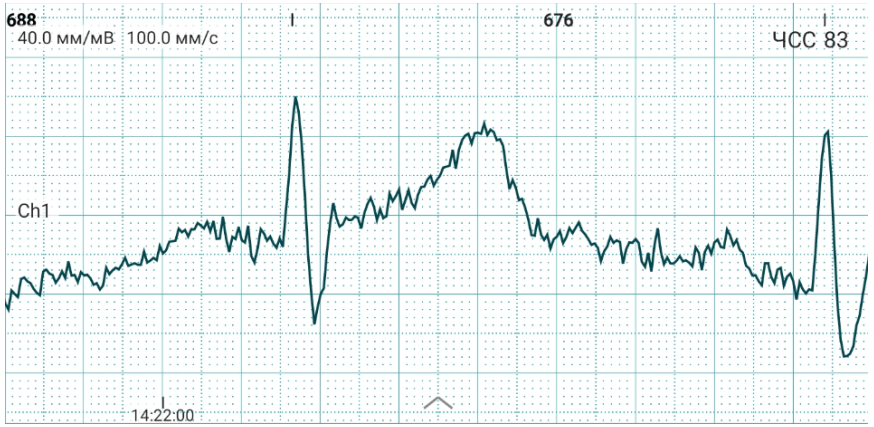
The use of telemedicine solutions in post-COVID cardiological supervision



Konstantin Apykhtin, Ph.D.,

M.D., therapist, Alfa-Vita clinic,

Kyiv, Ukraine, 2022

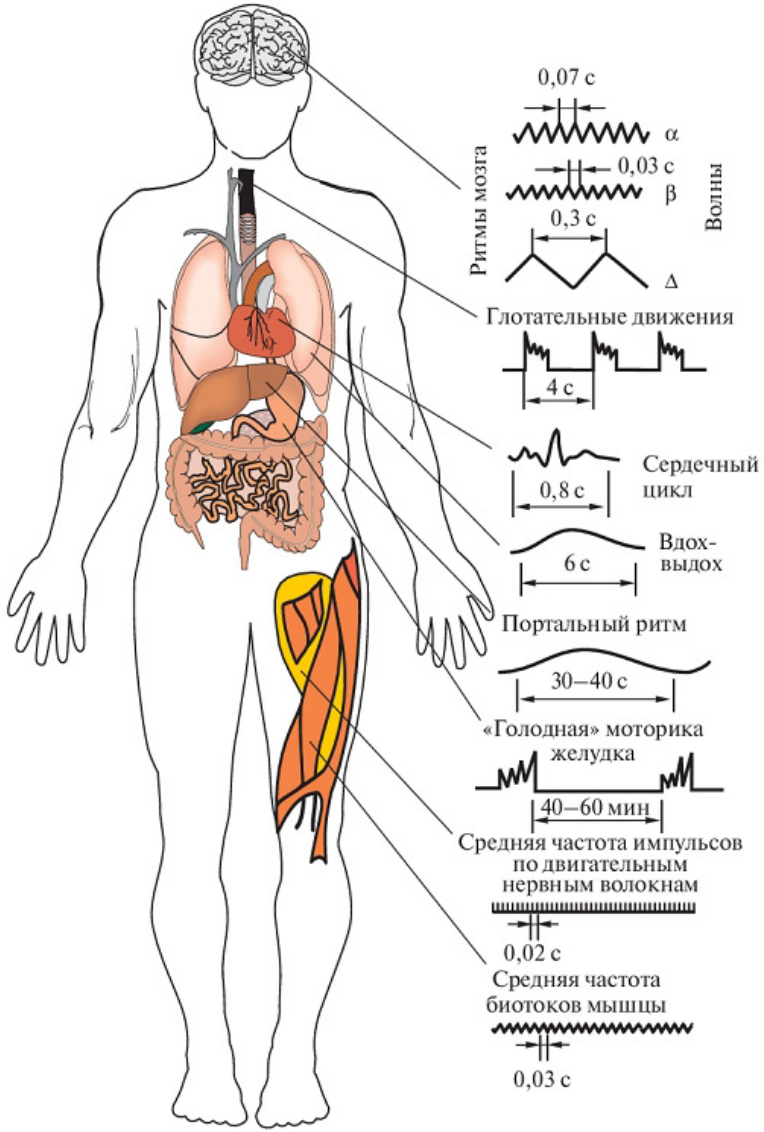
- Traditionally used **static approach** to assessing the patient's health has a **limitation**, because it does not reveal **reversible premorbid changes (RPC)**, which are reflected in **biorhythms** of cardio-vascular system.
- **HRV** is effective and convenient tool to describe RPC.
- Regular **remote monitoring** of the patient's ECG and HRV by means of **telemedical ECG systems** receiving patients' data with simple ultraportative **personalized** smartphone-based ECG and PPG registering devices.

Health

Reversible premorbid changes

Disease

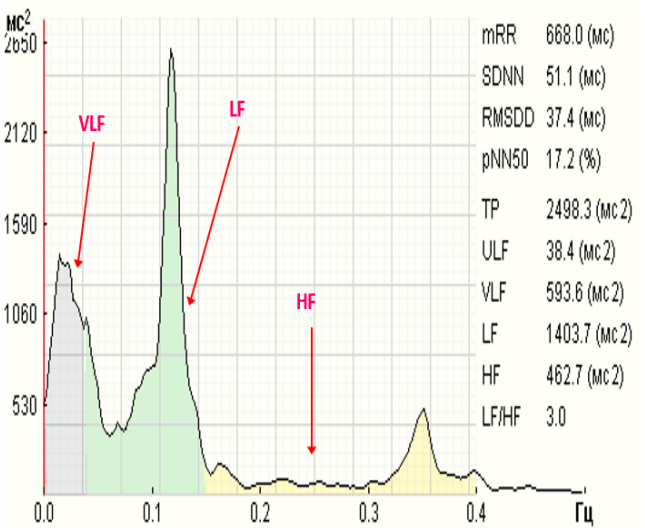
biorhythm analysis



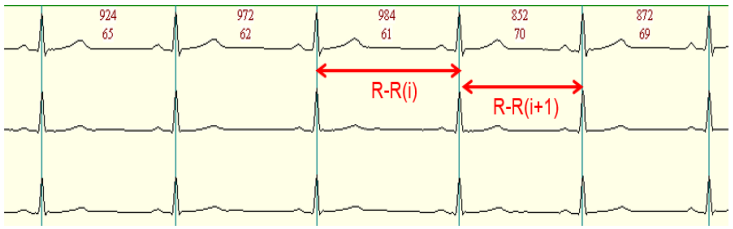
Basic methods of HRV analysis

- Time domain
- Frequency domain
- Geometrical indices
- Indicators of comprehensive assessment of the state of autonomic regulation

