



# Usage Evaluation of a Mobile App to Help Understand the Rehabilitation Process of Shoulder Surgery\*

## *Avaliação do uso de aplicativo de celular para auxílio no processo de reabilitação da cirurgia do ombro*

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### Abstract

#### Keywords

- rehabilitation
- shoulder/surgery
- physical therapy specialty
- orthopedics
- cell phone

**Objective** The present paper aims to evaluate the quality of a mobile phone application (app) designed to guide patients after shoulder surgical procedures.

**Methods** A free and easily accessible app was developed to help patients at home. Patients were monitored for app use and adaptation before physical therapy started. At the end of 6 weeks, a qualitative questionnaire was employed to determine the usability of the app.

**Results** In total, 97% of the respondents reported that the app was easy to download, the exercises were readily understood, and they would recommend the app. Ninety-three percent of the participants agreed that the app made them feel a greater degree of participation in the treatment of their illness, while 90% considered the app self-explanatory.

**Conclusion** The virtual platform helps the patients to understand the treatment, aiding the medical prescription of postoperative exercises to be performed at home.

### Resumo

**Objetivo** Avaliar a qualidade de um aplicativo de celular desenvolvido para orientar pacientes em período pós-operatório de procedimentos cirúrgicos do ombro.

**Métodos** Desenvolveu-se um aplicativo gratuito e de fácil acesso para auxiliar os pacientes em domicílio. Os indivíduos foram monitorados quanto ao uso do aplicativo

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**Palavras-chave**

- reabilitação
- ombro/cirurgia
- fisioterapia
- ortopedia
- telefone celular

e adaptação à sua prática antes do início da fisioterapia. Ao final de 6 semanas, aplicou-se um questionário qualitativo para avaliar a usabilidade do aplicativo.

**Resultados** Um total de 97% dos respondentes afirmaram que foi fácil executar o *download* do aplicativo, que os exercícios sugeridos foram prontamente entendidos, e relataram que indicariam o aplicativo. Noventa e três por cento da amostra concorda que o aplicativo fez com que se sentissem mais participativos com relação ao tratamento de sua doença, enquanto 90% consideraram o aplicativo autoexplicativo.

**Conclusão** O uso de uma plataforma virtual é uma ferramenta de compreensão sobre o tratamento e auxilia na prescrição médica de exercícios pós-operatórios domiciliares.

## Introduction

The guidance given by the doctor about the rehabilitation process after a surgical procedure is critical to achieve a successful outcome, and it must be well understood by the patient. Rehabilitation protocols have been discussed and applied for a long time, ranging according to lesion type, service orientation, and surgeon's preference.

Since the shoulder joint is subject to rapid postoperative stiffness and atrophy, rehabilitation is usually as important as the surgical procedure.<sup>1</sup> Therefore, it is important that the patient performs some movements before being referred to a rehabilitation service<sup>2</sup>

Both the general population and medical providers try to keep up with the newest developments in internet access and smartphone technologies. Now, doctors and patients can communicate in a virtual environment through mobile applications<sup>3-9</sup> to discuss postoperative guidelines, solve simple doubts, and strengthen the doctor-patient relationship.<sup>7</sup>

It is undeniable that mobile phone applications (apps) facilitate communication.<sup>8</sup> Patients undoubtedly become more active in their treatment<sup>4</sup> and feel included, thus increasing their participation in the process.

To clarify procedure-related doubts, an app with self-explanatory videos was developed so that patients can review their doctor's guidance. The app does not intend to treat patients; it is simply a means of communication for

