

Portable Health Monitoring Devices to Keep Track of Your Vitals

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Abstract

Monitoring is the process of looking at a disease, condition, or one or more medical phenomena over time. Portable monitoring devices are increasingly helping people better monitor their health status, both at the personal and medical level by providing more information to specialists, which may allow for early diagnosis and treatment. Many health care problems can be managed under one roof in places such as high-tech hospitals. However, with busy lifestyles and progressive changes, seeing a doctor is always time, money and productivity. To address this issue, portable health monitoring devices can serve as early warning systems, alerting patients to the need for a hospital visit. In this paper we review the basic lifestyle which should be adapted by more and more people, in order to stay alert and have a track of your health *via* monitoring vitals. Furthermore, we present the valuable vital signs which are important to be monitored by the particular devices which are easily available in market. Finally, we discuss the smartest way to monitor your fitness daily by smartwatch with tracking designed for specific workouts and even monitoring sleep helps to keep good health. **Conclusion:** These portable health assistants can help patients with cardiovascular and respiratory disorders by acting as a cost-effective, time-saving, and simple-to-use interface between biomedical technology and them.

Keywords: Vital signs; Health; Oximeter; Regular monitoring; Portable devices.

Introduction

Significant symptoms can be used to diagnose or track medical issues. Fever, heart rate, respiratory rate, and blood pressure are among the most important metrics examined by medical professionals and health care providers. Many health care problems can be managed under one roof in places such as high-tech hospitals. However, with busy lifestyles and progressive changes, seeing a doctor is always time, money, and productivity, due to the growing number of patients and the shortage of specialists. With the rise in medical costs and the population, there is now a demand for low-cost, small health gadgets that may help determine the amount of many essential factors in an industrialized society. To address this issue, portable health monitoring devices can serve as early warning systems, alerting patients to the need for a hospital visit.

According to a WHO (World Health Organization) report, chronic diseases are not only the leading cause of death but also the leading cause of disability globally. The good news is that early detection and treatment can still save a patient's life. Keeping track of our health on a regular basis, which usually necessitates the attention of a medical expert, is one of the healthy practices to maintain physical fitness. Doctors now have an enormous number of patients to care for, putting an enormous strain on their time. As a result, a patient who genuinely requires a doctor's care may not receive it. In this

instance, wearable are quite useful for tracking health metrics such as heart rates. They also assist us in maintaining a healthy diet. Furthermore, glucometers are available, which assist patients keep track of the sugar concentration in their blood and, as a result, take decisive steps to control their blood sugar. ^[1] Small blood pressure measuring devices are now accessible, allowing patients to monitor their blood pressure. While wearable may only alert with heart rates, other vital indicators such as ECG, blood oxygen saturation, and so on must still be tested in hospitals. However, in our generation, people's hectic schedules, the distance between their home and the hospital, and, of course, money is the primary three reasons why they fail to keep track of their health. A portable health monitoring device that may work as an assistant and bridge the gap between doctor and patient without them having to see each other in person is one of the most widely proposed and touted solutions. The expensive cost, poor performance, or confusing user interface are the reasons why such products have not obtained a brilliant view from the market window and widespread acceptance. ^[2]

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Who wouldn't want to have a Healthy Lifestyle?

This is something that everyone does!

But how do you know you're all healthy and living a life free of any potentially serious medical conditions? Especially when you're rushing around trying to cross everything off your to do list for the day, which, of course, repeats itself in an endless circle. With such hectic schedules waiting for you each day, finding time to see a doctor to confirm your fitness is nearly impossible. [3]

So, what's the other option?

We now have a list of devices that can monitor your health. These health trackers were created using cutting-edge technology to keep track of how you're doing in your daily life. When a defect is found, you will be notified promptly so that you can see a practitioner as soon as possible.

1. Oximeters for SPO₂ and heart rate,
2. Blood pressure monitor,
3. Thermometers for temperature,
4. Glucometers for measuring blood glucose,
5. Smartphones apps for tracking vitals,
6. Smart watches for monitoring vitals, etc.

Regular monitoring is required because health is a top priority. Your vital signs should be checked on a regular basis to maintain track of your health and prevent diseases, especially if early detection of diseases can decrease suffering and medical costs. The early detection and treatment of many diseases can vastly increase the patient's medical treatment options.

What is regularMonitoring?

