID: 37211145.

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CardioMessenger Smart

Plug & play. The only option.

Connecting the patient to the Home Monitoring Service Center

Easy set-up
- Plug & play
- Automatic monitoring initialization (pairing)
- No patient interaction needed

CardioMessenger Smart

Using a cellular network
- No need for landline connection
- Global monitoring capability (roaming)*

Internal power
- Remains on, even when away from a power source for up to 48 hours
- Remains connected

* Not all previous CardioMessenger generations global capable. Subject to network availability.

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BIOTRONIK HMSC Provides Daily Automatic Updates

Remote monitoring data – collected daily, updated daily

Vs.

Advantages of daily transmission

- Remote diagnostics available anytime without online scheduling
- Remote triage with the last 24 hours of data accessible any time
- Assess therapy effectiveness with daily insight

Negligible impact on battery longevity

- 500 daily transmissions at 12-18 months post implant had no significant longevity impact[1]

Varma et. al. Long term preservation of battery longevity (despite daily transmission load) with Home Monitoring – the TRUST trial. Europace (2013) 15 (suppl 2), Abstract P1134

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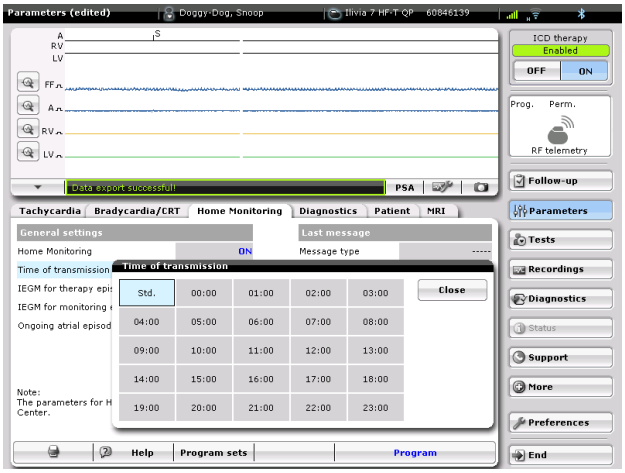
Device Programming for Home Monitoring

Minimal Device Programming Required



- Ensure Home Monitoring is turned On
- Set Transmission Time:
  - Std. = between 12:00 a.m. and 3:00 a.m.
  - Programmable to meet patient needs

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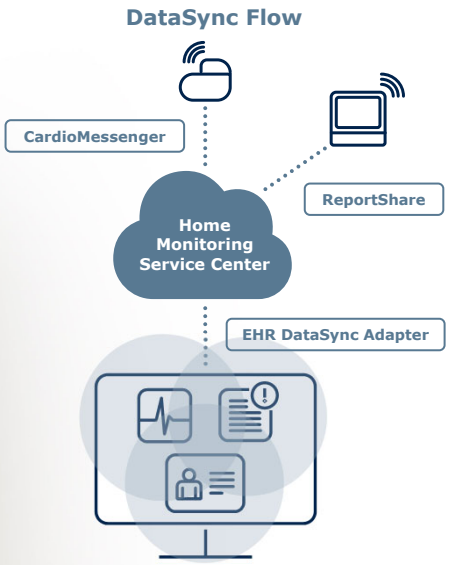
Automated Workflow

BIOTRONIK DataSync and ReportShare Solutions



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Triaging Your Home Monitoring Patients

Traffic light prioritization of alerts

Patients for review

Patients 1 - 6 of 6

Search | Display

Patient ID	Finding	Device/SN
BM IV Demo Biotro Nik	Brady Pause, ...	BIOMONITOR IV 95036674
Sarah Connor Sarah Connor	Device EOS	Itrevia 7 VR-T 60835191
2323675 Kylo Ren	Lead LeadRV, ...	Edora 8 DR-T 69351782
587734264 Malcolm Reynolds	Device DetOff, ...	Ilivia 7 HF-T QP 61036670
67825678 Joe Smith	Brady Pause, ...	BIOMONITOR IV 95037468
39985720 Ellen Ripley	Lead LeadRV, ...	Amvia Edge HF-T QP 1000000918

View | Patients for review | All patient groups | Activated monit

The traffic light concept:

- Look at the **red alerts** first - potential life-threatening alerts
- Next focus your attention on the **yellow alerts**

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Triaging Your Home Monitoring Patients
Comment Field to Communicate Relevant Information

Use the comment field to add relevant information, Examples:

- Does the patient have a known history of Afib that the MD is watching to see if the Afib burden increases?
- Is there a known (chronic) elevated impedance reading on the RV lead?

