Pre-read 4. Linking Next Generation BP devices to Clinical Event Data for Performance Monitoring and Continued Innovation

Background

The evolution of blood pressure (BP) measurement technology, from the Riva-Rocci sphygmomanometer to modern oscillometric cuff-based monitors, has been driven by the established link between elevated BP and increased cardiovascular risk, and the proven benefit of antihypertensive treatment in reducing cardiovascular morbidity and mortality.

Twenty-four-hour cuff-based ambulatory BP monitoring (ABPM) is the gold standard for diagnosing hypertension due to its stronger association with cardiovascular outcomes compared to clinic-based oscillometric measurements. However, the limitations of cuff-based ABPM: restricted accessibility, user burden, and variable accuracy are well recognized.

Cuffless BP technologies offer the potential to overcome these barriers by improving accessibility, comfort, and cost-efficiency. However, improvement in cardiovascular risk prediction cannot be achieved if these technologies continue to be benchmarked solely against cuff-based measurements, which themselves are inaccurate and imperfect surrogates for cardiovascular risk.

Can Cuffless Technology Outperform Cuff-Based Methods in Risk Assessment?

Emerging evidence suggests that photoplethysmography (PPG) and electrocardiography (ECG) signals, used in cuffless BP technologies, may outperform cuff-based measurements in predicting cardiovascular risk. The major challenge lies in validating these findings across large populations over extended follow-up periods.

This can be addressed through integration of cuffless BP data into electronic health records (EHRs) and linkage to clinical outcomes recorded in both primary and secondary care settings (see briefing on electronic integration). Such linkage would enable optimization of BP technologies (and other wearable sensors) toward direct measurement of cardiovascular risk rather than BP alone, and allow demonstration that risk prediction exceeds that of traditional cuff-based methods. It would also support real-time performance monitoring.

The Role of Electronic Data Linkage in Continuous Improvement

Next-generation cuffless technologies, when linked to clinical event data, create unparalleled opportunities for performance monitoring and iterative innovation. Real-world linkage to conventional cuff-based measurements provides large-scale validation data beyond what is feasible in controlled “validation” studies.

Furthermore, electronic linkage enables monitoring of user engagement and technology performance across diverse populations, including disadvantaged groups, and allows assessment of how cuffless technologies support achievement of BP control targets and reduction of cardiovascular risk in real-world settings.