The Mini-ECG-Device „InstantCheck“

Review InstantCheck

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The Concept: „Mini-ECG-Device as „constant companion“

Stethoscope, blood pressure measuring device and reflex hammer help with the orientation on the condition of the patients. In clinics and doctors surgeries all persons are used to work with ECG, X-Ray and CT. In case of emergency and home visit this devices can not be used. Is it therefore necessary that any person with weakness has to be brought into the clinic? Is it also possible to decide competent in the nursing home? From the physician is always expected a fast and competent diagnosis and decision. Pulse oxymeter and blood glucose measuring have been before indispensable in the medical emergency. With the device „InstantCheck“ (Company DAVITA®, Kleve, www.DAVITA.de) now an ECG-monitor has achieved a mobile phone format.

Can this device be used for a medical decision? I wanted to clarify this question in the practice.

Test 1/8: Start: „Does it work without a manual?“

The package indicates that 100 ECGs can be stored for each 30 seconds. In the case there are a small device in a bright orange cover and USB cable, two manuals in German and English language, a CD and a patient cable with 2 adhesive electrodes. Two AAA-batteries must be purchased and inserted. After opening the cover an orange button can be pressed to turn on the device. A short beep indicates that the unit is turned on. Following the instructions of the small screen I press the start button. In English language you are asked to put both thumbs on the black electrodes. With „place thumbs gently“ it is remembered to press the thumbs not with force on the electrodes, but just press very gently. A muscle activity of the thumbs will lead via a muscle tremor to a disturbed representation. During 30 seconds of recording the label of the unit illuminates in red and signalizes with the expiration the end of the recording.

The current ECG is clearly readable on the monitor. The heart rhythm can be identified. The first test is passed.
**Test 2/8: PC-Connection: „Plug & Pray?“**

The software installation is done in less than 20 seconds without problems. The 12 Megabytes of the programme leave a 5 MB-Exe-File in the programme folder. If only all programmes would need so little place! The ECG-Database can easily be reached in the **Directory C: InstantCheck**.

The dubbing of a 30 kilobyte ECG via USB is done in a flash. Only briefly appears a progress bar. Afterwards the programme asks for an assignment to an applied patient data. Should the patient data not be applied, so it is possible to import the data and then remove later the ECG in the right folder. Also a group of ECGs can be removed by a check mark.

A **search function** also allows for extensive data sets a fast selection of patients. The function searches for names or ID, even using segments from the middle of a name can be specified („ller“ instead of Müller“). The result is a list of names. **This feature is more powerful than many doctors surgeries softwares. Test 2 is passed.**

**Test 3/8: Analysis: „The electronical ECG-ruler?“**

With **two clicks in the ECG-curve** surprising performances appear. The first click sets a vertical line in the ECG, this is the beginning of the analyzed interval. Another click of the left mouse button sets a second stroke. And immediately the interval transforms from black to blue and 6 ECG parameters are shown in the analytical field. The measured distances PR, QRS and QT are marked there as coloured bars. This creates confidence for the evaluation, because it reveals the automatic transmission, which is considered as a basis of measurement. HR specifies the „Heart-Rate“ = Heart frequency, QTc is calculated referring to the Bazett-formula.

**How are the measurements determined?**
The curves of the ECG-measurements from the selected interval will be composed to an average value. The measurement makes a statement about the average values.

The software is intelligent enough to interpret correctly the intervals which are set with mouse clicks. So there are no corresponding errors caused by inaccurate insertion of the markers in the middle of an ECG-complex. Internally the programme has already done a separation of the individual heart operations. For example a heart operation is either fully integrated into the interval or completely ignored.
I see what I expect from an ECG: the heart rhythm, arrhythmia, P-wave, the PR-interval, die QRS-width, the ST-segment and T-wave. With the software I can pick out the appropriate intervals for timing and I can suppress high disturbed recording phases. Overall I feel at home.

My ECG-Ruler has received an electronic competition. The flexibility of the very fast measurement is a plus point for the PC-assisted analyses of the ECG. The disadvantage is that the detail analysis „Waveform Analysis“ is only 55x 55 mm in size. That is enough to control the software, but for reading of the measured values it is too little. Alternatively we would need to look at the hardcopy. Test 3 is however passed.