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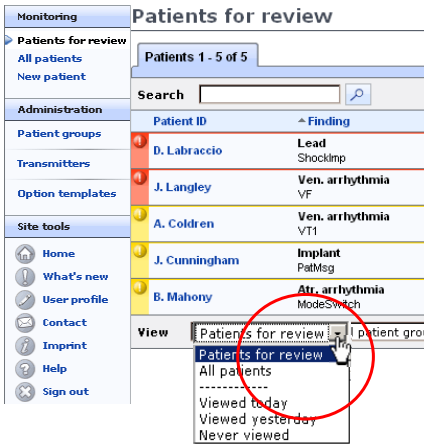
Triaging Your Home Monitoring Patients
Focus on Patients Who Need Care

Displays relevant information first…



- Patients with no active findings are not displayed on "Patients for review"
- You can always change to the "All patients" view to find patients not on the 'Patients for review' list

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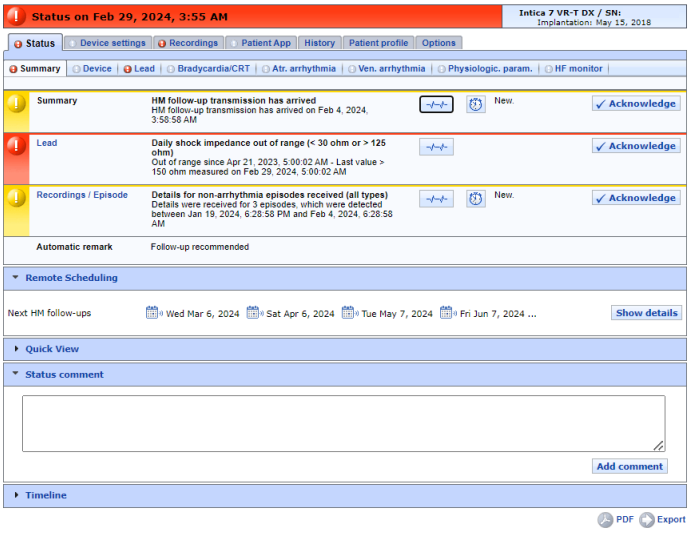
Status Summary Page

First Step: Display Relevant Clinical Data



HMSC helps you to prioritize/triage alerts:

- Red=Review first
- Yellow=Review per your clinic's guidelines
- Clock Icon=Postpone for days or weeks
- Acknowledge=Alert has been reviewed and/or resolved and can be removed from list

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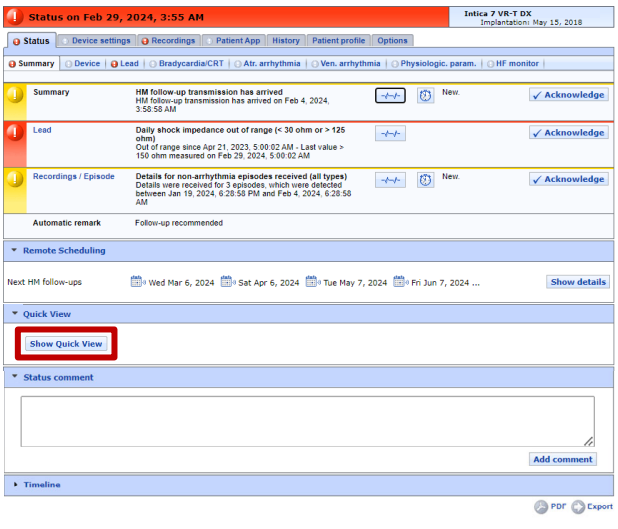
Patients for Review: Quick View



