Preface

Device-Based Arrhythmia Monitoring

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Editors

The transformation of device-based arrhythmia monitoring since the release of the first Holter monitor in 1962 reflects the broader trajectory of how advancements in technology, scientific evidence, and patient/consumer preferences are changing the way health care is delivered. The technological feat of being able to record 24 hours of heart rhythm tracings in a pocket-sized device was made possible, in large part, by the newly developed transistor. Today, thanks to countless technological innovations, medical advancements in the treatment of arrhythmias, and the desire of individuals to have agency over their health care, the estimated 3.6 billion people who have smartphones can download a free app that, using the device's flashlight, can obtain a surrogate marker for a single-lead electrocardiogram.¹ Device-based heart rhythm monitoring is now widely available not only to patients but also the general public. The data are used to manage disease as well as to maintain health. Devices range from diagnostic to life-sustaining. Scientific endeavors to help guide use of these devices continue to grow, as do the challenges of managing the data that they produce.

In this issue of *Cardiac Electrophysiology Clinics*, we provide an overview of the state-of-the-art of device-based arrhythmia monitoring. We begin with medical grade arrhythmia monitoring devices that now extend the diagnostic power of wearable devices and provide the option of telemetry, catering to a broad range of clinical scenarios. Implantable loop recorders extend the diagnostic power even further and have become critical diagnostic tools for patients with cryptogenic stroke or syncope. Next, we turn to remote monitoring of implantable cardiac rhythm management devices. A large body of evidence now exists supporting remote monitoring as standard of care for these patients, which has been incorporated into clinical practice guidelines. Yet organizing remote monitoring centers and managing the volume of data remain a tremendous challenge, which we address as well. The threat of cybersecurity breaches is ever present in our modern world, yet the ability to remotely monitor and potentially reprogram implantable pacemakers and defibrillators could provide significant benefits for many patients around the world, particularly those living in remote regions. We review the present security measures

in place and explain why remote reprogramming, with the proper clinical guardrails, is very secure and unlikely to be a target of cybersecurity hackers.

Three articles in this issue are devoted to digital health tools for arrhythmia detection and management. Smartphones and other consumer wearables are democratizing the ability of individuals to record their heart rhythm, screen for atrial fibrillation, and monitor for potential proarrhythmia via QT interval monitoring. Looking into the future, we see how artificial intelligence is emerging as a powerful tool in arrhythmia monitoring and is likely to become an important clinical tool. We conclude by closing the loop and providing patients with direct access to their data, looking at the opportunity this has for empowering patients as well as the challenge it poses for providing the data in a meaningful and useful format for the diverse public.

When Norman Holter introduced the first prototype of his monitor in 1947 weighing over 36 kgs and worn as a backpack, it is doubtful he would have predicted the field today. Similarly, it is difficult for us to imagine what the field will look like in 65 years. But what is unlikely to change is the need for monitoring the heart rhythm and treating arrhythmias. The progress we have made has been possible thanks to the pioneers before us. We hope others will extend the knowledge and

experience summarized in these articles and continue this innovation.

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