Спектральні показники ВСР

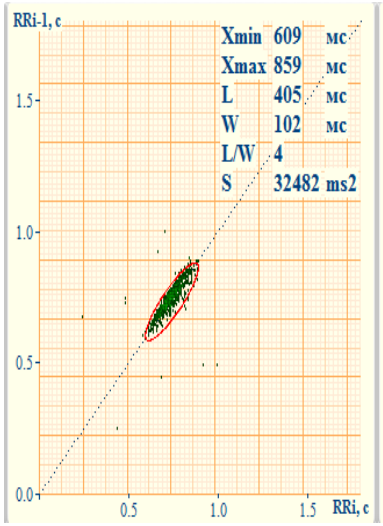


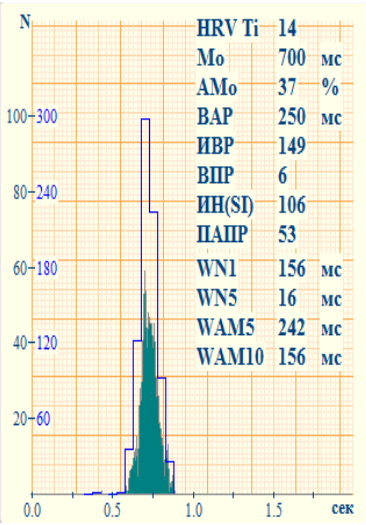
Індекси парасимпатичного тонусу



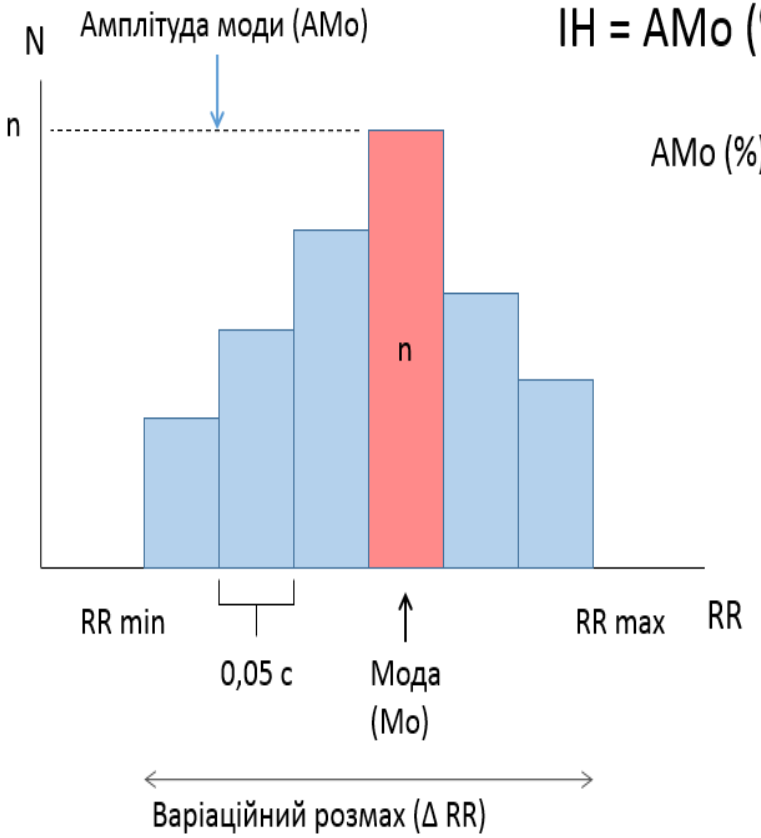
$$RMSSD = \sqrt{\frac{1}{N-1}\left(\sum_{i=1}^{N-1}\left((R-R)_{i+1}-(R-R)_i\right)^2\right)}$$

HRV = 20*ln (RMSSD)





Стрес-індекс Р.М. Баєвського
(SI, син. – індекс напруження [ІН]).