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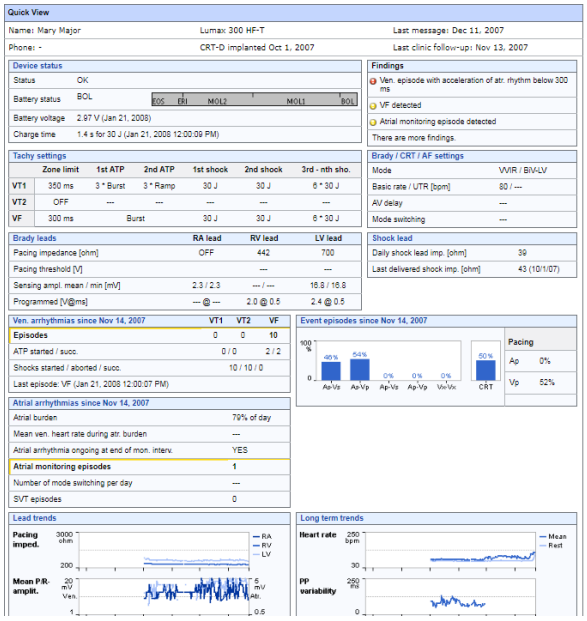
Quick View



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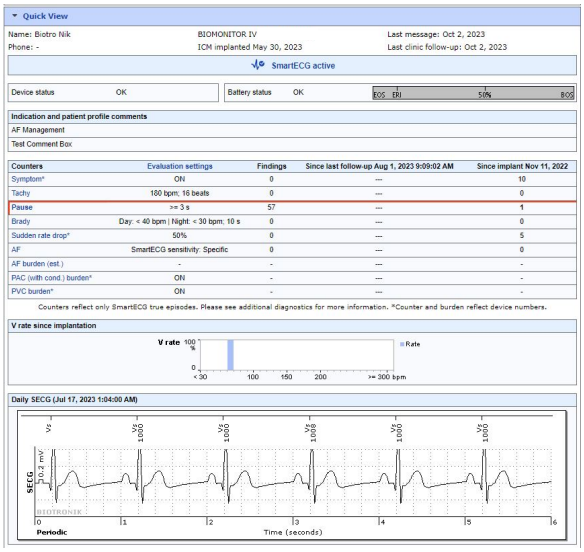
Quick View
BIOMONITOR IV



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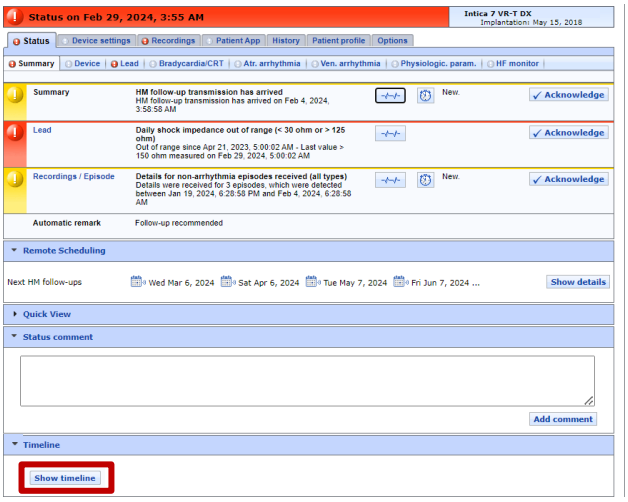
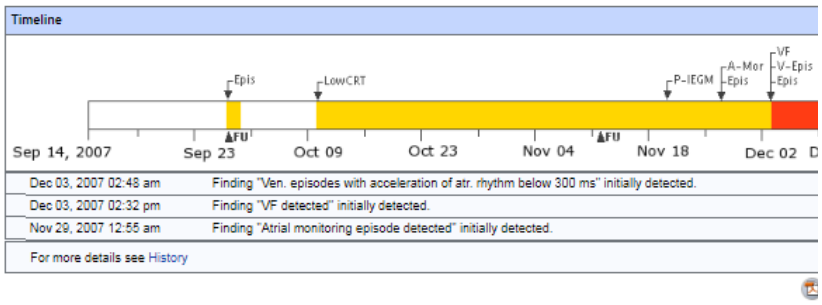
Patient Remote Monitoring Timeline



Patient Remote Monitoring Timeline



- How did the patient status change – and when?
- Which Monitoring Findings were reported?
- What was the responsible physician's comment and reaction?

