Smartphone based ECGs: connecting minds and hearts

Initiative Type

Technology

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Summary

Addressing cardiac risks for psychiatric patients in rural and remote areas has led Cairns Hospital and Health Service (HHS) to conduct a validation study of a new, ultra-portable Bluetooth Electrocardiogram (ECG) device which is both medical grade and approved by the Australian Therapeutic Goods Association (TGA).

The new device delivers a digital six-lead ECG in just 30 seconds without sticky dots or leads and can be completed with the patient clothed, in comparison to the 12-lead ECG, which can take up to 10 minutes to complete. The ultra-portable design measures only 10cm by 5cm, which makes it easy to use in a variety of clinical settings and can be distributed to community teams. It works by pairing the electro pad with a smartphone or tablet.
For the study, the project team recruited 75 patients with various psychiatric diagnoses, using the routine request from community teams for clinical ECGs as the trigger for enrolment.
The process involved taking a 12-lead ECG and within two minutes taking a six-lead ECG. The premise was that the electro-activity of the heart should be much the same because the underlying activity of heart does not change much.
It was found that there was good agreement between the six lead and the 12-lead devices. The average difference was 4.1milliseconds (msec), which was well within the clinically accepted margin of less than 40 msec.
This study showed that this new technology can be a big move forward in psychiatry cardiac monitoring in the most under-served population areas in Australia and that it can improve ECG and cardiac care in that remote population group.
Using this device can be a game changer in rural and remote health because it is not simply a device, but a tool to make the concept to connect hearts and minds a practical reality in Far North Queensland. Wider deployment will pave the way for more accessible and patient centred healthcare.

Key dates

Jul 2022

Jun 2023

Implementation sites

Cairns and Torres and Cape Hospital and Health Services

Key Contacts

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Aim

To perform a real-world clinical validation of the smartphone cardiac device for psychiatric patients.

Benefits

The most significant benefit is to the consumer, where the non-invasive nature of the test means consumers can remain fully clothed.
It is one device that can be used on many patients with only three points of contact.
A significant time saving - it only takes 10 seconds to set up and 30 seconds to conduct the test.
It is more efficient than a 12-lead, with no leads or sticky dots required.
It is more affordable than a 12-lead (costing around $300 and the battery lasts about two years.)
The portable nature of the device means that non-medical staff can be equipped with these devices and perform ECG measurement in consumers' own homes, that can be reviewed by clinicians remotely with immediate feedback.
It shows the importance of local validation studies to build trust in new systems, in particular in rural and remote areas.

Background

In psychiatry, some medications uniquely affect the intrinsic timing of the heart's electrical system and it is especially important to monitor these readings when commencing or changing medications. However, until recently, this level of community monitoring was difficult, especially in a region such as far north Queensland where the sheer size and remoteness of the communities we serve often act as barriers to health care access and equity.
Mental health care in Far North Queensland (Cairns and Torres and Cape HHSs) is provided in a catchment area of 270,000 square kilometres and approximately 28% of the consumer base identify as Aboriginal and Torres Strait Islander people. Schizophrenia, bipolar disorder and depression are the main illnesses that the Mental Health Service address and all three illnesses require medication that can change the QT wave interval.

Solutions Implemented

The next step is to complete the use-case protocols in preparation for a service-wide deployment across the 30 community and mental health care teams spread across Far North Queensland and Torres Strait.
Create a working document (implementation plan) that is integrated with clinical and documentation systems.

Evaluation and Results

QT clinical correlation: Average difference of 4.1 msec compared to 12-lead ECG, which is within accepted clinical margin of less than 40msec

- Heart rate: Average difference of seven beats per minute
- QRS interval and ST segments: QRS difference of 6.5 msec; ST average difference of 9.3 msec
- All the results were within the clinically acceptable cut offs. It demonstrated the six-lead device in a real-world rural setting is clinically comparable to a 12-lead ECG.

Qualitative feedback was also collected:

- Patients were very positive about the ease of use
- Patients appreciated the absence of wires
- Staff pointed out that this six-lead device was simple and quick to use.

Lessons Learnt

Minor training for staff is always needed for electronic devices, even though they are perceived to be simple to use and intuitive.

Further Reading

Kardia Mobile 6L