

# 'Quer N0 AVC' for Monitoring Stroke Patients' Healthcare Using a Mobile App

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**Abstract.** Stroke is one of the leading causes of death and impairments worldwide. After hospital discharge, it is necessary to monitor these patients during their recovery. This research addresses the implementation of a mobile app, entitled 'Quer N0 AVC', to improve the quality of stroke patient care in Joinville, Brazil. The study method was divided into two parts. The adaptation phase included all the necessary information in the app for monitoring stroke patients. The implementation phase aimed to prepare a routine for the Quer mobile app installation. One of the questionnaires collected data from 42 patients and identified that before hospital admission 29% of them did not have medical appointments, 36% had one or two appointments, 11% had three appointments, and 24% had four or more appointments. This research portrayed adaptation feasibility and the implementation of a cell phone app for following up on stroke patients.

**Keywords.** Stroke, Mobile App, Patient Monitoring.

## 1. Introduction

Stroke is the second-leading cause of death and the third-leading cause of disability-adjusted life years lost worldwide [1]. After a stroke, individuals continue with a broad range of impairments, such as weakness or paralysis, sensory losses, immobility, spasticity, and stroke-related pain [2]. The stroke patient is cared for in several healthcare institutions during the recovery phase after discharge, such as hospitals, primary healthcare units, outpatient facilities, etc. Due to communication challenges among service providers, an increased risk of care gaps accompanies those changes in institutions during treatment and rehabilitation [3]. Therefore, it is essential to monitor the stroke patients' journey during their rehabilitation [4,5].

The department that currently follows up on stroke patients in Joinville - Brazil is Joinvasc (Joinville Stroke Epidemiological Registry). Joinvasc was constituted by

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Municipal Law # 7,448 on June 12, 2013. Its purpose is to register data on stroke occurrences in public and private institutions in Joinville, specifying those occurrences epidemiologically to contribute to public health policies on the scopes of stroke prevention, treatment, and patient follow-up [6]. Currently, the Joinvasc employees get in touch with patients 30 and 90 days after being discharged from the hospital to follow up on stroke patients, and annually from 1 year up to 5 years after the stroke occurs. They do that by calling them and asking predefined questions.

In the last decade, mobile healthcare technologies (mHealth) were launched as a promising pathway for improving physician-patient communication. Some studies address the utilization and practicality of mHealth in handling chronic diseases [7]. mHealth provides an opportunity for obtaining and clustering different types of data from several sources through technologies such as application programming interfaces [8]. Through mHealth, patients can input data in apps making their health monitoring feasible through questionnaires incorporating patient-reported outcome measurement data [9,10].

The 'Quer' mobile app is a software program developed by the Univision<sup>2</sup> company, and it is a support tool for healthcare. It is possible to customize clinical information and keep it related; it is explicitly collected based on health context. It is also prepared to participate actively in its healthcare monitoring. Due to its characteristics, Quer mobile app can be adapted to monitor stroke patients and aid in avoiding secondary strokes.

Therefore, the objective of this study was to implement the Quer app for following up on stroke patients. The importance of this case study is that Quer mobile app can partially replace the mechanical process performed through telephone calls. In contrast, the patient (or caregiver) answers various risk-control questions, health maintenance, patient rehabilitation, and updates on their current health status. Thus, using the app may automate and streamline data collection for inputting in the Joinvasc database.

## 2. Methods

The applied research was exploratory objectives [11,12], including adapting and implementing a mobile app in clinical practice. This study was approved by the Research and Ethics Committee Report # 4,917,962. It was performed at São José Municipal Hospital, in Joinville - Brazil, in the Stroke Unit and Joinvasc. The data collected in this step of the research was prospective. The subjects studied in the first step are patients who suffered a stroke from July 2021 to August 2022, totaling 218 patients. First, it is important to emphasize that before the adaptation and implementation of the technology in clinical settings, a partnership was agreed to with the following institutions: Brazilian Stroke Association, Pontifícia Universidade Católica do Paraná, Univision, Joinville City Hall, and Joinvasc.