Changing Patient Alert Options

Edit alerts individually or select an alert template

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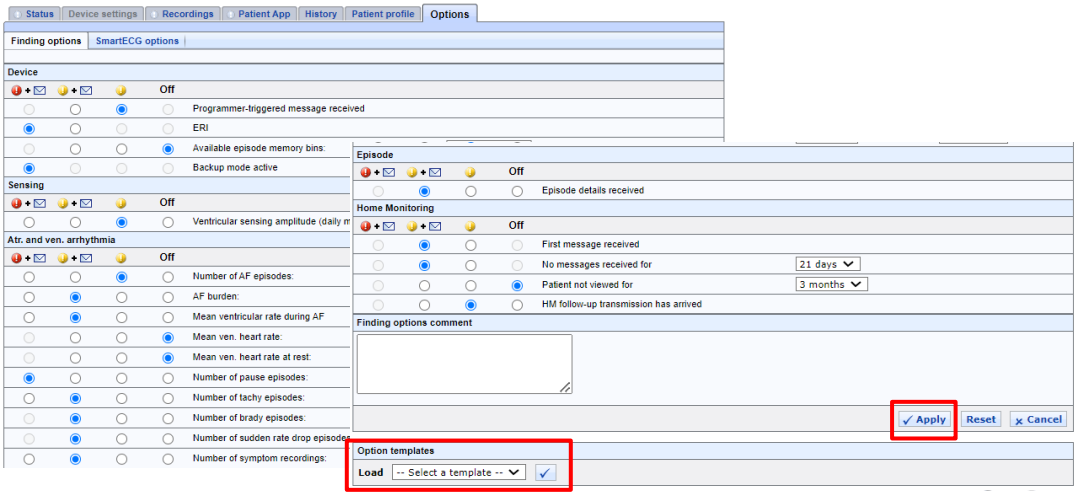
Changing Patient Alert Options

Edit alerts individually or select an alert template



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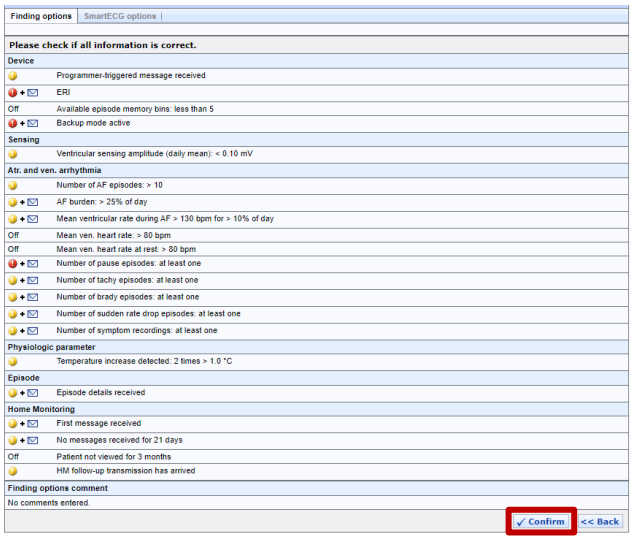
Changing Patient Alert Options



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How to Create a Template

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Optimizing Workflow & Managing Alerts

Real-World Experience

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Real-world experience that has impacted daily management of BIOTRONIK patient data.

HM Alert Optimization

Heart Rhythm Society

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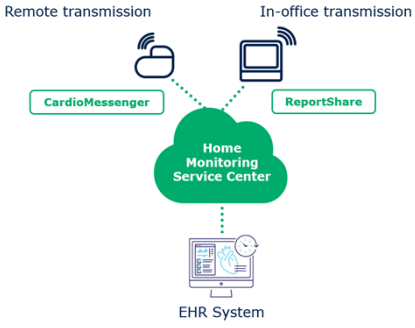
In-Clinic Efficiencies



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HM Alert Optimization

A journey on a project with the Mayo Clinic

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Remote Monitoring for CIEDs is a Class 1 recommendation that requires significant resources to manage.

