Automation of Remote Monitoring of Cardiac Implantable Electronic Devices (CIEDs): The Clinical Implications of After-Hours Data Management

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Introduction: Remote monitoring and follow up of data generated by CIEDs can be a complex and time-consuming process. Data flow 24 hours a day, 7 days a week and, as a result, data transmissions occur at times when devices clinics are closed. The aim of this study was to characterize after-hours transmissions by percentages of overall transmissions and by clinical urgency.

Methods: CIED device transmission data from patients enrolled in automated remote follow up using PaceMateTM remote monitoring software over a 12-month period were examined. Transmissions were classified as GREEN (normal), YELLOW (abnormal needing MD review) and RED (urgent action required) by PaceMateTM software and confirmed by IBHRE certified PaceMate technicians.

Result: There were 66,702 transmissions received from 9379 patients with 9379 devices (1 CIED per person). The transmission rate by device type ranged from 1.8 to 15.3 with a mean of 7.1 transmissions/device over the study period. Overall, 75.3% of transmissions occurred after usual business hours, 41.1% on weekday nights and 34.2% on weekends. There were 377 transmissions classified as RED alerts (0.6% of all transmissions) and 75.3% of RED alerts occurred after hours: 47.8% on weekday evening and 27.6% on weekends. There were 17323 transmissions classified as YELLOW alerts (26.0% of all transmissions) and 75.0% of these alters occurred after hours: 48.8% on weekday evenings and 33.7% on weekends.

Conclusion: Three-quarters of all transmissions from remote monitoring of CIEDs occurred after hours. These data take a great deal of staff labor to process manually and may be taking time away from other important clinical activities during usual hours. Importantly, 75% of all RED and all YELLOW alert transmissions also occurred after hours. The combined total of RED and YELLOW alerts represented almost 18000 transmission, 27% of all transmissions, and, on average, 1.9 transmissions per patient. This high volume of potentially clinically significant and actionable after-hours events puts patients at risk for missed or delayed clinical response without an automated, systematic way to process them.