

CardioER® - Using smartphone medical applications as an aid to clinical decision-making – are we ready for this?

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INTRODUCTION

The development of medical applications for tablets or smartphones has been worldwide spread. The technology has been applied in several areas, with uses ranging from control of medicine administration, detection and control of diseases, alerting skilled people to handle emergency situations in neighboring areas, assessment of skin lesions, contraception, medical training etc.¹⁻⁹ It is not clear whether the applications have been submitted to scientific evaluation⁵.

In Brazil, experience with national applications is still early and few data are known. Thus, we have developed a descriptive study with the objective of evaluating the functionality and rate of approval of a national medical application for the Brazilian population.

METHODOLOGY

We used the CardioER® application, marketed by Editora Manole Ltda. since September 2015, which is considered the first national medical application with conduct flowcharts and content related to cardiac

emergencies. Between August and December 2016, an optional questionnaire with 11 multiple-choice questions on the use, degree of importance, academic/professional training of the user and role in emergencies was introduced with the latest update of the application. Of approximately 40,000 downloads via App Store and Google Play, 791 (1.9%) answered the questionnaire. The responses were evaluated, and the results are described below.

The questions made were:

1) What is your level of training?

a) Medical scholar

b) Cardiologist

c) Doctor, but not a cardiologist

d) Health professional, but not a doctor

e) Not a health professional

2) Does your work involve emergency situations?

a) Yes b) No

3) In your opinion, is the content of the application appropriate to its objective?

a) Yes b) No

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4) In your opinion, which feature in the application is more important to your clinical practice?

- a) Guidelines
- b) Flowcharts
- c) Tables
- d) Images
- e) Calculators
- f) Videos
- g) Blog

5) Have you ever consulted the application for help in correcting the dosage of a medication/choice of a particular therapy?

- a) Yes
- b) No

6) Has the application influenced any medical decisions?

- a) Yes
- b) No

7) Do you consider the use of the application in a given situation/medical decision:

- a) Was helpful
- b) Got in the way
- c) Made no difference
- d) I did not use it in these situations

8) Do you think the use of medical applications like this is valid?

- a) Yes
- b) No

9) Do you feel confident in using the application in real medical situations?

- a) Yes
- b) No

10) Would you recommend the application to other people?

- a) Yes
- b) No

11) What is the final assessment that you make of this application?

- a) Excellent
- b) Great
- c) Good
- d) Bad
- e) Terrible

STATISTICAL ANALYSIS

Presented in the form of percentages and absolute values calculated for each question analyzed.

RESULTS

Approximately 9% of those who used the application were medical scholars, 56% were not cardiologists, 32% were training cardiologists and about 93% worked in emergency sectors (Figure 1). Ninety-six percent found the application content adequate to its objective and the flowcharts were considered the most important feature by 56%, followed by the guidelines (26%) and dosage calculators (12%). According to the users, 81% felt the application assisted them in the choice of therapy, being helpful in 88% of the cases and getting in the way 0% of the times. Approximately 99% of users found the application valid and 96% feel confident making decisions based on its information. Overall, the final assessment of