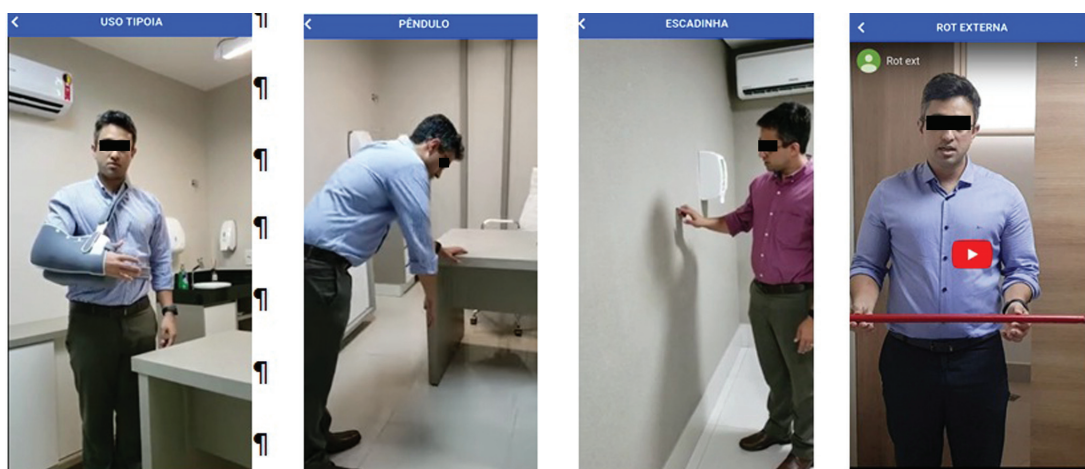
patients to follow professional prescription. Thus, the present study aimed to qualitatively evaluate an app developed to guide patients in the postoperative period of shoulder surgical procedures, helping them to understand the initial rehabilitation process.

## Materials and Methods

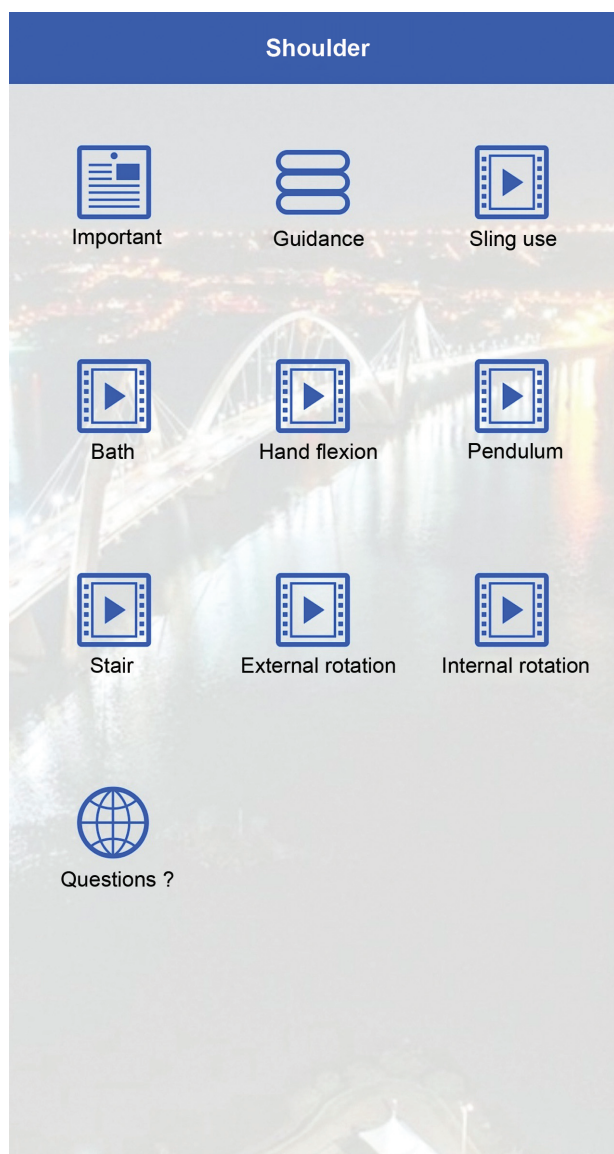
In this study, a questionnaire assessed the perception of the patients regarding the creation of an app to guide them after shoulder surgeries. The questionnaire included questions about the ease of downloading and understanding the exercises, possible app indication to other people, patients' participation in their condition and whether the app was considered self-explanatory.

