International Journal of Health Technology and Innovation
An Official Journal of **Kalam Institute of Health Technology** | ISSN - **2583-8547**
RESEARCH ARTICLE

Avida by Omnyk: A Revolutionary Wearable Ring for Continuous Health Monitoring

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Received: 12th August, 2024; Revised: 28th October, 2024; Accepted: 21st November, 2024; Available Online: 05th December, 2024

ABSTRACT

Omnyk's flagship product, Avida, is a revolutionary finger wearable device in the form of a ring. Designed to monitor essential body vitals, Avida tracks key metrics such as heart rate, blood oxygen level, inter-beat interval, missed beats, and step count.

Crafted from hypoallergenic materials, Avida prioritizes comfort and safety for extended usage periods. The ring is available in multiple sizes, ensuring a perfect fit for users with varying finger ring sizes, thus catering to a wide range of individuals.

Avida's lightweight design enhances comfort, preventing any feelings of fatigue even during continuous wear throughout the day and night. This 24/7 wearability feature ensures that users can monitor their vital signs seamlessly without discomfort or inconvenience.

Keywords: Remote patient monitoring, Inter-beat interval, Heart rate, Blood oxygen saturation, Heart rate variability, Variability, Wearable ring.

International Journal of Health Technology and Innovation (2024)

How to cite this article: Bobra Y, Patnala S, Chekuri DK, Tejaanjali NGR. Avida by Omnyk: A Revolutionary Wearable Ring for Continuous Health Monitoring. International Journal of Health Technology and Innovation. 2024;3(3):14-17.

Doi: 10.60142/ijhti.v3i03.03

Source of support: Nil.

Conflict of interest: None

INTRODUCTION

Deaths from cardiovascular disease (CVD) jumped globally from 12.1 million in 1990 to 20.5 million in 2021, according to a new report from the World Heart Federation (WHF), with four in five CVD deaths occurring in low- and middle-income countries (LMICs).[1] The CVD death rate of 272 per 100000 population in India is much higher than that of global average of 235.[2] Cardiovascular surgery, a critical intervention for patients with severe cardiac conditions, continues to face significant postoperative mortality challenges.

Recent studies report that the 30 day readmission rate is approximately 20%, out of which the reason for cardiac readmission is 42%.[3]

Delay in accessing care, a 2 hours delay can reduce survival rate by 50%[4] due to lack of awareness of symptoms and a delay in reaching healthcare facilities.

In addition, there will be a shortage of healthcare professionals of 15 to 18M by 2030.[5] The challenge is bigger in rural areas and much worse in lower-income countries.

Effective postoperative monitoring is essential for mitigating these risks and improving patient outcomes. Remote patient monitoring (RPM) technologies have become instrumental in this regard, providing continuous surveillance of key physiological parameters. Metrics such as heart rate (HR), blood oxygen saturation (SpO2), and inter-beat interval (IBI) are crucial for early detection of adverse events. Notably, IBI variability can serve as a prognostic indicator of autonomic nervous system dysfunction, which may predispose patients to arrhythmias and other cardiac events.

The Avida device by Omnyk exemplifies advanced RPM technology. This innovative finger-wearable device, designed as a ring, facilitates continuous monitoring of vital signs with high precision. Constructed from hypoallergenic materials, the Avida ring ensures patient comfort and safety for extended wear, thereby supporting 24/7 surveillance. By providing real-time data on HR, SpO2, and IBI, Avida enables healthcare providers to detect deviations from normal patterns promptly, allowing for timely clinical interventions and potentially reducing postoperative morbidity and mortality in cardiovascular surgery patients.

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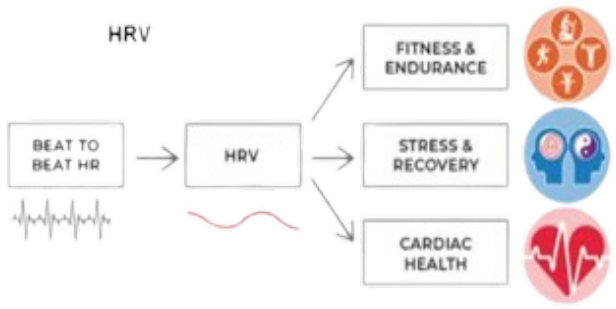

Fig. 1: HRV evaluation and its significance

Why is IBI (Interbeat Interval) considered as a potential parameter?

