KardiaMobile 6L for measuring QT interval in people having antipsychotic medication to inform early value assessment: a systematic review

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Scientific summary

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Scientific summary

Background

The primary indication for this assessment is the use of the KardiaMobile six-lead (6L) electrocardiogram (ECG) device for the assessment of QT interval-based cardiac risk in service users prior to the initiation of antipsychotic medications, which are associated with an established risk of QT interval prolongation, and for monitoring QT interval-based cardiac risk once medication has been established.

Current UK guidance recommends that a person should be offered an ECG before starting antipsychotic medication if:

- specified in the drug's summary of product characteristics or
- a physical examination has identified specific cardiovascular risk or
- there is a family history of cardiovascular disease, sudden collapse or other cardiovascular risk factors such as arrhythmia or
- the service user is being admitted as an inpatient.

This early value assessment (EVA) considers the potential clinical effectiveness of using KardiaMobile 6L for the initial assessment (triage) of QT interval-based cardiac risk in service users prior to the initiation of antipsychotic medications, which are associated with an established risk of QT interval prolongation, and for monitoring QT interval-based cardiac risk once medication has been established. The assessment of KardiaMobile 6L as a triage step means that patients with QT prolongation, identified by KardiaMobile 6L, would be followed up using 12-lead ECG; this would be the case both for assessment prior to the initiation of antipsychotic medications and for monitoring QT interval-based cardiac risk once medication has been established. There may be additional circumstances where follow-up 12-lead ECG is required, for example where the KardiaMobile 6L readout is considered to be of insufficient quality for clinical decision-making.

Objectives

The overall aim of this project was to provide a comprehensive summary of all available evidence that may be relevant to the potential implementation of KardiaMobile 6L, in the context of QT interval-based cardiac risk assessment for service users who require antipsychotic medication.

We defined a series of research questions that would need to be addressed, to support a full assessment of the clinical effectiveness and cost effectiveness of using KardiaMobile 6L for the initial assessment (triage) of QT interval-based cardiac risk in service users prior to the initiation of antipsychotic medications which are associated with an established risk of QT interval prolongation, and for monitoring QT interval-based cardiac risk once medication has been established:

(1) What is the accuracy/technical performance of KardiaMobile 6L, where prolonged corrected QT interval (QTc), determined by 12-lead ECG (the reference standard method) is the target condition?
(2) What are the clinical effects (on cardiac and psychiatric outcomes) of using KardiaMobile 6L for the initial assessment (triage) of QT interval-based cardiac risk in service users taking antipsychotic medications that are associated with QT prolongation, both for baseline assessment before initiating medication and for ongoing monitoring, compared to 12-lead ECG in all patients (no triage step) or no ECG?
(3) What are the effects of using KardiaMobile 6L on service user acceptability/satisfaction and on training and workflow issues?

(4) What are the costs, from a UK NHS and Personal Social Services perspective, of using KardiaMobile 6L for the initial assessment (triage) of QT interval-based cardiac risk in service users taking antipsychotic medications that are associated with QT prolongation?
(5) What existing, published cost-effectiveness studies are available about QT interval assessment for service users who require antipsychotic medication?

Given the anticipated limitations of the evidence base, this assessment used a broader scope to consider whether the KardiaMobile 6L device has the potential to provide an effective and safe alternative to 12-lead ECG for initial assessment and monitoring of QT interval-based cardiac risk in people taking antipsychotic medications. For example, the inclusion criteria for questions 1 and 3 allowed the inclusion of data for any population not just those starting or maintained on antipsychotic medications that are associated with QT prolongation, observational studies were included for all questions other than question 5, and concordance studies (a study type which cannot provide estimates of the clinical accuracy of a test) were included for question 1. The available evidence has been summarised, with consideration of its relevance to the above research questions, and a detailed description of evidence gaps where further research is needed is provided. This assessment does not include cost-effectiveness modelling, because the evidence currently available is not sufficient to support this.

Methods

Twenty-seven databases, including MEDLINE and EMBASE, research registers, conference proceedings and a pre-print resource were searched for relevant studies from inception to April/May 2022. Search results were screened for relevance independently by two reviewers. Full-text inclusion assessment, data extraction and quality assessment were conducted by one reviewer and checked by a second. The methodological quality of included technical validation studies was assessed using relevant components of QUADAS-2. No formal quality assessment was applied to the other study types (case series) included in this report. We did not consider formal assessment of methodological quality or risk of bias to be appropriate for non-research study pilot project reports; however, our report includes a qualitative summary of the key issues, with respect to the reliability of the information provided by these reports to address the aims of this EVA. Meta-analysis was considered inappropriate, due to the small number of included studies and wide variation in study design, study populations and outcomes reported; we therefore employed a narrative synthesis. The results section of this report is structured by research question.

Results

The evidence to inform this EVA of KardiaMobile 6L, for use in the context of QT interval-based cardiac risk assessment for service users who require antipsychotic medication, was extremely limited.

We did not identify any studies, which addressed any of the five research questions defined for this EVA, in the target population (service users who require antipsychotic medication).

All eight included studies were technical validation studies or case series, which reported some limited information about agreement between QT interval measurements derived from KardiaMobile 6L and 12-lead ECG. All of these studies were conducted in non-psychiatric populations [e.g. cardiac patients, coronavirus disease 2019 (COVID-19) patients], and all used cardiologists to interpret all ECGs and, in some instances, also applied optimised methods of interpreting ECGs (multiple reader assessment). Where reported or calculable, the mean difference in QTc between devices (12-lead ECG vs. KardiaMobile 6L) was generally small (≤ 10 ms) and QTc measured using KardiaMobile 6L was consistently lower than that measured by 12-lead ECG. However, it should be noted that none of the

included studies provided any information to indicate in how many (if any) patients observed differences in measured QTc would have resulted in a change of clinical category.

All the information about the use of KardiaMobile 6L in the context of QT interval-based cardiac risk assessment for service users who require antipsychotic medication, included in this EVA report, was taken from two unpublished pilot project reports.

It is important to note that both these project reports relate to work undertaken as part of a wider Academic Health Science Network (AHSN) pilot, which was not intended to be used in wider evaluations of KardiaMobile 6L for use in the NHS.

Both reports included information from surveys of staff and service users, which indicated that the use of KardiaMobile 6L may be associated with reductions in the time taken to complete an ECG and costs, relative to 12-lead ECG, and that KardiaMobile 6L was preferred over 12-lead ECG by almost all of the staff and service users who responded. It should be noted that estimates of the time taken to complete an ECG were based on opinion, retrospectively obtained from staff who had chosen to use KardiaMobile 6L during the pilot period, rather than real-world measurement of actual time taken. It should also be noted that estimates of overall potential cost savings associated with KardiaMobile 6L did not include the costs of any follow-up 12-lead ECGs required.

Conclusions

As anticipated during the scoping phase of this assessment and reflected in the decision to undertake an EVA, there is insufficient evidence to support a full diagnostic assessment evaluating the clinical and cost effectiveness of KardiaMobile 6L, in the context of QT interval-based cardiac risk assessment for service users who require antipsychotic medication. The evidence to inform the aims of this EVA (i.e. to assess whether the device has the potential to be clinically effective and cost-effective) was also limited. This report includes a comprehensive list of research recommendations, both to reduce the uncertainty around this EVA and to provide the additional data needed to inform a full diagnostic assessment, including cost-effectiveness modelling.

Study registration

This study is registered as PROSPERO CRD42022336695.

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