$$ІН = АМо\ (\%) / (2*Мо*\Delta\ RR)$$

$$АМо\ (\%) = n / N\ * 100\%$$

$$[Мо] = с$$

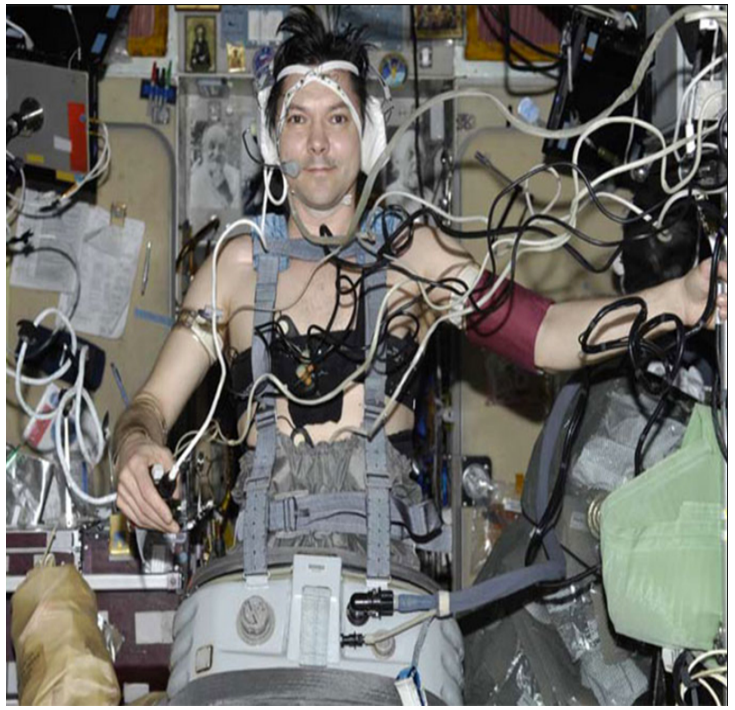
$$[ВР] = с$$

Спокій : ≈ 50 - 180

Сон : < 50

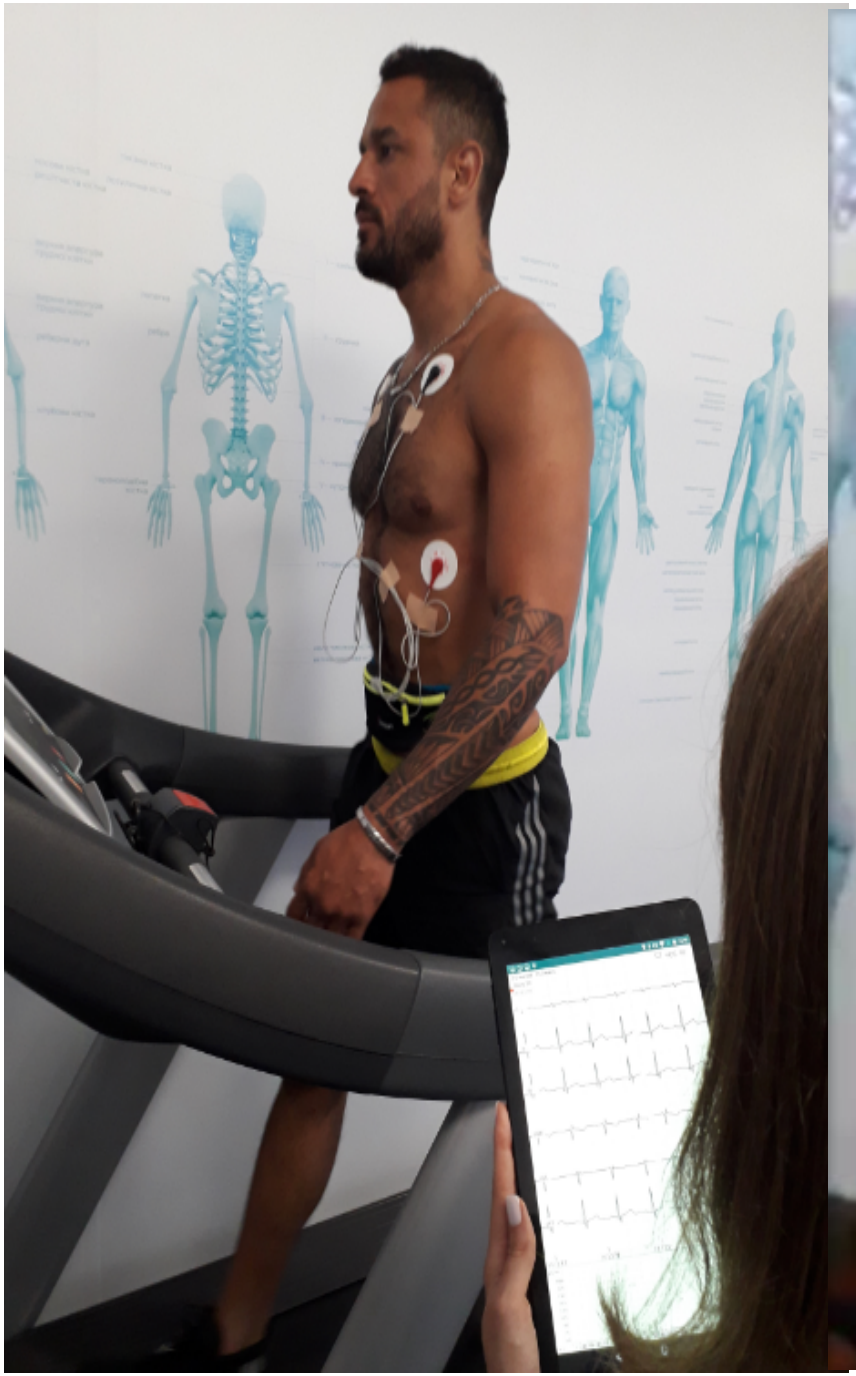
Стрес : 200 - 1000

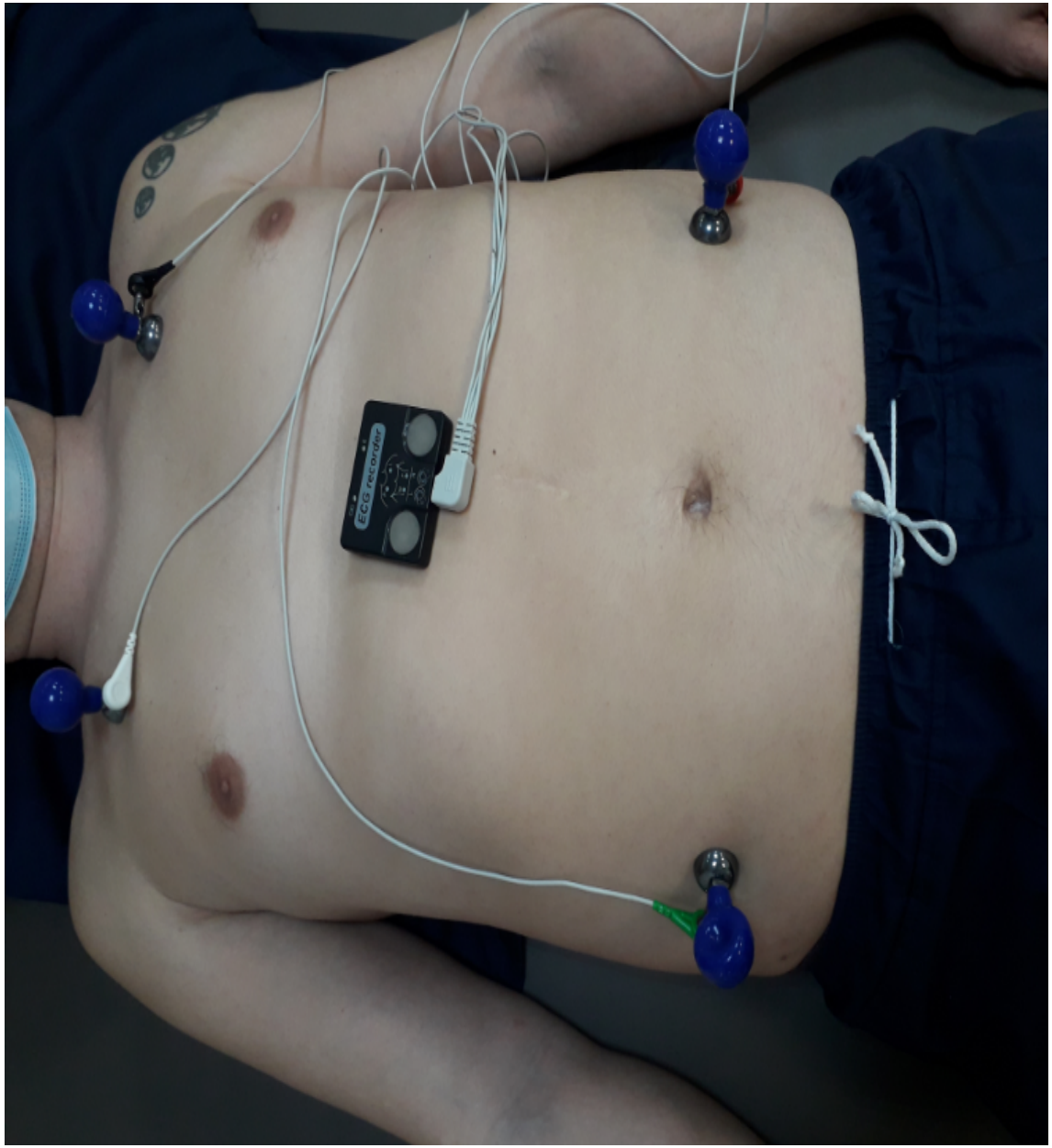
Інфаркт міокарду : 1000 – 2000 и >

