WIWE
Message from the heart
Cardiovascular diseases are the main causes of death, roughly 20 million people die each year due to these diseases.

Stroke cases:
15 million strokes a year, 25% of them are fatal

Sudden cardiac arrest cases:
7 million people die each year
USA: 350,000/year
Europe: 400,000/year
China: 550,000/year

Main drivers of the cardiac monitoring market:
- Increasing proportion of cardiovascular disorders
- Evolution of technology and e-health
- Health programs of governments

Market drivers

- Stroke occurrence raises 34% between 2015 and 2035 in the EU
- Cost of stroke treatment reaches 45 billion EUR in in the EU and will further increase
Wearable technology

- The market of wearable devices are growing each year, shown by several predictions.
- Portable, health monitoring devices are predicted to have the most dominant growth in the near future.
- There is a huge demand for accurate and cost-effective solutions in self-examining medtech devices, which also provide e-health platforms.
- There is a need of intelligent devices that can detect and assess the early signs of diseases.
The „wearable” market

ECG market forecast:
2015: 1.8 billion USD
2018: 3 billion USD
2022: 6.3 billion USD

250 million devices sold by 2018
ECG and performance monitor market before boost.
What is WIWE?

WIWE basically consists of two parts:

1. **A medical device**, with which the measurements can be carried out,

2. **An application**, which enables viewing the evaluation and the results.

*The WIWE device connects to the smartphone/tablet via Bluetooth 4.0.*
Why WIWE?

- **Self-observation, pre-qualification:** WIWE gives you a full picture of the condition of your heart without visiting your physician.
- 40g, suitable for men’s wallet, women’s bag
- Examination can be carried out anywhere, anytime. It helps identifying diseases e.g. arrhythmia, which can be very difficult to diagnose.
- More profile can be created in the health journal, we can follow the tendencies for each.
- Users get faster and more accurate, automatic feed-back.
- Risk assessment of stroke and sudden cardiac arrest.
- Monitoring functions: EC, blood oxygen levels, heart rate, pedometer.
- Pedometer, calorie counter helps in establishing healthy lifestyle.
- Real-time data sharing.
- It offers safety, the planning of the future, and confidence for all of us!
- Useful to both doctors and patients.
- Easy and comfortable usage.
- Elegant and practical design, small and portable.
- WIWE can replace Holter-tests.
- Affordable and no extra charge.
Background of invention

Prof. Dr. Kozmann György (D.Sc.)

- University professor
- Master of Science in Electrical Engineering (BME, 1964), C.Sc. (1981),
- President of the Medical Information Technology R&D, University of Pannonia
- Doctor of the MTA (Hungarian Academy of Sciences) (2001)
- MTA MFA professor emeritus,
- Head of scientific division of the Bioengineering Department
- President of VEAB Medical Informatics Work Committee
- Member of 2 international (IMIA International Medical Informatics Association, ISE International Society of Electrocardiology) and 5 Hungarian professional associations and committees
- Editor in chief for IME medical manager journal

More than **170 publications** in national and international journals.
The main function of the WIWE is recording ECG signals using Einthoven’s first lead (measured between the two arms), from which the following parameters are illustrated:

- **ECG**: assessing the ECG signals recorded in 60 seconds based on an accurate algorithm.
- **AR**: assessing the regularity of heart rate or arrhythmia, which can lead to atrial fibrillation in some cases (and also can cause stroke).
- **VH**: investigation of ventricular repolarization heterogeneity, which describes the state of bioelectrical connections between heart muscle cells. Sharp deterioration may lead to severe ventricular arrhythmias, also sudden heart arrest.
- **Oxygen saturation**: assessment of SpO2 takes place during the 60 seconds ECG recording. Low value may cause oxygen deficiency in the brain, muscle, major organs, cells, etc.
- **Heart rate**: Number of heartbeats in a minute also can describe the cardiac function.

In addition WIWE includes a pedometer, whose elaboration received as much attention as the main functions of the application. Thanks to an accurate accelerometer, the device has a fully acting step counting feature.
Stroke is the second leading cause of deaths worldwide, causing more than five million deaths a year. WIWE gives you risk assessment especially on stroke caused by atrial fibrillation, which is the largest proportion of ischemic strokes.