2023 HRS/EHRA/APHRS/LAHRS expert consensus statement on practical management of the remote device clinic

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4.1. Recommended staffing requirements for remote monitoring

Recommendations for staffing requirements for RM

COR	LOE	Recommendations	References
1	B-NR	1. For the care of patients with CIEDs on RM, a team-based organizational model with formal policies, procedures, and clear definitions of the roles and responsibilities of qualified staff is recommended to optimize all related RM tasks.	1,25,28,29,53,90,102-109
1	B-NR	2. For the care of patients with CIEDs on RM, it is recommended that there is adequate dedicated time to perform all RM tasks, including scheduled and nonscheduled transmissions, patient follow-up, and administrative tasks.	25,28,57,104,106,110
1	B-NR	3. For the care of patients with CIEDs on RM, it is recommended that the staff-to-patient ratios in RM clinics reflect the increasing unscheduled transmission workload.	3,28,59,111,112
2a	C-LD	4. For the care of patients with CIEDs on RM, it is reasonable for clinics to have a minimum of 3.0 full-time equivalents per 1000 patients on RM, comprising both clinical and administrative staff.	27

- Clinical benefits of RM is proven, understood and implemented in daily practice
- Nevertheless, it required significant resources to manage patients in RM

➢ Workflow efficiency and actionable data are important to reduce workload

➢ Mayo Clinic Rochester real-world example of alert optimization towards efficient alert management for BIOTRONIK CIED patients

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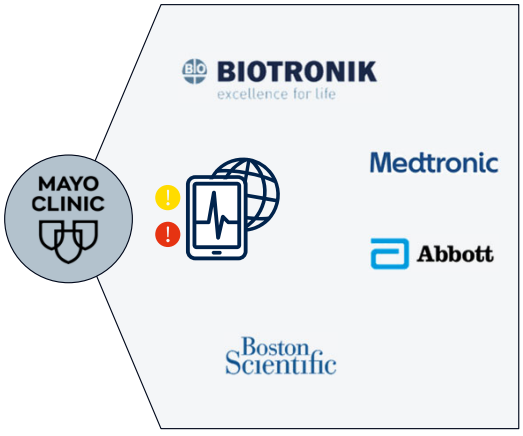
Mayo Clinic Rochester BIOTRONIK HM Alert Optimization Project*

- The Mayo Rochester device clinic team is managing all patients in RM
- Outpatient clinic, support lab and 2 major hospitals (no vendor representatives)
- Mayo monitors patients across all vendors

➢ Collaboration with BIOTRONIK to analyze alerts and optimize alert configuration in BIOTRONIK Home Monitoring System

➢ Goal was to focus on actionable data and reduce workload reviewing patients



* Jamiee LaScotte, R.N., Marko Tietz, M.S., Mark Henrich, R.N., Christine Kneeland, R.N., et al. Improving clinical efficiency through indication-based optimization of Remote Monitoring Alerts for CIED Patients, 2024 Heart Rythm Society.

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Mayo Clinic Rochester
BIOTRONIK HM Alert Optimization Project

Mayo Clinic Rochester

408 active HM patients*
- 210 IPG
- 108 CRT(D/P)
- 87 ICD
- 3 ICM

Pre-Optimization: Jul 2022 – Dec 2022
Alert template definition and configuration: Jan – Feb 2023
Post-Optimization: Mar 2023 – Aug 2023

*≥50% transmission rate and at least 1 alert in analysis timeframe

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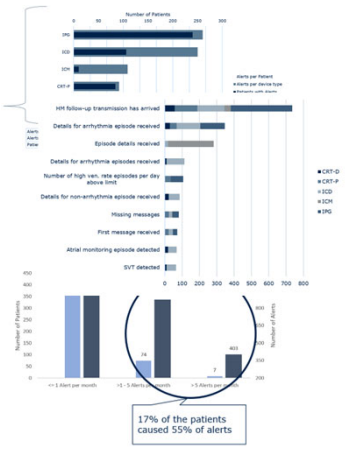
HM Alert Analysis Resulted in 22 New Templates
All templates could be applied remotely without bringing the patient in



- Different **device types** and **indications require specific templates.** Pacemakers and ICDs have baseline templates, while CRT devices introduce additional complexity. Patient conditions like Afib further influence alert specificity.
- **Balancing** a **manageable number** of **templates** with alert specificity is crucial
- Templates were created based on device type, model, and clinical indication of Afib. These criteria resulted in **22 template definitions**. Templates were assigned individually to patients.