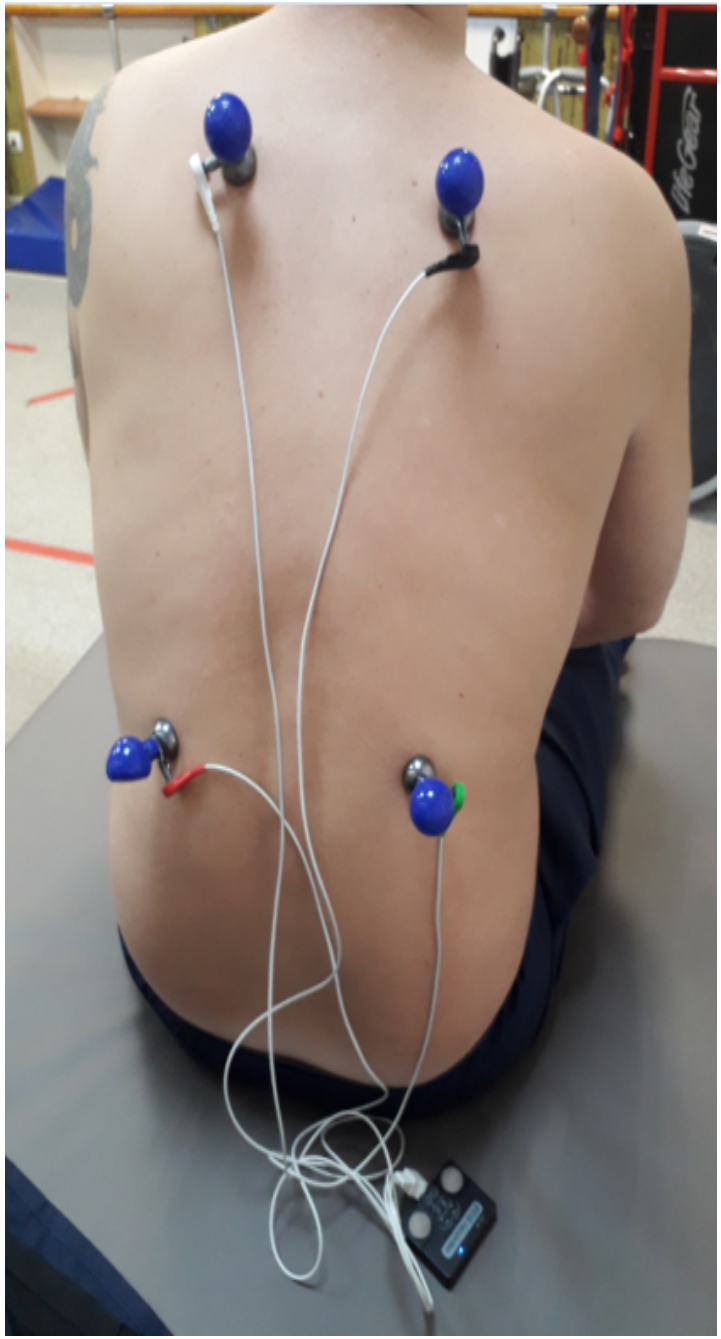


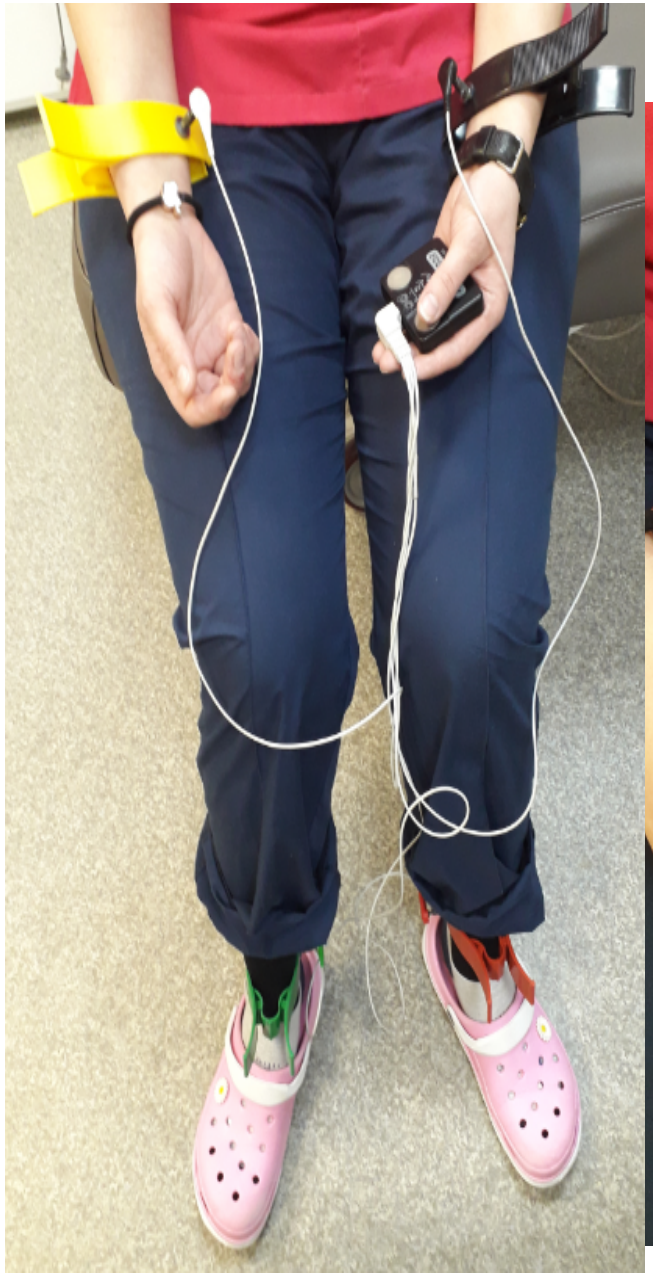
Equipment

- Ultraportative pocket and wearing ECG-registrators (**Solvaig, Ukraine**).
- Bracelets (PPG and ECG) (**Corsano, Switzerland**)
- Sports belts that record heart rate and HRV, e.g. Polar H-7, Polar H-10