Keeping your body in good health is a difficult task. No one can be in good health for long if he/she does not monitor the core vital signs of good health. Eating healthy and exercising are not the only essentials to maintaining good health but, monitoring vitals using a health monitoring device regularly is also essential. Continuous monitoring helps patients and doctors react appropriately by keeping records of blood pressure, blood glucose, body temperature, pulse, heart rate, and respiratory rate. Keeping records aid doctors to know about the real condition of a patient and help them take action smartly. While regular monitoring of one's health is important, it can also be very challenging if you prefer to go to only to hospitals for check-ups because:

1. There is always overcrowding in hospitals.
2. Lack of doctors.
3. Huge number of patients with complicated conditions.
4. Unavailability of monitoring device. [2]

Key Benefits of Regular Health Monitoring

Traditionally, you needed to go to a hospital to see a doctor for health checkups, which was a time and money consuming task.

However, with the technological advent, all this has changed significantly. Nowadays remote health monitoring is helping patients in recording their health vitals in non-clinical set-ups or on the go. Easy to use devices can be operated in the home with no technological knowledge to prevent multiple illnesses. Decreased cost, less hassle, improved experience and better results are key benefits of regular home monitoring. These devices;

1. Reduce hospitalization related cost, time and efforts.
2. Reduce time needed for taking appointment.
3. Detect serious illness early for quick treatment.
4. Rapid diagnosis that helps to reach a logical conclusion.
5. Better adherence to prescribed medications if you think you have no time to visit your doctor or clinic for regular health checkups, you can buy a regular health monitoring system to use at home. [2]

Valuable Vital Sign Sand Monitoring Device

Heart Rate (HR)

Heart Rate (HR) is an important general measure that is now regularly measured in both health care and fitness/sports activities. In sports and work situations, monitoring or informing the heart's response during exercise and recovery is important. Analysis of heart rate variability is gaining popularity as a primary indicator of cardiovascular health. It can be used to determine a person's psychophysiological condition, such as stress and fatigue tests.

Medical experts suggest using a heartbeat signal as part of a heart rate measurement. Rhythmic vascular proliferation caused by an increase in blood pressure forced into the vessel due to heart failure and rest. This rating provides more information than HR, such as pulse power, amplitude, and general. Pulse signal is not the same as heart rate, and can be calculated using pulse oximetry principles, which are also used to determine blood oxygen saturation. [4]

Blood Pressure (BP)

Cardiac output, vascular resistance, blood volume and viscosity, and vascular wall flexibility are all factors that contribute to it. Ambulatory blood pressure monitoring allows for more day to day monitoring, which is ideal for monitoring high blood pressure (hypertension), which is one of the leading causes of global disease burden, as well as improving predicting heart disease.

BP on average is measured with pressure drops in a patient's arms and a stethoscope. This method has been modified to measure independent of blood pressure, including the use of a fully functional motor bag that measures blood pressure by linking external pressure to the intensity of the pulse volume. [5]

Continuous cuff monitoring might have unfavorable consequences, including as sleep interruption, skin irritations, and a rise in stress levels. New technologies for ambulatory blood pressure monitoring have been developed to address this issue. [6]

Woo et al. recently developed an experimental watch type prototype that uses a pressure sensor near the radial artery to provide an accurate blood pressure measurement on a personal smart phone, resulting in a realtime continuous monitoring BP wearable device. [7]

Blood Oxygen Saturation (SpO₂)

Blood oxygen saturation (SpO₂) is a crucial characteristic that may be easily measured using Photo Plethysmo Graphy (PPG) and pulse oximetry methods. The PPG method allows for the acquisition of blood vessel variation waveforms, which may then be used to assess blood oxygen saturation using two wavelengths (usually 660 nm and 905 nm). This is because the absorbance spectrum of hemoglobin changes as it binds to oxygen.

It is possible to estimate the amount of oxygen transported by blood cells using oximetry principles (usually 95%-100%). This metric may help detect changes in a patient's health that would otherwise go unnoticed, such as a reduced percentage of oxygen (95%) in the blood, which signals hypoxia and results in insufficient oxygen supply to the human body. When a patient is anemic, blood oxygen saturation measurement can be difficult. [8,9]

Aside from medical applications, ambulatory pulse oximetry monitoring is particularly useful in assessing a person's aerobic efficiency during a routine activity. A study of the oxygenation of the capillary bed in muscles could lead to increased athlete performance. Information on limb and brain oxygenation is especially useful in military and space applications, as gravity changes can influence oxygen transport to various portions of the body, resulting in blackouts. A positive association between an individual's performance and oxygenation responses as a function of task load has been discovered. [4]

