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ELECTRONIC HEALTH DEVICES – NEW POSSIBILITIES, ACCESSIBILITY, INFORMATIVENESS AND CONVENIENCE FOR THE PATIENT

Dotsenko M. Ya.
doctor of Science (Medicine), professor
of the Department of Internal Medicine
Herasymenko L. V.
candidate of Science (Medicine), Associate Professor
of the Department of Therapy and Cardiology
Shekhunova I. O.
candidate of Science (Medicine), Associate Professor
of the Department of Internal Medicine
Educational and Scientific Institute of Postgraduate Education
Zaporizhzhia State Medical and Pharmaceutical University,
Zaporizhzhia, Ukraine

Annotation. The article provides a brief overview of the capabilities of devices for remote clinical monitoring of human health indicators.

Keywords: Remote measurements, clinical monitoring of a cardiac patient Google, when searching for "electronic health" provides the following definition - it is a multi-component information and telecommunications system that provides automation of medical services accounting and electronic medical information management.

Judging by the publications in the "European Journal of Cardiology", the authors put a different concept into this term and understand it as a family of devices designed to monitor the vital functions of the patient's body or make their life easier.

Recently, the name of such devices can be found such as "plasters", "patches", which emphasize that they can be "glued" to the patient's skin and this will give a

minimum of inconvenience to the patient. "Patches" that can be worn have become popular in the market, and healthcare investors are interested in them. According to the BIS Research report, the global market for "plasters" was valued at US$8.65 billion in 2021 and is projected to reach US$26.89 billion by the end of 2031. (Fig. 1.) [1, 2].

Fig. 1. World market carriers - patches. Adapted for [1]

The main “families” of e-health tools are:

- Smartphone Apps: ECG Apps. ECG Monitoring Replaces Holter Monitoring, BP Monitoring, Multiparameter Heart Failure (HF) Studies
- Nanosensors: American microsensors, edible sensors (on tablets for compliance assessment)
- Laboratory parameter systems: skin, respiratory gases
- Miniature systems: portable echocardiography. Teleechocardiography.
- Means for monitoring and treating obstructive sleep apnea syndrome (OSAS)
- and others.

It should be noted that clinical medicine currently does not have time to work out and make scientifically sound conclusions regarding E-health devices. For example, a variety of outpatient ECG monitors are already widely offered, and there are no official recommendations for their selection. The components of the "patches" include foil sensors, thermoformed foam, adhesive conductive tapes and thermoplastic polyurethane (TPU) films. Components such as nanomaterials and

polymers in wearable sensors improve the detection of certain biomarkers. The introduction of artificial intelligence and machine learning in E-health leads to the evolution of therapeutic and diagnostic devices.

The purpose of writing this work was to familiarize readers with the main offers regarding e-health devices, available, in particular, on the Ukrainian market.

The most pressing issue here is ECG monitoring. It should be noted that interest in this problem, in addition to cardiologists, has increased significantly among neurologists and sports medicine specialists. curiosity neurologists conditioned by by the fact that violation rhythm hearts often are reason cerebral disasters [3, 4]. In sports medicine remains unresolved problem sudden death at athletes [5]

D-Heart Pocket ECG Monitor is a professional ECG device compatible with IOS and Android. D-Heart = is a smartphone app, easy to use, clinically reliable, portable and affordable (Fig. 2).

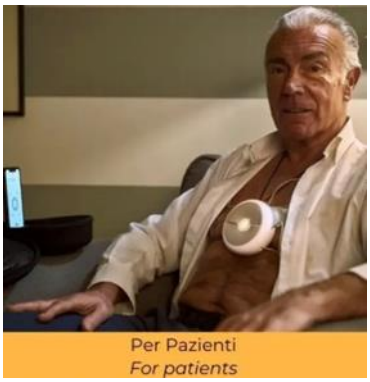

Fig. 2. D-Heart ECG monitor on the patient's chest.

D-Heart is easy to transport, weighs less than a smartphone and quickly connects to the app via Bluetooth. D-Heart is capable of recording ECG in 8 and 12 leads, which allows for accurate recognition of possible heart diseases, both arrhythmic and ischemic. The ECG can be sent to a 24-hour telecardiology service or to your doctor.

The KardiaMobile 6L is a portable (24 grams) consumer ECG device that can track arrhythmias (Fig. 3). This FDA-cleared ECG can record 6-lead ECGs simultaneously, detect atrial fibrillation, bradycardia, and tachycardia. The device can save ECGs, record symptoms, and notes. The program includes a library of

arrhythmias with real samples, breakdown, and description of the ECG shape for further study and analysis.

When using the device, place it on the user's left bare knee, and place a finger of each hand on the upper electrodes. The cardiograph's 3V CR2016 lithium battery will provide up to 200 hours of operation.

Fig. 3. Video review of the cardiograph KardiaMobile 6L.

The portable ECG monitor PM10 is designed for individual use and early prevention of cardiovascular diseases (**Fig. 4).**

Fig. 4. Portable ECG Monitor PM10

ECG data can be stored in the cloud for verification and analysis. Dimensions: 43x15x100 mm. Weight: 60 g. Color display 1.77 inches. Transmission via Bluetooth. An accurate conclusion can be obtained immediately after measurement.

AliveCor KardiaMobile 6L AC-019-NUA-A - Personal ECG monitor with 6-lead recording (Fig. 5). Works with most smartphones, allows you to diagnose up to 6 common arrhythmias. Works with most smartphones and tablets. To use Kardia, you must download the Kardia app to a compatible device.