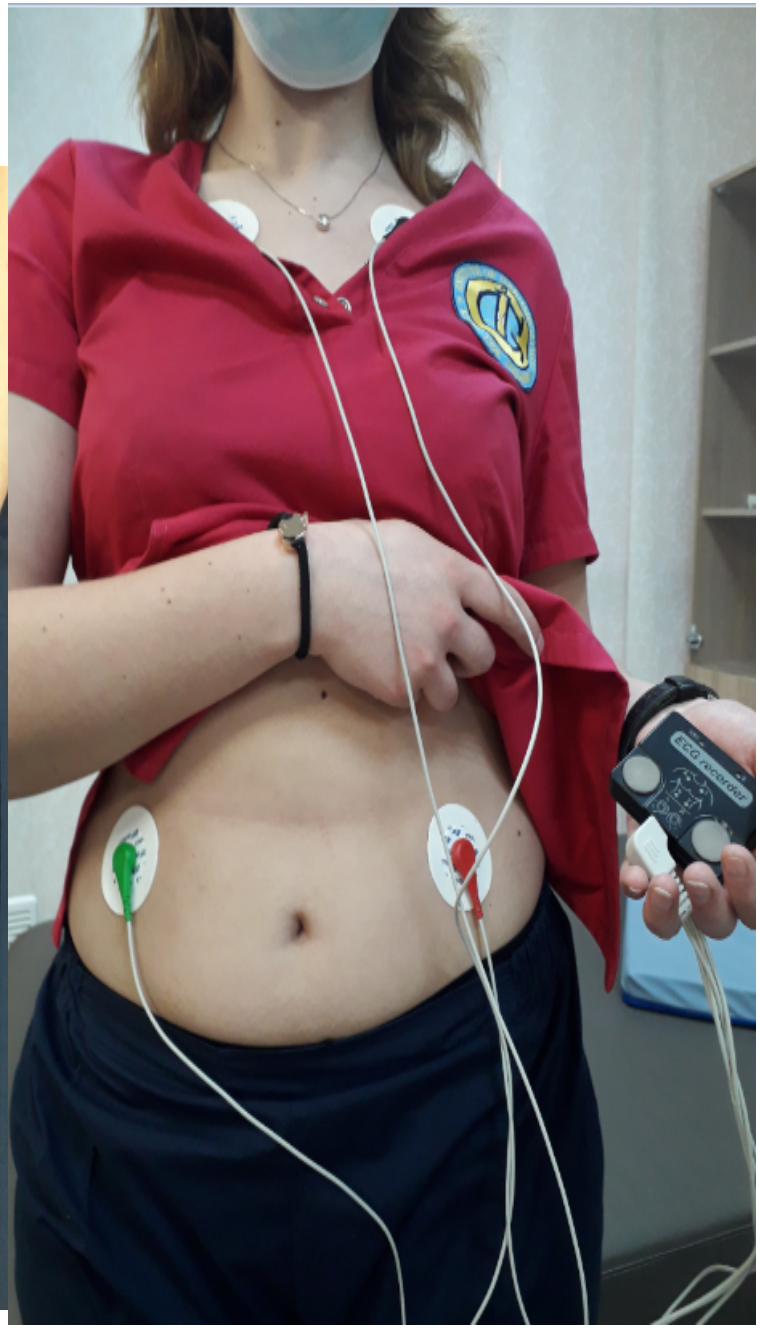



ECG recorder



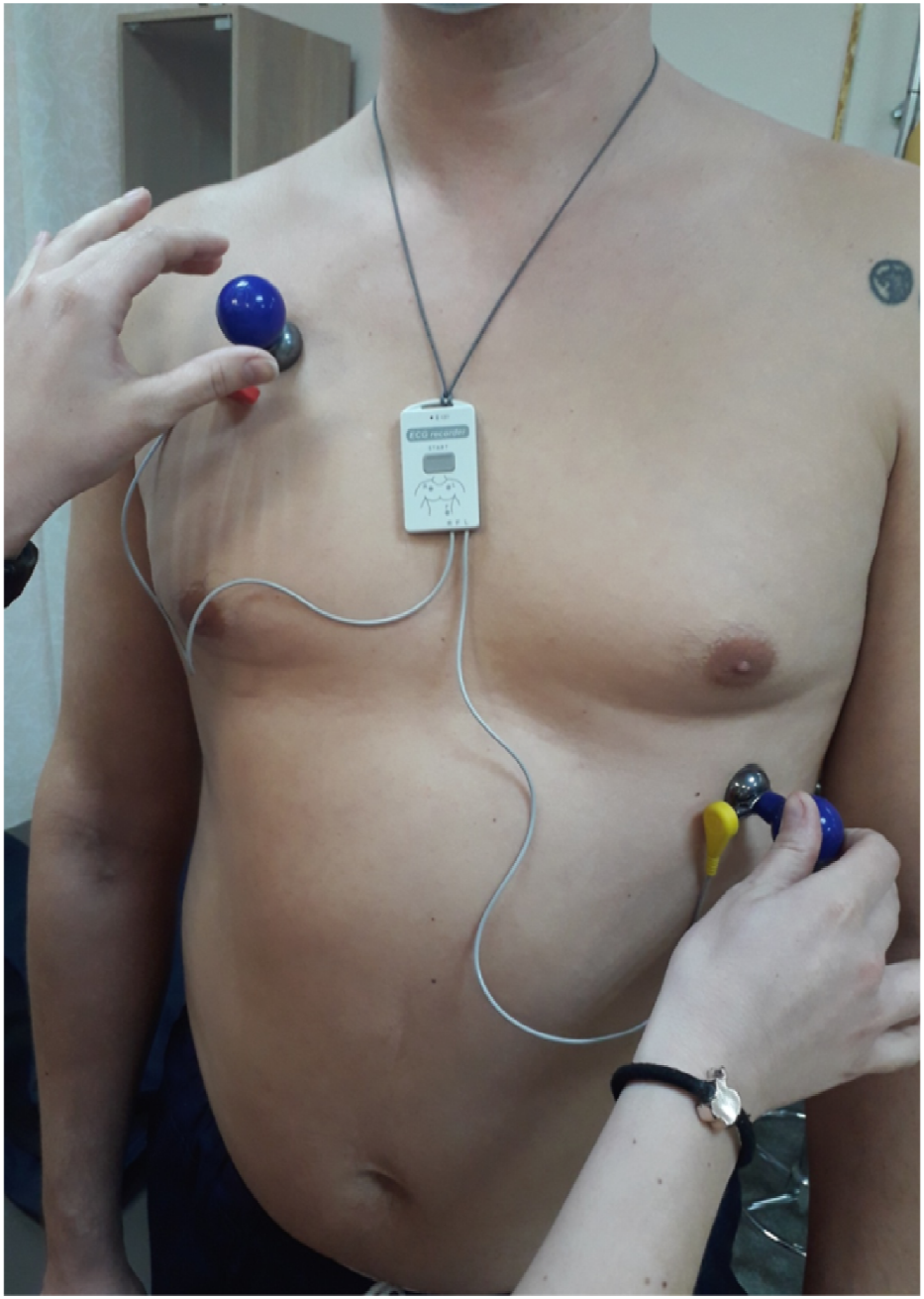


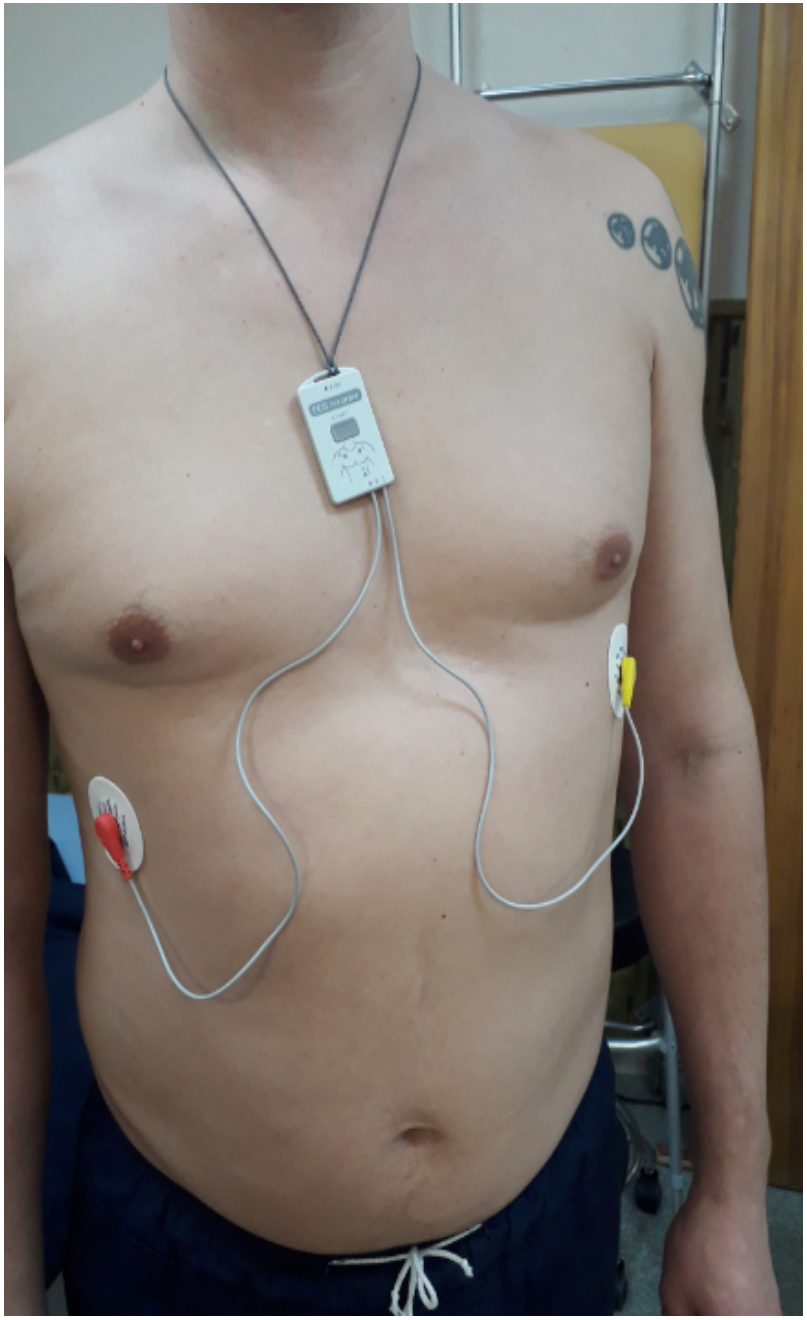
ECG recorder

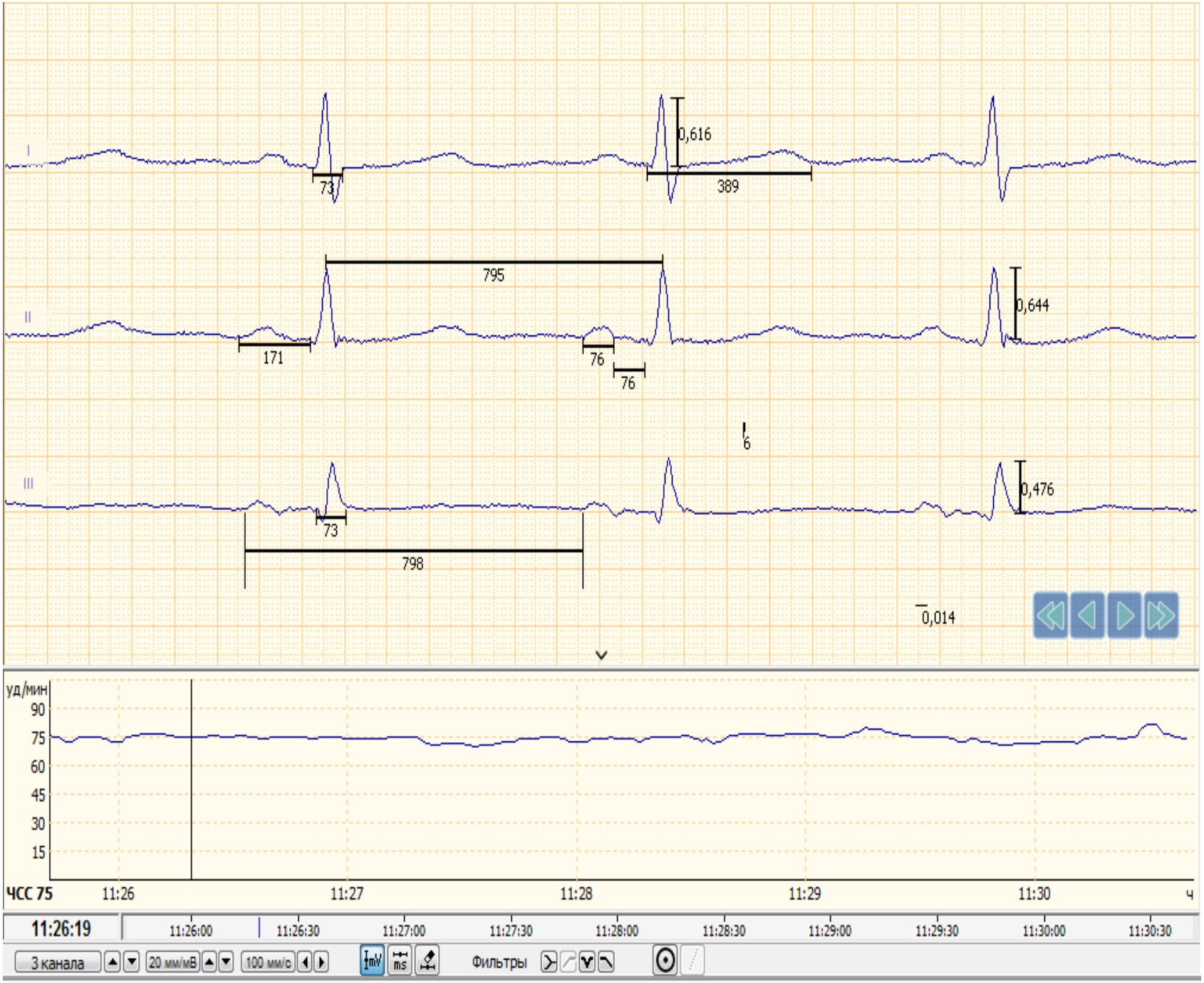


ECG recorder
I/O

I/O