Advantage of BIOTRONIK Home Monitoring:

- All **Alerts** can be **configured remotely**. Very efficient, **no need** to **bring the patient in for re-configuration**
- Provided **statistics** and data **helped to streamline efforts** in applying templates for patients

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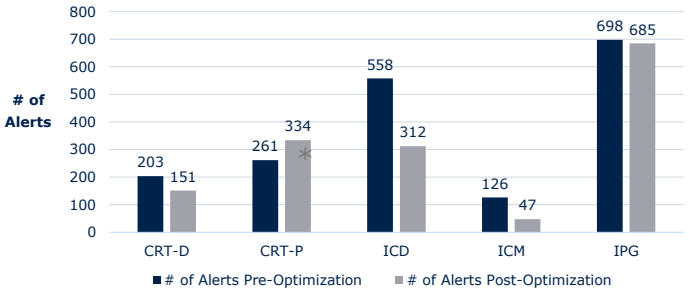
BIOTRONIK HM Alert Optimization Project

Resulted in reduction in alerts and time to manage HM patients*



Device Type	# of Patients	# of Alerts		Alerts per Patient Rate	
		Pre-Optimization	Post-Optimization	Pre-Optimization	Post-Optimization
CRT-D	30	203	151	6.8	5.0
CRT-P	78	261	334	3.3	4.3
ICD	87	558	312	6.4	3.6
ICM	3	126	47	42.0	15.7
IPG	210	698	685	3.3	3.3
Overall	**408**	**1846**	**1529**	**4.5**	**3.7**

408 Patients

1 HM User Group

1846 HM Alerts to 1529 HM Alerts

17.2% reduction

26% reduction in time to manage HM patients

Increase in CRT-P alerts resulting from a change in alert sensitivity for low BiV pacing and a concurrent study requiring CRT-P patients to be programmed to a non-pacing mode.

* Jamiee LaScotte, R.N., Marko Tietz, M.S., Mark Henrich, R.N., Christine Kneeland, R.N., et al. Improving clinical efficiency through indication-based optimization of Remote Monitoring Alerts for CIED Patients, 2024 Heart Rythm Society.

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Improving clinical efficiency through indication-based optimization of Remote Monitoring Alerts for CIED Patients

Authors: LaScotte J, R.N.[1], Tietz M, M.S.[2], Ryan J, R.N.[1], CCDS, Henrich M, R.N.[1], Kneeland C, R.N.[1], Stuart-Mullen L, APRN, CNS, M.S.N.[1], Naidoo TC, BSc, MPHP, Cha Yong-Mei, M.D.[1], Hayes D, M.D.[2]
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HEART RHYTHM 2024

Background

Remote monitoring (RM) of cardiac implantable electronic devices (CIEDs) is the accepted standard of care. The rapid evolution of RM technology has exponentially increased clinical data management for healthcare professionals. Nominal alert settings for most CIED types often result in non-actionable events and contribute to clinical inefficiencies and alert fatigue.

Objective(s)

Our aim was to identify opportunities for workload reduction for actively monitored CIED patients by analysis of alerts pre- and post-optimization in an RM system.

Method

Mayo Clinic Rochester patients with CIEDs enrolled and monitored in BIOTRONIK Home Monitoring (HM) with ≥50% HM transmission success rate and at least one alert were analyzed six months pre- and post-optimization of alert parameters. Device indication and device type-specific alerts were defined and applied over two months. Six months after optimization, the analysis was repeated to determine differences in alert volume per device type. The length of time needed to assess a triggered alert in HM was recorded by a device nurse to evaluate the time savings achieved by clinicians.

Our clinic established a standard for remote alert action and physician notification. Typically, action follows an assessment by the device nurse after the remote transmission is received. Ideally, it's more efficient to avoid the transmission of nonactionable or false alerts. Standardizing alert templates across device manufacturers is challenging due to disparate alert settings and programming options. Alert programming often involves a mix of device-based programming and website-based settings, based on the manufacturer.

Different device types and indications require specific templates. Pacemakers and ICDs have baseline templates, while CRT devices introduce additional complexity. Patient conditions like atrial fibrillation further influence alert specificity. Balancing a manageable number of templates with alert specificity is crucial.