The app was created using the iGenApps software (iGenApps, San Francisco, CA, USA), available on Android® and Playstore. This app was developed to be free, with simple, didactic language, using a sequence of texts, videos, and illustrations (► **Figure 1**). The iGenApps software, which uses Java language, was used as a platform, and it allows the creation of apps for both Android and iOS systems. The creation and development of the app was carried out by one of the authors (► **Figure 2**).

The iGenApps software allows the insertion of texts and video links. As such, a series of videos was recorded on YouTube, and links, along with texts, were made available in the app.



**Fig. 1** Guidelines for exercises performance. Source: Author's personal file.



**Fig. 2** Mobile application home screen. Source: Author's personal file.

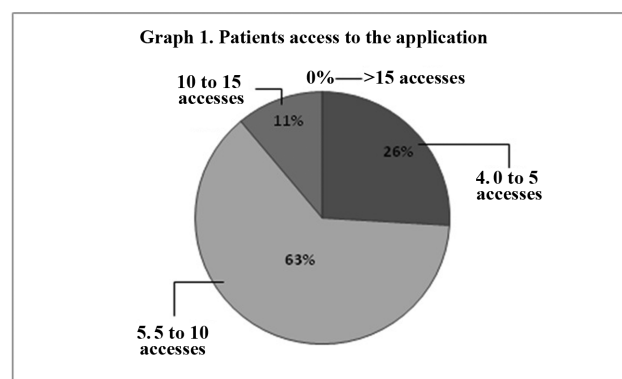
After the surgery, the attending physician explained the postoperative guidelines, as usual, but asked patients to watch the videos to remember the exercises shown during the first postoperative visit.

The patients were monitored on app use through a tool that reported the number of accesses. At the end of a 6-week follow-up period, when the patient was referred for rehabilitation, a questionnaire (**Appendix 1**) assessed app use in a qualitative way.

Thirty-two patients were evaluated; two of them were excluded due to lack of internet access (both lived in rural areas). The questionnaire was applied during the postoperative period in accredited hospitals with advanced training in shoulder and elbow surgery at our institution.

## Results

Of the 30 patients comprising the sample, 13 were male and 17 were female, with a mean age of 48 years; most of them



**Fig. 3** Patient access to the application.

attended elementary school (10 patients) and high school (14 patients). Two patients were college graduates, three were illiterate and none held a postgraduate degree.

Most patients accessed the app 5 to 10 times (► **Figure 3**).

Regarding the questionnaire, 97% of respondents reported that it was easy to download the app, that the exercises were readily understood, and that they would recommend the app to someone who had doubts on how to perform these exercises after shoulder surgery. When asked if the app made them feel more participatory in the treatment of their condition, 93% patients said yes, and 90% considered the app self-explanatory. Questionnaire data are shown in ► **Table 1**.

## Discussion

Patients reported that the app helped them to understand the exercises. One of them said, “the videos gave me confidence to perform the exercises prescribed by the doctor.” The videos allowed the patients to review the prescribed exercises, reducing doubts about their execution at home. These data are consistent with findings in the literature in which smartphones were considered practical.<sup>10</sup> In contrast, complaints about the low scientific evidence on app use for rehabilitation,<sup>3</sup> validation, and lack of direct medical participation in apps were not observed in our study. Physicians were directly involved in all phases of the app creation, and the exercises included in the videos had already been described and validated by another rehabilitation study.<sup>1</sup>

The question “Would you recommend the application to someone who has doubts about the surgical procedure?” assessed satisfaction with the app use, and it elicited mostly positive answers. Two situations warrant such acceptance. The first one is familiarity with technology and accessibility, as patients can access the app at any time from the comfort of their homes. This practical aspect is also observed in other studies.<sup>4,8-12</sup> The second one is the feeling of greater doctor-patient proximity.<sup>2</sup>

Despite the doctor-patient proximity proposed by the app, two patients said that videos were quite didactic, but that the doctor's explanation will always be more informative. One patient reported that the app did not influence his understanding, since the doctor had already answered all his