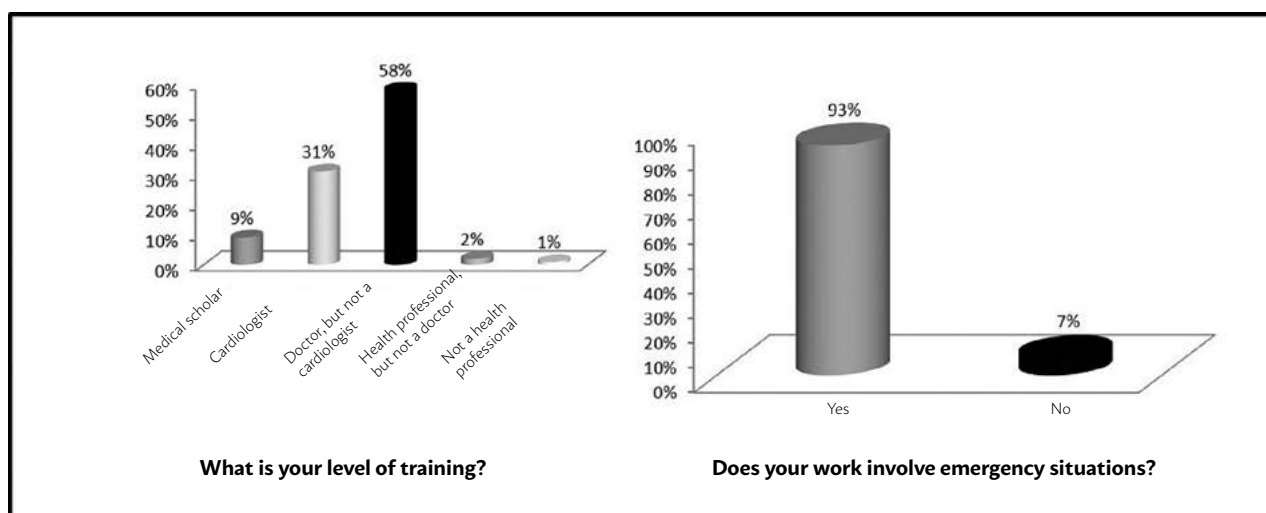


FIGURE 1. Application user profiles.