R
LF
ECG recorder
L
RF


ECG recorder




I
0,616
73
389
II
795
0,644
171
76
76
III
0,476
73
798
0,014
уд/мин
90
75
60
45
30
15
ЧСС 75
11:26
11:27
11:28
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11:30
ч
11:26:19
11:26:00
11:26:30
11:27:00
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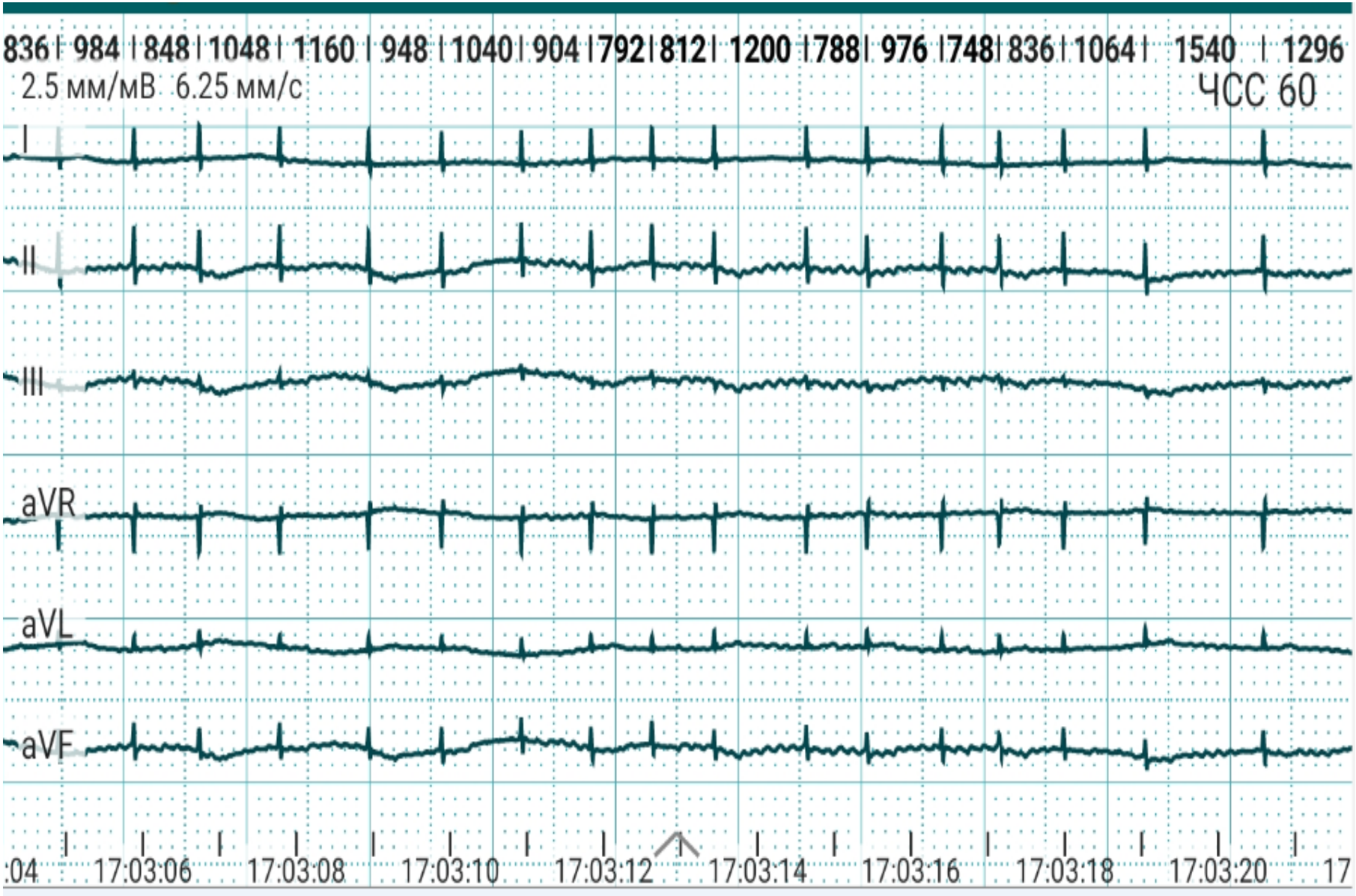
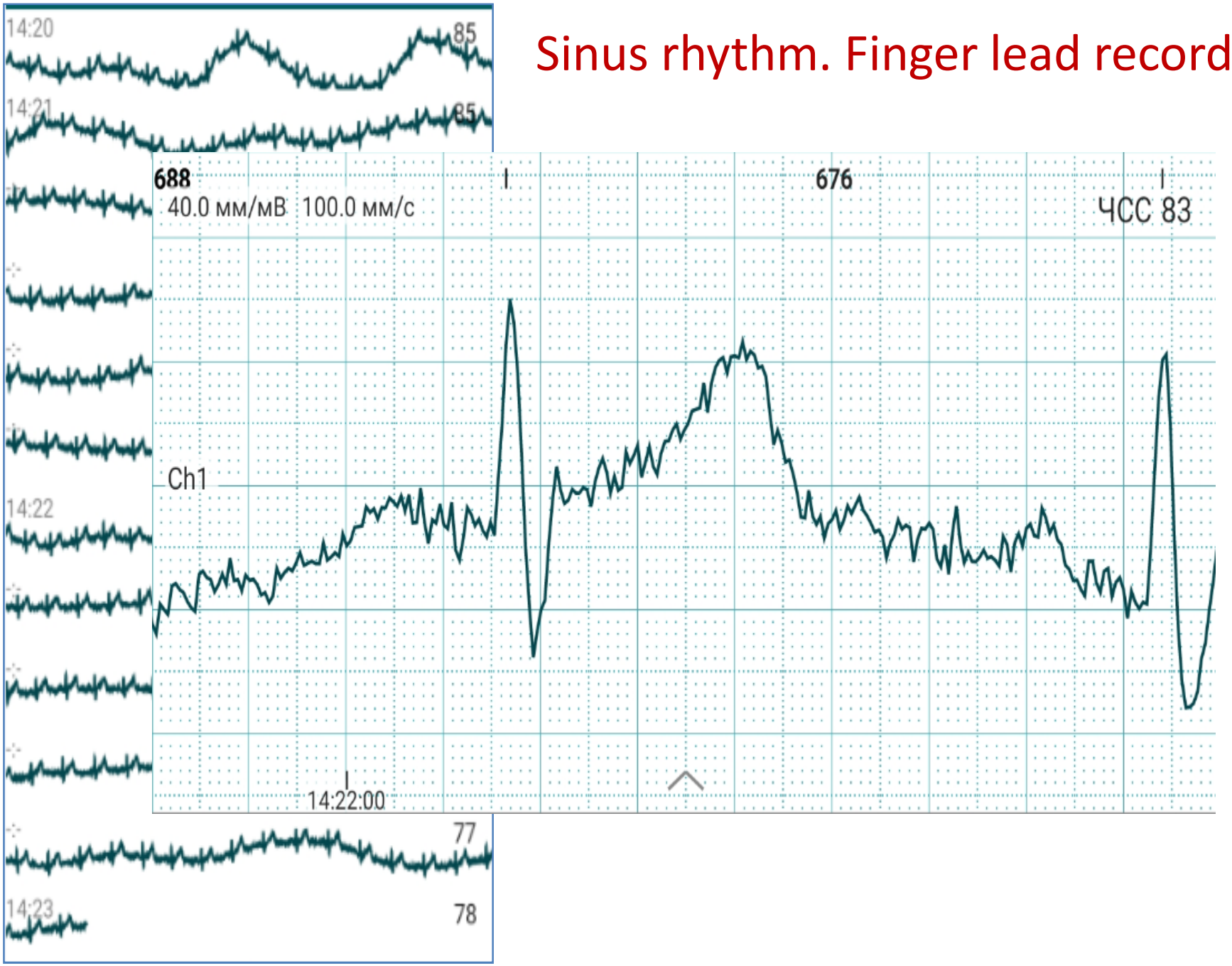
11:29:30
11:30:00
11:30:30
3 канала
20 мм/мВ
100 мм/с
Фильтры