Interbeat interval (IBI) based analysis is required for effective clinical significance. Heart rate variability (HRV), which measures the fluctuation in time between the heartbeats, helps to evaluate overall heart health and potential risk(s) for cardiac conditions. Heart rate variability is the beat-to-beat variation of the inter beat interval of an ECG. This variability is modulated primarily by the sympathetic and parasympathetic autonomic nervous system.

- Sign of the overall health of a person
- Measures stress and recovery levels
- Measures quality of sleep
- Measures physical and psychological adaptability of the body
- Measures involuntary performance - reflexes, digestion, etc.
- Increased importance on pre-emptive wellness

Why is HRV important?

- If the parasympathetic nervous system is dominant ⇒ leads to higher HRV
- If the sympathetic nervous system is dominant ⇒ leads to lower HRV
- Overnight HRV is one of the best and trustable measures of HRV - a value lower than 50 ms for overnight SDNN is a highly credible measure of increased risk of mortality.

Fig. 1 is a visual representation of HRV evaluation and its significance.

HRV regression using time-domain analysis

- **SDNN:** Standard deviation of NN intervals.
- **SDANN:** Standard deviation of the average NN intervals
- for each 5-minute segment of a 24-hour HRV recording.
- **SDNN index (SDNNI):** Mean of the standard deviations
- Of all the NN intervals for each 5 minutes segment of a 24 hours
- HRV recording
- **pNN50:** Percentage of successive RR intervals that differ by more than 50 ms.
- **RMSSD:** Root mean square of successive RR interval differences.

RESULTS

Proprietary algorithms developed by Omnyk for evaluation of the following key matrix of data;

- 1. Various HRV parameters: SDNN, SDNNI, RMSSD, pNN50, and SDANN
- 2. Sleep analysis,
- 3. Stress Analysis,
- 4. Activity and correlation of medical history.
- This enables us to identify a potential need for medical care and issue alerts in real time

Limitations

- The data and real-time alerts are intended for any disease(s) intended to deliver a potential need for immediate care.
- In the absence of adequate compliance and/or availability of internet/cellular connection, the alerts will not be delivered in time for care.

Implications

For practice

- Keeping track of post-care recovery remotely in real-time.
- Adjusting drug dosage based on custom daily reports.
- Timely delivery of when needed.
- Better outcome of care.

For policy

- Standard of care for patients with CVD to get a 30 day remote management care.
- Remote management care should be an integral part of care at healthcare facilities.

Future Research

Omnyk's AI-based analysis evaluates "Parasympathetic" and "Sympathetic" nervous systems. Balanced functioning of these nervous systems is very important for the healthy functioning of all internal body organs, including inflammation, which is one of the key factors in the onset of chronic diseases.

High vagal activity, indexed by greater heart rate variability (HRV), along with other body vitals such as inter-beat interval (IBI), SpO2, heart rate, blood pressure trends, temperature along with physical activity, independently predicts potential future risks and better prognosis of all chronic diseases such as; cardiovascular diseases, diabetes, cancer and chronic obstructive pulmonary disease (COPD).

Omnyk's future plans include adding capabilities for measuring "Blood Pressure" and Temperature trends.

Omnyk's future plans also include conducting clinical trials to identify makers for the prediction of;

- Potential future risks for a myocardial infarction (MI) and disease management protocol.
- Potential future risks for developing diabetes and its management protocol.

Addressing Gaps in Home-Based Rehabilitation

Research shows home-based rehabilitation offers benefits like lower blood pressure, reduced anxiety, increased exercise capacity, and lower infection risks. However, current solutions fall short due to reliance on patient punctuality for data collection.