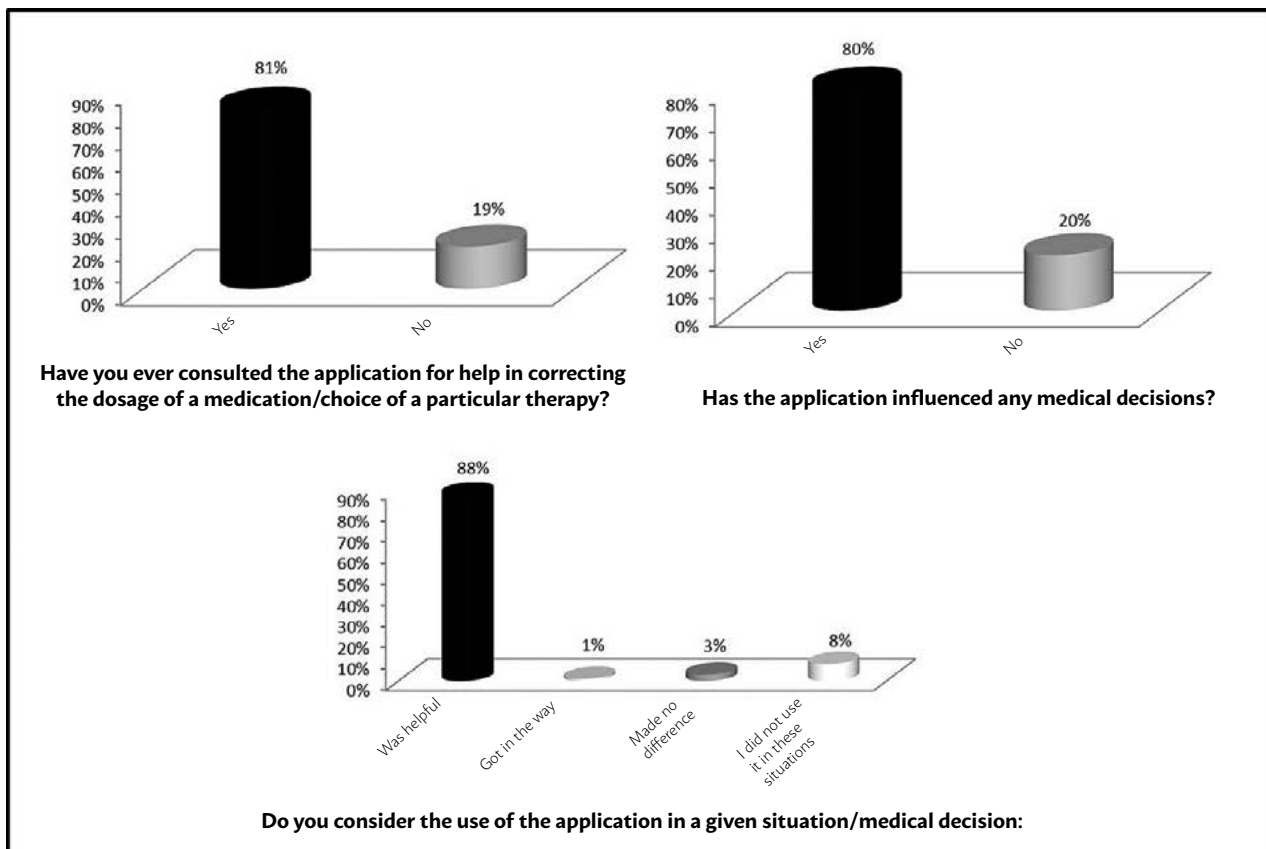


FIGURE 2. Results of the practical use of the application.

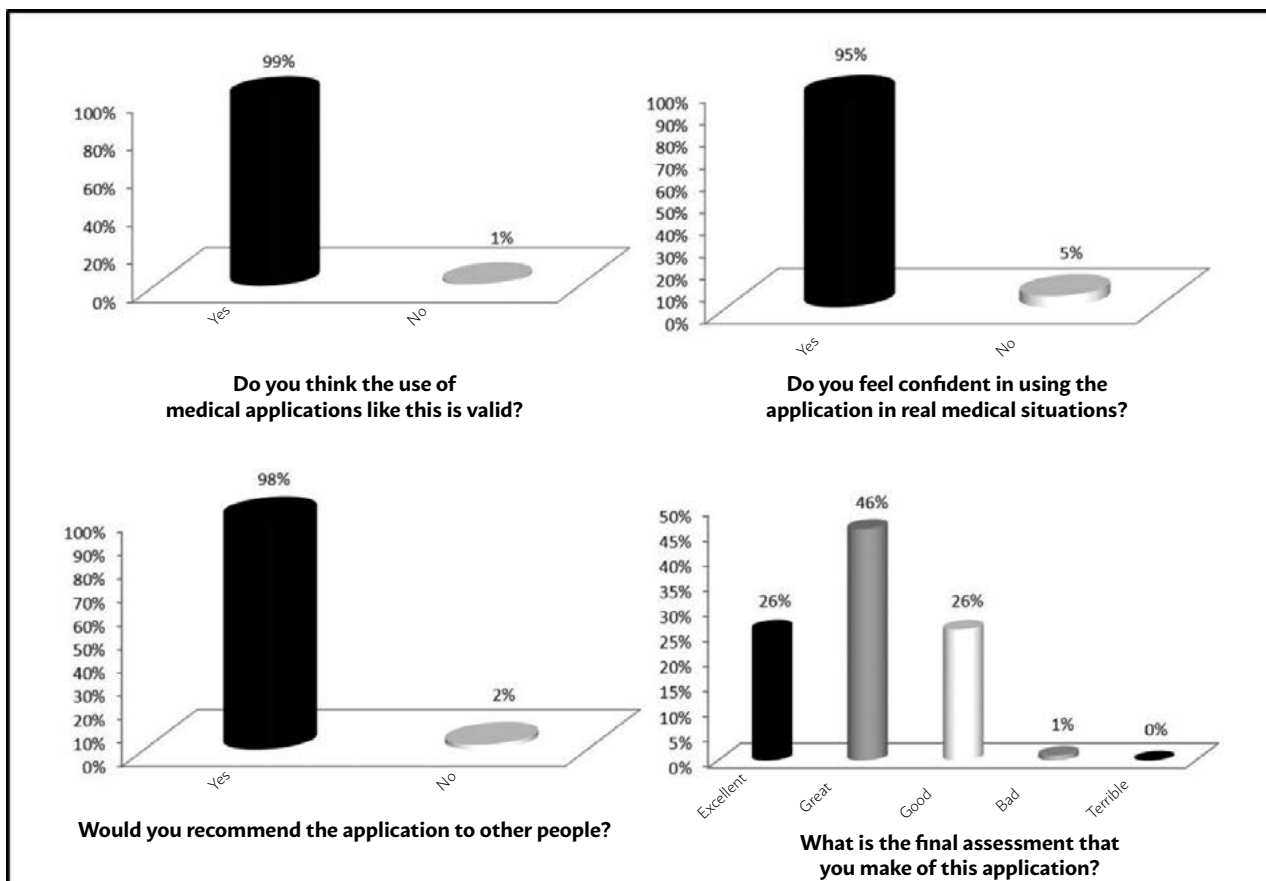


FIGURE 3. Final conclusion of the users regarding the application.

the application was excellent, great or good for 97% of users. The results of the practical use of the application and user's final opinion on it are shown in figures 2 and 3.