**Ischemic stroke:**

- Oxygen deficiency in the brain tissue
- Main reason of ischemic strokes is the blockage of blood supplying arteries, which may be caused by blood clots drifting in the vessels
- Atrial fibrillation is the most common cause of strokes originated from the heart
- 15% of strokes are due to atrial fibrillation
Sudden cardiac arrest can happen with anyone, anytime and anywhere, it kills 7 million people a year. In our case, we examine the ventricular repolarization heterogeneity, which is proven to effect the chance of having dangerous arrhythmias and so the risk of sudden cardiac arrest. It should be pointed out, that sudden cardiac arrest and heart attacks are two different events.

**Sudden cardiac arrest:**
- Heart abnormalities resulting in death. No more than an hour goes by between the start of symptoms and loss of life.
- It is due to ventricular arrhythmia, ventricular fibrillation.
- The blood pump function of heart ceases, circulation stops.
- Resuscitation should start within minutes, or else the patient’s life can not be saved.
Prevention and risk factors

Non-modifiable factors
There are some risk factors that cannot be influenced. These are:

- Medical history, genetics
- Age
- Sex
- Ethnicity

Health conditions
Some medical conditions increase the risk of heart diseases.

- Hypertension
- High cholesterol level
- Diabetes
- etc.

Lifestyle
Our way of life significantly influences our health status.

- Unhealthy eating habits
- Lack of exercise
- Obesity
- Excessive alcohol consumption
- Smoking
- etc.
Normally electrical impulses starting from the sinus (sinoatrial) node cause contractions in the heart muscle cells, which impulses lead through the so called cardiac conduction system (atrioventricular node and His-Purkinje system).

The ECG derived parameters can help determine whether the heart rate and rhythm, the generation and velocity of stimulus are in a normal range or not, from which many conclusions can be drawn regarding the condition of the cardiovascular system.
Details - the ECG parameters

WIWE examines the parameters below, compared to indicated reference values.

- **Heart rate**: the speed of the heartbeat measured by the number of contractions of the heart per minute (bpm).

- **QRS complex**: depolarization of the heart ventricles.

- **Corrected QT interval (QTc)**: QT interval is a measure of the time between the start of the Q wave and the end of the T wave in the heart's electrical cycle. The QT interval represents electrical depolarization and repolarization of the ventricles.

- **PQ interval**: length of time between the start of atrial and ventricular activation.
Details - Arrhythmia

The application creates a so called Poincaré figure based on the recorded cardiac cycles, which indicates the fluctuation of heart rate. As shown in the figure, the closer the points are, the more regular is the heart rate. Significant fluctuation in the rate (high degree of dispersion of the points) indicates arrhythmia, in more severe cases, atrial fibrillation.
Overall, assessing the ventricular heterogeneity provides a feedback about the coordinated operation of heart muscle cells, so the condition of cardiac muscle can be concluded. If the reported QRST integral values are below the reference value, the alignment of cells is in a worse condition, so the heart’s electrical function is unstable. An average QRST integral value is calculated and represented on a graph so we can describe the ventricular repolarization heterogeneity and so the condition of heart muscles. The results are illustrated with three different colors, red, yellow and green.
The accuracy of the algorithm

We have analyzed the accuracy of our algorithm with the help of more than 10,000, 30 seconds long ECG recordings taken from PhysioNET.

The sensitivity of WIWE is 98.69%, which is the chance of determining the real abnormal patterns.

Specificity is 99.59%, which means that we can determine the healthy patterns with such precision.

There is no other product known on the market that exceeds WIWE’s precision.
What are the minimum requirements for the WIWE app?

- To use the WIWE application you need iOS 8.1 or later for Apple products, and Android 5.0 for Android-based products.

- To connect your devices Bluetooth 4.0 (Low Energy) is necessary.

As shown on the chart, sales of Android-based devices are above the sales of iOS-based products in the recent years. Our huge competitive advantage is that we payed as much attention on Android-based devices as we did on Apple products.
Target groups

WIWE’s main target groups are the following:

1. **People with heart problems,**
   who already have a form of heart disease, which can be detected and monitored by WIWE, recording episodes or relapses.