This study englobed two main phases. The first was the adaptation phase; in this phase, we used the predefined questions previously used by Joinvasc to draft the questionnaires sent to stroke patients. The adaptation phase included all necessary information already used for monitoring patients who have suffered a stroke episode currently used by Joinvasc. The second phase was the implementation phase, which aimed to implement the use of the Quer mobile app during stroke patient hospitalization and their monitoring after hospital discharge.

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<sup>2</sup> Univision website: <https://univision.net.br/app-quer/>

The following is how some issues were approached in the implementation phase:

- The researchers defined a well-defined assigned routine and specified responsibilities during the Quer mobile app installation. And the Joinvasc team was responsible for choosing who would perform the installation of the Quer mobile app on the patient's cell phone.
- Instructions were drafted to help health professionals to explain the installation routine for running the app. That begins by first identifying hospitalized stroke patients, registering the patient on the Web Quer Portal, installing the bedside app in the patient's or companion's cell phone shown in Figure 1 (B), and registering the medications the patient is taking when released from the hospital.
- A cell phone with an activated phone chip number and Wi-Fi access to an internet router has been provided for installing the app for those patients who did not have Wi-Fi access available. That cell phone was also provided to the patient to contact them whenever they had any doubts regarding the research and to operate the app.
- The patients and/or their companions were approached after the patient was transferred to the Stroke Unit, which usually occurs on the third day after hospital admission. Figure 1(A) shows that some information pamphlets were drafted to help the patients and the health professionals, and videos were prepared to explain the Quer mobile app installation and usage.
- A formal introduction to the Quer app took place for most healthcare professionals who provide stroke care at the hospital. It is important to stress that teaching employees to use the Quer app and the Quer Web Portal took place several times during the process; for example, initially, it was explained to the resident nursing students when installing the app, and after that, two nurses who were Joinvasc employees, and then it was explained to all the employees in the U-AVC Integral for inputting the medications in the app.



(A) Information pamphlet for installing the Quer N0 Stroke mobile app.

(B) A Joinvasc nurse teaching the patient's companion how to install the Quer mobile app.

**Figure 1.** The implementation phase of the 'Quer N0 Stroke' project.

### 3. Results

In the adaptation phase, three monitoring questionnaires and six stroke healthcare guidance were drafted. Figure 2 displays the main function menus from the Quer app

after downloading the Quer app from the app store, and signing up for an account, and joining to Brazilian Stroke Association.



**Figure 2.** Menus from the Quer mobile app.

In the installation phase, the hospital employee installs the app on the patient's and/or caregiver's cell phone, and the person is taught how to use the Quer app. The information pamphlet on using the app is also delivered, as shown in Figure 1. The healthcare professional will register the patient's medications in the app the patient needs to take before being released from the hospital. That is for helping them to manage the disease (since the app is enabled to register reminders at proper times for taking medications). The patients usually use the chat to clarify their doubts about issues such as rehabilitation, healthy foods, physical activities, and others. The patient can also input data in the app at any time and at the most appropriate time for doing that.

One of the questionnaires named 'Introducing to use Quer mobile app' collected data from 42 patients and identified that 72% of patients had a stroke history in their family (23% father, 28% mother, 26% other family members, and 5% had not one, but two related family members), 86% of the patients were hypertensive, 28% diabetic, 28% had dyslipidemia, and 18% of patient suffered from heart disease. When the issue approached was about personal medical care during the previous year before the stroke, 29% did not take any medical examinations, 36% had one or two medical appointments, 11% had three appointments, and 24% had four or more medical appointments.

The main identified challenges for implementing this technology were the patients needing to have cell phones available for internet access, hindrances in understanding and employing technology, loss and/or stolen cell phones, difficulty in answering the questionnaires, and non-compliance to treatment. However, these issues haven't been approached yet by the researchers.

#### 4. Conclusion

This research portrays adaptation feasibility and the implementation of a cell phone app for monitoring and following up on stroke patients after hospital discharge. The 'Quer' app was proven in this study to be capable of providing some benefits, such as aiding in the adequate use of medication at the prescribed schedules for the patients, facilitating communication with the health professional through the chat, providing stroke healthcare guidance, and automate data collection through questionnaires. Although this app can partially substitute the healthcare data collection process after a stroke, there are still some challenges due to the unavailability of internet access to cell phones and non-adherence to using the app.

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