Blood Glucose (BG)

The measurement of Blood Glucose (BG) is a worldwide need in diabetic patients. It is not assessed in a typical clinical procedure, although it is significant in the diabetic global population. According to the world health organization, diabetes affected 9% of the global population over the age of 18 in 2014, and 1.5 million people died directly as a result of the disease in 2012. Diabetes causes a variety of physiological problems (cerebral vascular disturbance, retinopathy and nephropathy). Diabetics can avoid this by monitoring their blood glucose levels and injecting insulin as needed to keep their blood glucose levels within normal ranges. Collecting a blood sample by pricking the finger with a lancet is the most common method for determining BG content. A lot of effort has gone into avoiding finger pricking, and as a result, various devices have been created and are now on the market with the goal of continuously measuring BG levels while still employing intrusive procedures. For instance, a Medtronic Continuous Glucose Monitoring (CGM) device can detect blood sugar levels using an adhesive patch with a needle and communicate the information wirelessly to a wearable insulin pump, which then releases insulin into the body. [10]

Body Temperature (BT)

Body Temperature (BT) is the result of a balance between heat

production and loss in the body, and its assessment is critical to avoid de-functionalization of numerous body elements owing to excessive temperatures (e.g. proteins denature and lose function above certain temperatures). [4]

The Body Temperature (BT) is divided into two parts Core Temperature (CT) and Skin Temperature (ST). Because the body's thermoregulation processes govern core temperature, skin temperature varies over a larger range than core temperature. Blood circulation affects skin temperature, which is linked to HR and metabolic rate. [11]

External elements such as air circulation, ambient temperature, and humidity all play a role in the body's temperature regulation system. Different wearable technologies, such as skin-like arrays of precision temperature sensors or wearing adhesive devices to continually detect temperature, have been created to measure both temperatures. A re-usable wireless epidermal temperature sensor a battery free RFID thermometer that is proving to be a viable technology for estimating CT is a recent example. [4]

Smartest way to keep Track of your fitness

Moreover, portable monitoring devices can change your life as they allow you to conduct a basic testing at home. Health monitoring devices that work with your computer and phone are the best. Without the use of spreadsheets, whiteboards, or a personal trainer, it is now feasible to track your activities. You can now visualize the impact of cardio on your body by integrating GPS tracking and heart rate monitoring. It's especially satisfying if you're just beginning out on your athletic journey because you'll notice significant gains as soon as you begin exercising.

Fitness tracking device

1. Smartphone that tracks your activities (we like the iPhone)
2. For specific workouts, a smartwatch with tracking has been devised.
3. For the most precise readings, use a bluetooth heart rate monitor (for pros).

Do you need Health Monitoring during Sleep?

Health gadgets alter your sleep patterns, allowing you to perform better during the day. Sleep is necessary for your body to rebuild itself and stay healthy for a longer period of time. It's hard to believe, yet while you're sleeping, little helper proteins are repairing your organs and tissues. If you don't get enough sleep, it will damage your behavior and cognitive function fast, and your cells and tissues will suffer in the long run, making you more susceptible to illness and disease.

Sleep tracking device

1. App to track your sleep (paid services offer the best functionalities).
2. Sleep tracking is available on the smartwatch.
3. To access your sleep reports, use your smartphone.

It's not just about getting enough sleep, science suggests 6 hours to 8 hours per night but also about the quality of your sleep,

which is determined by the length, duration, and cycles of four distinct stages of sleep. To get an idea of your sleep quality, you don't need to go to a sleep clinic or be hooked up to electrodes. ^[12]

How your Gut and Digestion Influence your Sleep?

Because each stage has its own body measurements, such as heart rate and body temperature, a sleep watch tracking app using a smart watch (bluetooth health device) can monitor your sleep cycles and phases, as well as night recording sounds, such as ringing and external sounds, to give you a full daily report to see where you can make the change and sleep better. ^[12]

Discussion and Conclusion

These are some of the health and fitness devices that you could utilize to stay active and healthy. The main advantage of using these gadgets is that you can learn about even the tiniest difficulty in your body before the symptoms appear. As a result, you keep yourself under constant surveillance and avoid all of the anguish that might otherwise manifest. Because having the correct equipment by your side allows you to focus on your health and take preventive measures as needed.

These portable health assistants can help patients with cardiovascular and respiratory disorders by acting as a cost effective, time saving, and simple to use interface between biomedical technology and them.

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