Fig. 5. Personal Monitor AliveCor KardiaMobile 6L AC-019-NUA-A

TM80 **Patient Monitor** is a wireless patient monitor for remote measurements in clinical settings. Real-time monitoring including ECG, HR, SpO2, pulse rate, ST, QT interval assessment; 24-hour outpatient BP monitoring; device location tracking for continuous patient monitoring. With a 3.5-inch touchscreen, using TM80 is as easy as using a regular smartphone (Fig. 6).

Fig. 6. The BeneVision™ TM80 monitor is connected to the patient.

Wearable patches based on graphene are made of a thin film of graphene that measures blood glucose levels by directly applying it to the skin surface. These non-invasive skin patches are a better alternative to standard glucose tests. These patches extract glucose from the cells between hair follicles and also analyze sweat. The wearable graphene patches work based on the process of electroosmotic extraction, which uses a small electrical current to extract glucose and sweat, thereby accessing biomarkers.

Measurements such as glucose can be taken every 10-15 minutes for several hours, and the data can be sent wirelessly to a smartphone or smartwatch.

Declared O creation ultrasound patches that Can wear [2]. The design of these patches combines all the components of ultrasound equipment. They are attached to the skin with strong bioadhesives, which provides stable, high-resolution images of internal organs. Effective readings are obtained with these patches due to constant monitoring and minimal interference with body movement. The ultrasound patch, about the size of a postage stamp, can continuously image internal organs for 48 hours. It should be noted that we were unable to find any information about these devices being available for sale.

There are currently many devices on the market for diagnosing OSAS. Devices for outpatient treatment of OSAS are constantly being updated, and one of the latest is the "prisma SMART" model. This device for non-invasive mask respiratory support with controlled pressure is used to treat breathing disorders during sleep or for the periodic treatment of respiratory failure. The prisma SMART device does not belong to the category of life support equipment (Fig. 7). The CPAP mode can be used in patients over 3 years old.

Fig. 7. Prisma SMART device https://cardiomc.com.ua/srar-aparat-prisma-smart.html

The device can operate with one pressure level (CPAP) or two pressure levels.

In conclusion, we cannot help but recall such popular smart watches. It is very convenient to find out how many steps you have taken per day, calories burned, what is your heart rate during physical activity. However, many patients buy such watches to monitor blood pressure. And here the question arises. So, work has already been carried out to determine the accuracy of measuring blood pressure using smart watches [6]. The aim of this study was to investigate the accuracy of photoplethysmography (PPG)-based BP measurement using the Samsung Galaxy Watch Active 2 compared to conventional BP measurement. The authors concluded that there is differential and proportional systematic error in PPG-based systolic and diastolic BP measurement. Systolic BP is overestimated at lower values and underestimated at higher values. This may indicate potential for use as a hypertension screening tool. Further studies are needed to investigate clinical applicability.

Thus, at present there is a rapid development of equipment for E-health. Unfortunately, in our opinion, information about such devices is not sufficiently covered in modern recommendations. Practicing doctors should be informed about

the capabilities of such devices and use them more widely in routine practice.

REFERENCES

1. Збірник клінічних рекомендацій кардіологія та ревматологія. - Додаток № 1 до Медичної газети «Здоров'я України», Тематичного номера «Кардіологія, ревматологія, кардіохірургія» Київ 2022. - 120с. https://health-ua.com/multimedia/userfiles/files/2022/ZU_ZKR_Kardio_2022/ZKR_Cardio_Revma_2023.pdf

2. Top Five Wearable Patch Innovations Changing Healthcare in 2023 // BIS Research, Jan 20, 2023 https://bisresearch.com

3. American College of Cardiology Scientific Session/World Congress of Cardiology 2023. Session 410 - Late-Breaking Clinical Trials V: 410-08. Presented March 6, 2023. https://doi.org/10.1016/j.medj.2023.02.009

4. 2024 Guideline for the Primary Prevention of Stroke: A Guideline From the American Heart Association/American Stroke Association Cheryl Bushnell, MD, MHS, FAHA, Chair, Walter N. Kernan, MD, Co-Vice Chair, Anjail Z. Sharrief, MD, MPH, FAHA, Co-Vice Chair, Seemant Chaturvedi, MD, John W. Cole, MD, MS, William K. Cornwell III, MD, MSCS, FAHA, Christine Cosby-Gaither, EdD, Show All and Paul K. Whelton, MB, MD, MSc // Stroke.- Volume 55, Issue 12, December 2024; P. e344-e424 https://doi.org/10.1161/STR.0000000000000475

5. Pelliccia A., Sharma S., Gati S et al. 2020 ESC Guidelines on sports cardiology and exercise in patients with cardiovascular disease: The Task Force on sports cardiology and exercise in patients with cardiovascular disease of the European Society of Cardiology (ESC) // European Heart Journal. - Volume 42, Issue 1, 1 January 2021, P. 17–96, https://doi.org/10.1093/eurheartj/ehaa605

6. M. Falter, K. Driesen, M. Scherrenberg, Z. Peters, T. Kaihara, P. Dendale, Accuracy of photoplethysmography - based measurement of blood pressure // European Journal of Preventive Cardiology. - Volume 29, Issue Supplement _1, May 2022, zwac 056.302, https :// doi . org /10.1093/ eurjpc / zwac 056.302)