This study aims to show the advantages of optimized alert standard templates by analyzing one manufacturer's remote website, Biotronik. Biotronik allows full remote alert programming via clinical practice standards. Templates were created based on device type, model, and clinical indication of atrial fibrillation. These criteria resulted in 22 template definitions.

The 22 templates were individually assigned to patients, excluding those with pre-existing individualized alert settings. New patients receive the appropriate template upon website registration. We now enroll all new patients with an appropriate template moving forward.

Biotronik and Mayo collaborated on data pull and alert analysis.

Results

- A total of 408 patients with a median HM transmission success rate of 95% were analyzed.
- Pre-optimization HM alerts decreased from 1846 to 1529 post-optimization.
- Overall alert reduction of 17.2%.
- Time savings resulted in a 26% reduction in clinician time for alert management.
- Alerts for all device types decreased except for CRT-P devices.
  - Unintentional increase in low BiV pacing % alert sensitivity beyond industry standard.
  - Concurrent study requiring CRT-P patients to be programmed to a non-pacing mode.

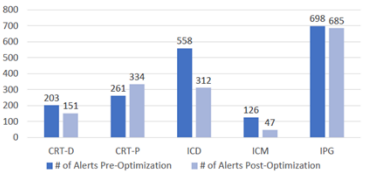
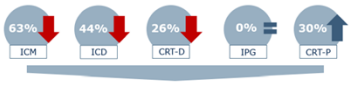


Figure 1 Change in Alerts Pre- and Post-Optimization



17.2% Overall Alert Reduction

Conclusion

This quality improvement analysis showcases that with careful review of alert parameters and non-actionable received alerts, safe and effective adjustments can significantly reduce RM clinical work burden. This decrease alleviates alert fatigue and reallocates time for clinicians to focus on actionable HM alerts and provide efficient patient care.

Recommendations

The study results show that our clinic would benefit by applying an alert template strategy across all manufacturers. Also, a more in-depth assessment of actionable vs. non-actionable alert events may yield further reductions in time spent on alert management.

Disclosures / Acknowledgments

James Ryan participates on BIOTRONIK Allied Health Professional Advisory Committee. The authors also recognize MicKenzie Clapp, R.N., Emira Skoric, R.N., Sarah Schroeder, R.N., Eric Lenway, R.N., and Ali Bangs, R.N. for their contributions to the study of time estimates.

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Key Takeaways from this project with Mayo Clinic

- Alert Optimization focuses on actionable alerts and reduces workload
- Template definition takes time and needs to be aligned between clinic RN's and EP physician team
- RM patients should be continuously assessed to ensure that the appropriate alert templates are utilized
- Templates apply to majority of patients, but individual patient custom alert programming still applies

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In-Clinic Efficiency

How technology can help focus on patient care

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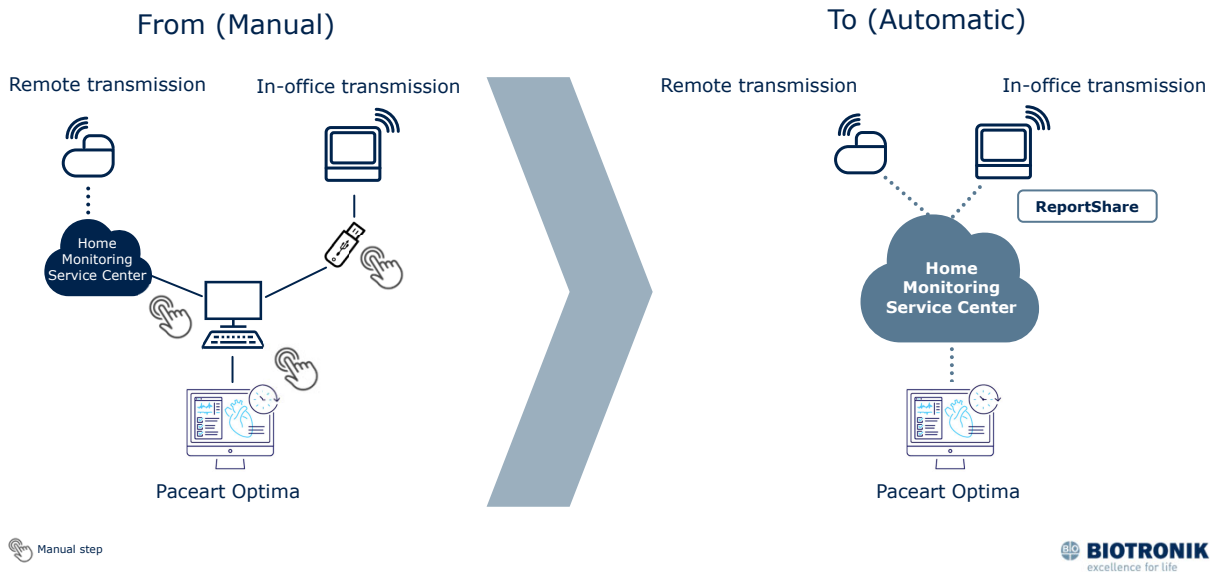
Data Integration Project at Kaiser Permanente