**Test 4/8: Hardcopy: „Blue ink on pink paper or all in black?“**

In connection with a check mark in front a desired ECG can be printed on DIN A4 paper. By clicking on the icon „Print Preview“ I get a print preview with ECG blue print on ECG-paper in a classic old rose. These are familiar colours. In pin-sharp clarity I receive a 25mm-representation, which can be further evaluated with an ECG-ruler. Kindly the comments are printed, too. Mostly however I print in black ink on the laser printer. This fits to our scanner-archiving.

Such an ECG finding sheet meets all the requirements for a document archiving. Test 4 is passed.
**Test 5/8: Patient Cable: „Diagnosis extended?“**

The patient cable is for monitoring closely an individual patient for several hours. It is not necessary to put the thumbs on the integrated electrodes. The patient cable allows the connection of two commercially available push button-electrodes. The patient is able to start individual records as desired. This procedure is suitable for cases in which a 24-hour-holter-monitor ECG was always running on the „wrong day“. Thus a gap in the ECG-diagnosis can be closed. **Test 5 is passed.**

**Test 6/8: Menü: „Pretty designed?“**

3 buttons are used to control the menus, that is pleasantly clear. There are six menu items in the display, which can be accessed via the menu button in serial.

- **Continuous Mode** starts a recording of 120 minutes, which can be finished at any time.
- **Preview ECG** plays recorded ECGs which are shown again on the display.
- **Transmit Data** transfers with the help of the USB-cable the ECGs in the PC. An accidental pressing does not harm the data in the device.
- **Date & Time** can be operated easily.
- **Erase all Data** allows an early cancellation of the memory. This should only be used if you are not interested in a transfer of the data to the PC.
- **Attention** points in English language that the device does not provide the diagnosis, but the physician.

Clear and effective menu structure – **Test 6 passed.**

**Test 7/8: Practice test: „Fast enough for everyday use?“**

Often if I wanted to write an ECG I have heard: “I have no time” or “I am not dressed for an ECG”. Nobody has refused the ECG with 2 thumbs. After 15 seconds the storage of the data begins with the duration of 30 seconds. Thereby the ECG is shown on the display. With „Transmit data“ the transmission of the data to the PC is started. The programme asks well-behaved for the assignment to a patient. The whole process from the decision to let make an ECG to the contemplation on the PC-monitor takes only one minute. Usually I only write the name into the PC and print out the ECG at once via STRG+P. In case there is a pathological finding, then I could easily motivate the patients which have received a pathological ECG for a large ECG with 12 channels.

**The ECG takes one minute time - Test 7 is passed.**
**Test 8/8: On the way: „Decision on nursing home bed?“**

It is the task of the country doctor to visit patients being seriously ill and needing special care. With a minimum of equipment a maximum of responsibility should be taken over. “I don’t want to go into the hospital, but what means my palpitation?

The InstantCheck can help in this situation to identify sinus rhythm, arterial fibrillation or extra systoles. For safe exclusion of a myocardial infarction an ECG with one channel is not suitable. Therefore all 12-ECG-leads must be available.

**Test 8: Assessment of cardiac rhythm: yes – The exclusion of myocardial infarction: no.**

**Test-Result: 7,5 of 8 points**

**Requirements of the InstantCheck**
- For the measurement and archiving: Windows-PC
- For a paper-ECG most suitable is: Laser printer (Black- and white or coloured)

**Advantages of the InstantCheck:**
- the start of operation works without explanation
- fast transfer with USB and a well sophisticated software
- semiautomatic ECG-measurement on the PC replace the ECG-ruler
- perfect printout of the 25mm-ECG on paper
- the domestic ECG-diagnostics in unclear attacks
- clear menu control
- after 60 seconds the ECG is already in the PC
- suitable for the analysis of cardiac rhythm during home visit

**The boundaries of the InstantCheck:**
- Not suitable for a safe exclusion of a myocardial infarction.
- Not suitable, if you have not learned the ECG-reading.
- Not suitable for patients with tremor. Than the application should be done with external cable and ECG-electrodes fixed on the left and right underarms.
- Dry hands need to be moistured only with a drop of saltwater.

**Disadvantages of InstantCheck**
- For an own determination of the ECG-times in the „Waveform-Analysis“-area the image is too small – a larger representation would be desirable. Therefore a software-update would be enough.