Atrial fibrillation, large-wave form.



Sinus rhythm. Finger lead recording.



Cloud analytic services

- **CardioLyse**
- **Corsano**
- **CardioMood**

CardioLyse

Our Focus

Cardiolyse

Post-discharge Remote Monitoring Platform for:

- Heart Failure (severe)
- Atrial Fibrillation Ablation
- Ischemic Stroke
- Post-Myocardial Infarction
- Post-Covid *Delta variant*

Connected devices:

Discharge guidelines:

ESC European Society of Cardiology

NICE National Institute for Health and Care Excellence

NHS

American Heart Association.

CardioLyse

Our Solution: **RMP with Heart Risk Analytics**

Cardiolyse

CE certified

1. Universal ECG score
2. Analysis of myocardial damage
3. Syndromic ECG analysis
4. HRV Analysis
5. Prognostic level analysis
6. Minnesota code

Risk stratification & Automatic rest ECG & Holter ECG data analysis

Forms individual benchmark ECG's

Enhances the accuracy of results

Middle-term (up to 2 months) forecast

Valuable Analysis Reports & Alerts

Connected heart health measuring devices

Other vital signs:

- Chronic patients
- Post- discharge patients

2021

CardioLyse

Unique combination

ECG analytics

(Heart abnormalities analysis)

+

HRV analytics

(Stress, emotion, recovery & fatigue)

Supporting lifestyle changes and treatment strategy on:

- **Exercise plan**
- **Nutrition over time**
- **Medications used and other factors.**

Machine learning algorithms adjust to patient's personal baseline.

CardioLyse

Scoring Systems

Cardiolyse

Standard ECG Analysis

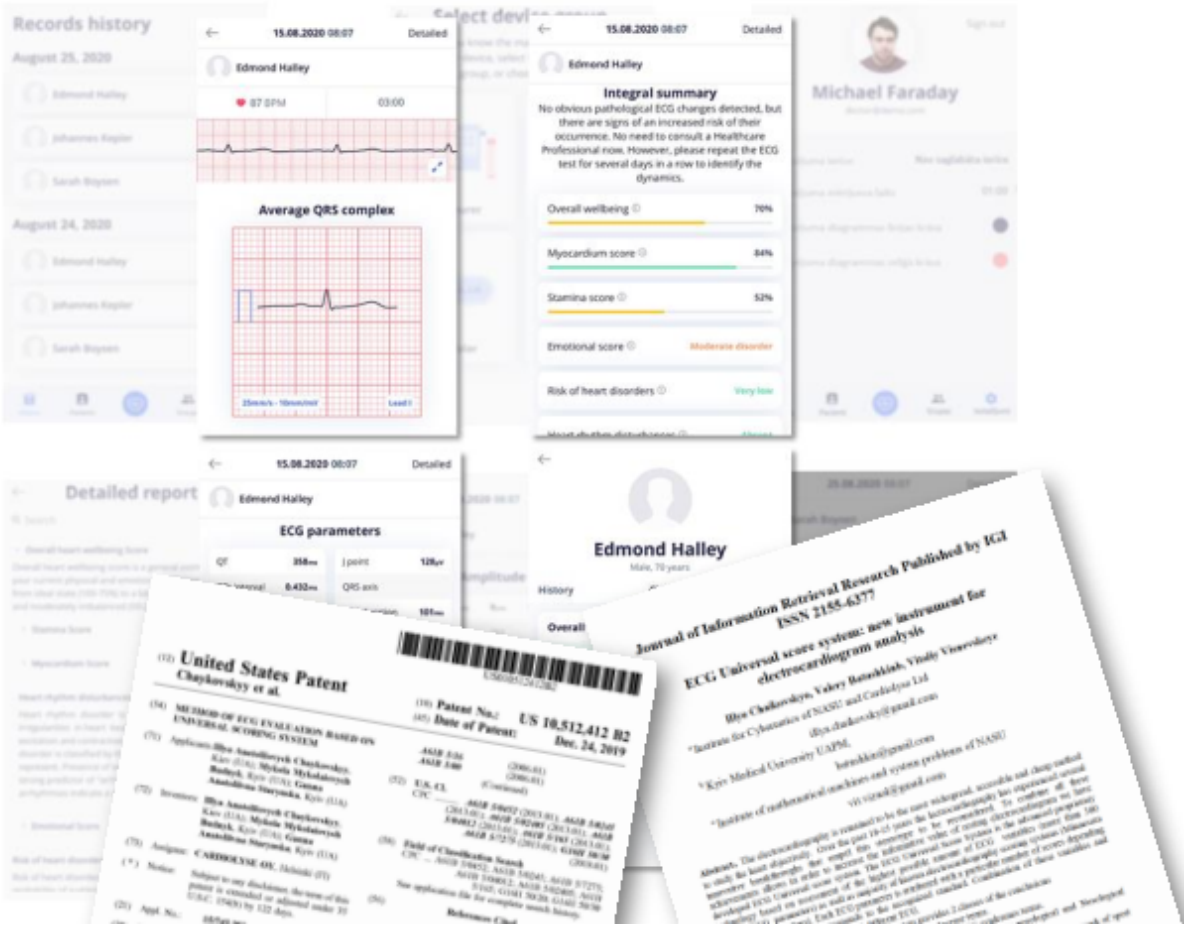
Unique combination of time-amplitude ECG analysis algorithms

Level of Myocardial damage

Determines the dynamics of myocardial changes and effectiveness of therapeutic measures

Universal ECG Score System

Evaluating the effectiveness of therapeutic measures and has a proven predictive value



Must have doctor's kit