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Editorial

Cell phone based ECG monitoring: Old wine in new bottle, or something better?

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> "You never change things by fighting the existing reality.
>
> To change something, build a new model that makes the existing model obsolete."
>
> — **Buckminster Fuller**

Norman "Jeff" Holter in his pioneering work led to the first prototype of "mobile" cardiac telemetry device, requiring 85 pounds of equipment, worn on his back while riding a stationary bicycle and used a radio-ECG [1–3]. Developments in miniaturization of instrumentation, evolution of microprocessors and wireless networking technologies have acted in concert to make his vision a reality. Mobile ECG monitoring is about to revolutionize the way we diagnose cardiac rhythm disorders [4].

Several features distinguish the modern ambulatory electrocardiography (AECG) devices and make them extremely useful. These novel devices allow us to continuously monitor an ECG (beat-to-beat) almost real time, in addition to automatic arrhythmia detection and wireless transmission of data. These features play a critical role in improving the diagnostic yield while also enhancing arrhythmia detection [5–12]. Nevertheless, challenges persist for both manufacturers and clinicians to provide reliability and functionality, along with ability to analyze and store large amounts of data securely.

The two studies published in this issue [13,14] have compared the Holter monitoring and traditional ECG recording with new devices utilizing mobile phone based protocols for recording and analyzing ECG. While WebCardio records 2 channel ambulatory ECG up to 72 h, SanketLife has the ability to support up to 12 leads of ECG and a short rhythm strip.

In the first study, the authors concluded that WebCardio performed better in P wave identification compared to conventional Holter mainly due to higher degree of signal noise from Holter cables which deteriorate over time [13]. The study stands out for its simplicity, generating inferences of high utility in routine clinical practice. The Web Cardio performed comparably well to the Holter in identifying arrhythmias. However when PVC and first degree AV Block were included, Web Cardio had an overall higher sensitivity in identifying arrhythmias, though not statistically significant.

In the second study, Kumar et al. [14] utilised SanketLife as a low cost, portable, pocket sized 12 lead ECG mechanised by SanketLife app running on compatible iOS & android phones that connect wirelessly via blue-tooth technology to the device. Due to its ability to record a 12 lead ECG it can be used to detect ischemia. Misdiagnosis or late diagnosis of acute coronary syndromes is quite common in Indian patients. Though several new options such as wearable and non-wearable devices are being explored across geographies to optimise healthcare delivery and ensure early diagnosis, published biomedical literature about the accuracy and reliability of these devices is still sparse. In this context, this prospective study aimed to establish the diagnostic accuracy of SanketLife against standard 12 lead ECG in the detection of cardiovascular pathology. Amongst the 91 pts studied, both modalities were equally sensitive in diagnosing ST segment elevation, hyperacute T waves & AV Block. However, there was a lack of agreement in a few cases of APCs & VPCs. The utility of the device in accurate diagnosis of AF was also documented, a fact that holds great promise.

The above studies add to the scant literature on these newer generation ECG monitoring devices. The fact that these devices were found comparable or better to traditional ones is not surprising, given that they basically perform same task, and differ only in physical design, lead position, wireless transfer of data, and app based processing utilizing mobile phones. In fact, they represent a paradigm shift in ECG monitoring similar to the point when development in microelectronics enabled development of portable ECG machines and Holter monitors. A major advantage of these devices is increased convenience and widespread usage as very little equipment is needed at point of care. Moreover, being in digital format, the ECG can be transmitted to physicians for quick interpretation.

From the pioneering work of Dr. Norman J. Holter [3] ambulatory ECG monitoring has evolved to include numerous novel devices that provide a wide array of recording options. The quality of signal processing and interpretation of ECG will continue to improve through increased processing power, machine learning and artificial intelligence. The type of patient and clinical indication will dictate which device and recording options are most appropriate in a given situation.

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Declaration of competing interest

None.

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