Centralized Data Storage and Automatic Transmission of Follow-up Data



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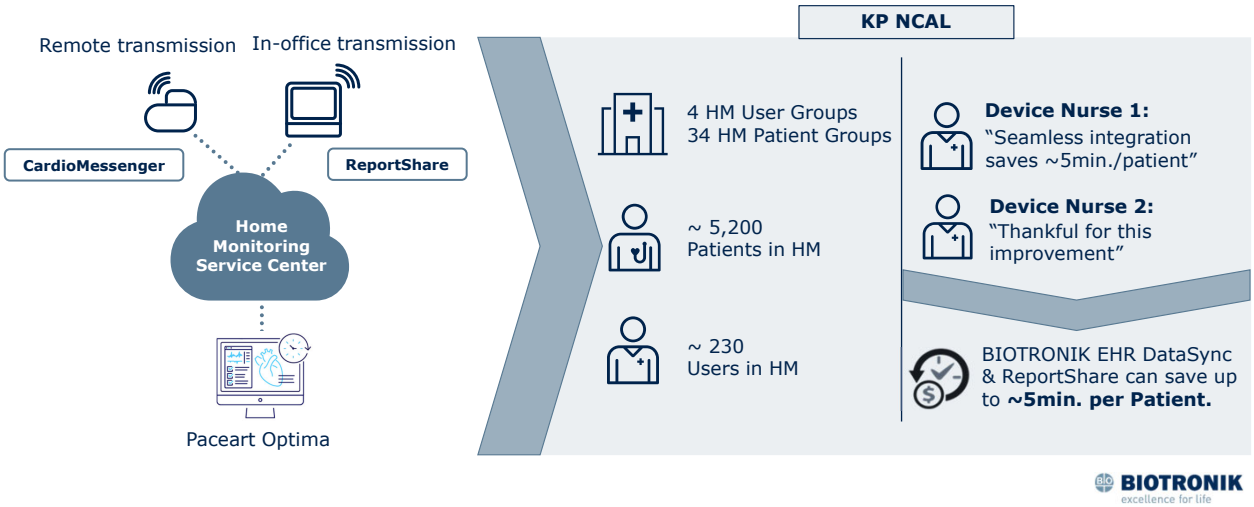
Data Integration Project at Kaiser Permanente

Reducing manual steps to focus on Patients.

Integration project completed in NCAL and SoCAL!



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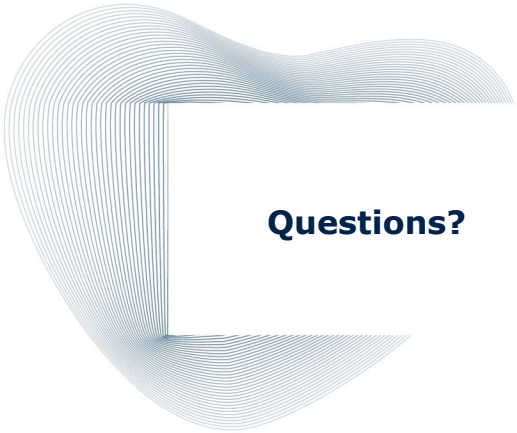

Questions?

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