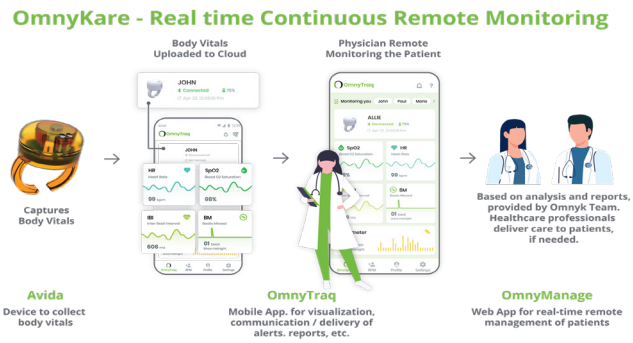

Fig. 2: OmnyKare-Real time continuous monitoring

Key challenges

Data collection compliance

Patients often fail to consistently and accurately collect health data, leading to gaps in care.

Dosage management

Accurate heart health insights under normal conditions are crucial for optimizing medication dosages. Current solutions lack real-life data integration, risking incorrect dosages.

Timely care delivery

Patients often don't know when to seek care, leading to delayed interventions.

Aim and Objectives

Introducing next-generation end-to-end digital "Remote Patient Management (RPM) platform. This innovative system comprises the Avida ring, OmnyTraq mobile application, and OmnyManage. Together, they provide a comprehensive solution that enables caregivers and healthcare providers to remotely monitor and manage patients' health statistics in real-time.

Remote Patient Management (RPM) Platform

The remote patient management (RPM) platform comprises three components: Avida, OmnyTraq, and OmnyManage.

Avida

A ring that collects body vitals via Bluetooth and transfers the data to OmnyTraq.

Proprietary Hardware and Software architecture enabled Omnyk to integrate all desired features in a ring size device that can be used 24 / 7 for up to 3 days on a single charge. This enables Omnyk to provide a "Holter Monitor" equivalent data using PPG technology.

OmnyTraq

A mobile application that visualizes the data from the Avida ring. When authorized, caregivers and physicians can access the user's data in real-time.

OmnyManage

A web application for real-time remote management of patients.

This integrated system allows healthcare professionals to analyze reports and deliver timely care based on the comprehensive data provided by the Omnyk team. Fig. 2 is a visual representation of OmnyKare – RPM workflow.

Why is RPM needed?

Increased accessibility

RPM enables healthcare providers to monitor patients remotely, which increases access to care for individuals living in rural or remote areas

Cost effectiveness

RPM can reduce the cost of healthcare by reducing the number of in-person visits to healthcare facilities

Improved outcomes

RPM allows healthcare providers to monitor patients' conditions more frequently and in real-time, leading to earlier detection of potential problems and improved health outcomes.

Better chronic disease management

RPM can be particularly beneficial for individuals with chronic conditions, as it allows for more frequent monitoring and management of their health. The COVID-19 pandemic has accelerated the adoption of RPM as it allows for remote monitoring of patients while reducing the risk of exposure to the virus.

How do we stand unique?

Continuous data collection

- Monitoring every single "Heart Beat."
- None of the products today are able to do 24/7 continuous monitoring.
- Inter Beat Interval (IBI) based in-depth data analysis

Personalized Predictive Analysis

Analytics as per the requirements set by physicians.

Actionable Real-Time Alerts

- Alerts are generated based on personalized analytics.
- Vetted by Omnyk's healthcare team.

CONCLUSION

The Avida ring by Omnyk, combined with the OmnyTraq mobile app and OmnyManage web platform, revolutionizes RPM. It provides continuous, 24/7 tracking of vital signs, including heart rate, blood oxygen levels, and IBI. This real-time data collection allows for precise HRV analysis, aiding in the early detection of cardiac issues and timely interventions, which is crucial for post-cardiovascular surgery care.

Avida addresses key challenges in home-based rehabilitation by ensuring accurate data collection, optimizing medication dosages, and enabling timely care. Its unique features, like personalized predictive analytics and real-time alerts, empower healthcare providers to make informed decisions. Ultimately, Avida enhances accessibility, cost-effectiveness, and patient outcomes, setting a new standard in RPM technology.

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