2. **People over 40,**
   including the elderly, who live far from any health institutions or can not regularly travel.
3. Those with risk factors,
   Who have high blood pressure, who are overweight or obese, smoke, regular drinkers or exposed to stress. In their case, WIWE can be used to monitor the adverse effects of the factors above.

4. Health-conscious people and those, who care about the health of their relatives.
   In the case of healthy, or perceived healthy people we can make sure of their condition or detect any potential problem. If the latter occurs, WIWE’s task is also monitoring.

Of course there are people in addition, who want to take care of their vulnerable loved ones and family. In their case, using the built-in sharing function can be helpful.
The picture on the left presents the diversity of the ECG device market.

As an indication, you can see the WIWE device below, showing that we have put a lot of effort into design in addition to practicality.
Comparing competition

The comparative table below shows the competing products that are currently on the market. We should highlight Kardia (AliveCor), which is currently the best-known ECG recording device on the market. In addition we investigated CheckMePro (Viata Shenzhen Technology Co., Ltd.), WeCardio ECG (Borsam Medical Instruments Co., Ltd.) and CardioQvark (L Kard LLC).

<table>
<thead>
<tr>
<th>Product</th>
<th>Price</th>
<th>Evaluation</th>
<th>Accuracy</th>
<th>Additional costs</th>
<th>Non-ECG based features</th>
<th>Availability</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kardia</td>
<td>99 $ + add.</td>
<td>ECG, AF, arrhythmia</td>
<td>97%</td>
<td>Yes</td>
<td>Yes</td>
<td>Australia, Canada, Ireland, India, Hong Kong, USA, UK</td>
</tr>
<tr>
<td>CheckMePro</td>
<td>449 $ + add.</td>
<td>ECG, arrhythmia, SpO2, HRV</td>
<td>?</td>
<td>No</td>
<td>Yes</td>
<td>Worldwide</td>
</tr>
<tr>
<td>WeCardio ECG</td>
<td>149$</td>
<td>ECG, arrhythmia</td>
<td>?</td>
<td>No</td>
<td>No</td>
<td>North America, Western and Eastern Europe, Southeast Asia, East Asia, Middle East, Oceania, Africa</td>
</tr>
<tr>
<td>CardioQvark</td>
<td>135 $ + add.</td>
<td>ECG, AF, arrhythmia</td>
<td>94,5%</td>
<td>Yes</td>
<td>No</td>
<td>Russia</td>
</tr>
<tr>
<td>WIWE</td>
<td>339$</td>
<td>ECG, AF, VT, VF, sudden cardiac death, stroke, arrhythmia risk assessment, SpO2</td>
<td>98,69%</td>
<td>No</td>
<td>Yes</td>
<td>Europe, Africa, Australia, expected to be available worldwide from autumn 2017</td>
</tr>
</tbody>
</table>
The advantages of WIWE over the competition

• Improved technology, a globally unique intelligent evaluation system.
• Over 98% accuracy.
• Direct, automatic risk analysis and diagnosis.
• Ventricular heterogeneity assessment.
• Built-in monitoring functions for a healthy lifestyle (SpO2, pedometer).
• Unique, practical design and small size.
• The device can also be used independently if rapid measurements are required.
• Works with smart devices with iOS and Android operating systems.
• There is no additional cost.
Why Sanatmetal?

• More than 50 years of experience in designing, manufacturing and marketing medical devices.
• We have several innovative solutions, with patents.
• We have roughly 25,000 products and we produce 3,000 for world market leading multinationals.
• We have intensive development processes, so that we can produce roughly 1,000 new products a year.
• We sell worldwide, supplying 38 countries.
• We have significant medical and technical knowledge base, cooperating with medical and technical universities, clinics and institutes.
• Our products meet the highest quality requirements of medical devices (BSI, FDA, ANVISA, EMKI).
• Previously we had British-American-Hungarian joint venture, known as the Depuy Sanatmetal.
• We developed strategic supplier relationships with market-leading companies, such as Zimmer, Biomet, DePuy Johnson & Johnson.

• **We are among Europe’s top 40 companies.**
If we know it, we can change it

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