A retrospective analysis of >11,000 CIED patients: 24/7 alert processing via a vendor-neutral remote monitoring software system

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**Introduction**: Remote monitoring (RM) of cardiac implantable electronic devices (CIEDs) allows for timely recognition of patient and device events requiring intervention. Most RM involves burdensome manual workflow that occurs exclusively on weekdays, during office hours. Automated software may reduce such burden, enabling RM of large patient groups. The purpose of this study was to assess the quantity and nature of CIED alerts in a large patient cohort, from multiple centres, remote monitored via an automated vendor-neutral software system with 24/7 processing of CIED alerts by IBHRE-certified technicians.

**Methods**: We performed a retrospective analysis of 10,554 consecutive patients with a CIED who underwent managed RM between April and October 2018. Analysis included CIED type and all alerts according to gravity and device type. Red alerts signified a patient or device event requiring urgent review, while yellow alerts required non-urgent review.

**Result**: Of the 10,554 patients undergoing managed remote monitoring, 4,432 (42%) patients had a permanent pacemaker (PPM), 3,413 (32.3%) had an implantable cardioverter defibrillator (ICD), and 2,709 (25.7%) had an implantable loop recorder (ILR). 18,940 alerts were transmitted. 3,210 (30.4%) of patients transmitted at least one alert. ICDs were responsible for 3,258 (17.2%) alerts, PPMs for 2,490 (13.1%) alerts, and ILRs for 13,192 (69.7%) alerts \( p < 0.001 \). 604 (3.2%) alerts were red, and 18,336 (96.8%) were yellow. 386 (63.9%) red alerts were transmitted by ICDs, 128 (21.2%) by PPMs, and 90 (14.9%) by ILRs.

**Conclusion**: In a large managed RM patient cohort, almost one-third of patients transmitted at least one device alert during a 6-month period, totalling over 18,000 alerts. ILRs were over-represented, transmitting 69.7% of alerts, despite accounting for only a quarter of all devices. 63.9% of red alerts were transmitted by ICDs. The enormity of the number of transmissions and the growing alerts from use of ILR highlight the need for a new approach to management of RM.