**Suitable applications:**
- Recognition of arterial flimmer arrhythmic
- Recognition of VES (ventricular extra systoles) and SVES (supraventricular extra systoles)
- Additional course control by heart patients
- Alternative for patients, who do not want to undress
- Attractive solution for patients, who are in hurry
- Permanent companion for home visits by physicians
- „At home“-Registration of diagnostically unclear situation
Annex: Additional technical details for specialists

The boundaries of the InstantCheck

It is clear that this device does not offer a 12 led ECG. Therefore it is not suitable to exclude a myocardial infarction. My most common question in the ECG-everyday practice however is not, whether the patient has a myocardial infarction. The most common question concerns the cardiac rhythm: What kind of extra systoles are existing? Has the patient now a sinus rhythm or even an artial fibrillation. Exists a dangerous QT-prolongation? Exists a bundle branch block? These are the silent questions with which physicians look at their patients. These can now be answered reliably within a minute.

Hardness test: QTc-determination

Said in advance: With the InstantCheck is usually a useful QTc-estimation possible. The QTc-Determination is reserved for specific medical questions. It is a hardness test, which also leads other ECG-software to their limits. Even professional devices with the value of 2000 € here often make huge mistakes. (Tip for testers: You always have a software bug, if at frequencies over 60 the QTc-values are higher than as QT.)

The exact determination of QT-interval has always made big trouble. To determine the end of the T-wave is difficult. Are the curves high, then the waves flatten out a little later. Low curves however run out faster. The QT-duration will also be influenced by the amplitude of the selective dissipation. The biological variation from beat to beat causes differences. Up to 40 ms can result by this factor. Additionally the QT-Dispersion appears, which can lead by normal ECGs to a difference of 40 ms from dissipation to dissipation.

Finally are used to convert from QT to QTc completely different formulas. „QTc“ means the definition of the QT-duration by a standard heart rate of 60/min. So it is possible also to say instead of „QTc“ „QT60“: This time should not exceed 440 ms, because that will be estimated as a risk for mortal arrhythmias. An experienced examiner therefore considers a “QTc“-duration more than 400 ms with increased vigilance.

For the determination of this frequency independent QTc-values are often used the formula of Bazett. But Bazett only has constructed a vague approximation. „QT divided by the square root of (60 / heart rate)“. The literature states that he has only used 35 different ECGs for the development of this formula. Better suitable is the Fridericia-Formula (3. root). The optimum is offered by complex computer-controlled conversions, which are based on extensive ECG-statistics.

What achieves the InstantCheck-Software by the QTc-determination? The programme measures at first the QT-interval automatically. The QTc-value is simultaneously calculated and shown. A recalculation with the calculator shows that this is done with the simple Bazett-formula.

The following errors by the semi automatic QTc-determination should be considered:

1) Frequency: At very low ECG-waves the heart rate is often miscounted. The evaluation interval then has to be chosen very carefully.

2) QT- start: If curves are disturbed the programme tries occasionally to incorporate parts of the P-Q-interval.
3) QT-end: If the curves are disturbed the end point of the T-wave is often set too early or to late. A manual shift of the measuring points is not possible. You have to click a suitable interval.

**My Tip:** Some authors, who have dealt with the QT- and QTc-time, prefer lately the R-T peak-measurement. This results in a significant reduction of disturbing influences, because the peak of the T-wave is better determined than the end point. Perhaps the software will be completed by the indication of „R-Tpeak“ one day. So long the OTC-value which a software determines can only be considered as a screening procedure.

### ECG-devices in comparison

A comparison with other ECG-devices showed for PR, QRS, ST-Level and heart rate an acceptable accordance. The variations were insignificant within the medical valuation. The comparison of the QT-values showed differences of 40 ms. The reason for the differences are the biological variations of each heart activities.

### The logic of the automatic extinguishing

What happens with the data which are stored in the device?

The device recognizes a failure of a „Transmit Data“-attempt. An unintentional cancellation of data in the ECG-device is thus prevented. The delete automatic works reliable after the following “AND“-logic: an automatic deleting occurs, if:

1) The data are successfully transmitted to the PC and
2) A new measurement is started.

This ensures that data never remain in the device which are already in the PC. Otherwise it also means that a record can be sent multiple times as needed to the PC. So it is possible for example shortly after the transfer to store the same ECG as a copy in another folder „Research purpose“.

### Conclusion of the technical detail analysis

The InstantCheck allows an undisturbed and fast medical work at all levels: with the ECG-LCD-monitor, the PC-Software and the paper printout.