DISCUSSION

The study shows that the use of an application directed to the medical audience and aimed at the rapid resolution of an emergency problem can bring benefits. At least in respect of the acceptance and usefulness of the device, the evaluations were, in their majority, great or excellent, partly due to its wide range of data with quick access. Or perhaps due to the availability of the flowcharts, following a line of reasoning and being the best-rated content on the platform.

Within cardiology, some smartphone applications have become popular in recent years and allowed the publication of data related to their use and viability^{6,10-19}.

As an example, a study published in 2017 evaluated the AliveCor application (AliveCor Inc, California, USA), developed as a cardiac event recorder. The objective of this study was to investigate whether the smartphone-based event logger could be effectively used to obtain a correlation between the rhythm of symptoms in unselected patients with palpitations. A total of 20 patients were included for 12 weeks. A correlation with the rhythm of symptoms was obtained in 85% of the patients, with an arrhythmia detected in 45%. Of a total of 966 electrocardiograms available for review, 96% were interpretable^{10,15}.

On the same line, another study is evaluating a technology that provides access to a reliable means of obtaining an electrocardiogram reading through a smartphone application that works with an attachment providing all 12 leads of a standard electrocardiogram system. The *ST Lewis* study was designed to validate the smartphone application and its ability to accurately assess the presence or absence of acute myocardial infarction with ST elevation in patients with chest pain in comparison with the gold standard. Approximately 60 patients will be included per institution for a total recruitment of 300 patients. Soon we will have the result of this correlation⁶.

Recently, with the collaboration of the European Society of Cardiology (ESC), applications were created on atrial fibrillation for use on smartphones and tablets. They seek to improve patient education,

improving communication between patients and health professionals and encouraging the active involvement of the patient in the management of their condition. It also aims to promote best practice approaches to the care of patients with atrial fibrillation and demonstrate the value of integrating new digital technology into clinical practice, with the potential for patient involvement, optimization of pharmacological and interventional therapy, and, lastly, to improve patient outcomes. There are still no published data on the effectiveness of its use¹³.

Still in the area of cardiology, at the end of 2017 another randomized trial was initiated with three months follow-up to evaluate the feasibility and effectiveness of medication-reminder applications on adherence to therapy compared to usual care. A total of 156 patients with chronic coronary disease have been randomized to one of three groups (usual care group, basic medication reminders group and advanced medication reminder group). The usual care group will receive standard care without access to a medication reminder. The basic medication reminder group will have access to a medication-reminder application with a basic feature that provides simple daily reminders without interactivity. The advanced medication reminder group will have access to a medication-reminder application with additional interactive and customizable features. The primary outcome is adherence to medication. Secondary outcomes include clinical measurements of blood pressure and cholesterol levels and knowledge of medication. An assessment of the process will also be performed to verify the feasibility of the intervention, estimating the acceptability and usefulness to the user¹⁴.

Other applications are working on the possibility of reducing door-to-balloon time and detect arrhythmias in patients with hypertrophic cardiomyopathy or who suffered an idiopathic stroke^{11,16,17}.

As noted, most studies are still under evaluation. Prospects have been assessed both on the feasibility and validation of applications. In Brazil, the data presented in this study show the first evaluation of a medical application aimed at emergency situations. There are limitations for not having effective data on mortality or outcomes for the patients involved. In addition, only a small portion of users responded to the poll. However, the data presented complement and follow a trend of global publications seeking the improvement of technology in the healthcare area.

CONCLUSION

The availability of medical applications may be able to assist health professionals in their day-to-day practice. The initial experience in Brazil shows that

the rate of acceptance and use was excellent, and the development of new applications should be encouraged by health professionals.

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