**Table 1** Questionnaire on application use

| Questions                                                                                   | Total amount of answers | YES Answers |                | NO Answers |                |
|---------------------------------------------------------------------------------------------|-------------------------|-------------|----------------|------------|----------------|
|                                                                                             |                         | Amount      | Percentage (%) | Amount     | Percentage (%) |
| Was the application easy to download?                                                       | 30                      | 29          | 97             | 1          | 3              |
| Did the application facilitate the understanding of the exercises?                          | 30                      | 29          | 97             | 1          | 3              |
| Would you recommend the application to someone who has doubts about the surgical procedure? | 30                      | 29          | 97             | 1          | 3              |
| Did the application make you feel more participatory about the treatment of your illness?   | 30                      | 28          | 93             | 2          | 7              |
| Do you consider the application self-explanatory?                                           | 30                      | 26          | 87             | 4          | 13             |

doubts. This demonstrates that, despite technological assistance, the presence of a physician is extremely relevant in any phase of treatment.

Similar findings were described by Harder et al,<sup>4</sup> with an app created by a health care professional, in this case a physical therapist, to assist post-mastectomy rehabilitation. The study had a positive impact, since the app helped patients in the post-treatment for breast cancer, but their sample (nine patients) was smaller compared to ours. Eaton et al<sup>13</sup> evaluated the use of an interface in medical learning and concluded that it helped residents and surgery fellowships.

Rassouli et al<sup>5</sup> evaluated several apps for chronic lung disease rehabilitation in a 20-day period and concluded that, in addition to being reasonable tools, they provide additional information to attending physicians.

Another research, carried out with the purpose of instructing home exercises, evaluated five patients with adhesive capsulitis and revealed that technology is useful for patient rehabilitation. This app had the advantage to evaluate and record the range of motion and exercise duration per patient.<sup>14</sup> Our app was not able to record the viewing time of each exercise, but it facilitated communication and understanding, consistent with several other studies.<sup>4-6,8</sup>

Gilbert et al<sup>8</sup> evaluated the rehabilitation of patients with shoulder conditions using the MUJO app (Paris, France) and concluded that it does not interfere with any rehabilitation protocol already in place. On the contrary, it can be implemented and adapted to the routine of the attending physician and specialist physical therapist.

It is always useful to point out that failure to follow prescriptions or carrying them out incorrectly is a possibility, since the patient is an active part of his/her treatment. We suggest that future studies evaluate patients who had access to and used an app, assessing the quality of their rehabilitation compared with a group not using this technology.

## Conclusion

We conclude that a virtual platform is useful for treatment understanding and helps the medical prescription of exercises to be performed at home after shoulder surgery.

The proposed app is easy to understand, quick for the operating system and fulfills the objective of guiding patients as part of their treatment, including them as actors in the treatment of their own conditions.

## Conflict of Interests

The authors declare that there are no conflict of interests.

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## Appendix 1–Questionnaire

- 1) AGE:
- 2) GENDER: MALE / FEMALE
- 3) EDUCATION:
  - ILLITERATE
  - ELEMENTARY SCHOOL
  - HIGH SCHOOL
  - COLLEGE
  - POSTGRADUATE DEGREE
- 4) DO YOU HAVE YOUR OWN INTERNET ACCESS OR DO YOU SHARE IT?
  - YES
  - NO
- 5) NUMBER OF APPLICATION ACCESSES:
  - 0 TO 5
  - 5 TO 10
  - 10 TO 15
  - OVER 15.
- 6) WAS THE APPLICATION EASY TO DOWNLOAD?
  - YES
  - NO
- 7) DID THE APPLICATION FACILITATE THE UNDERSTANDING OF THE EXERCISES?
  - YES
  - NO
- 8) WOULD YOU RECOMMEND THE APPLICATION TO SOMEONE WHO HAS DOUBTS ABOUT THE SURGICAL PROCEDURE?
  - YES
  - NO
- 9) DID THE APPLICATION MAKE YOU FEEL MORE PARTICIPATORY ABOUT THE TREATMENT OF YOUR ILLNESS?
  - YES
  - NO
- 10) DO YOU CONSIDER THE APPLICATION SELF-EXPLANATORY (OR WOULD YOU REQUIRE A DOCTOR TO EXPLAIN IT FOR YOU)?
  - YES
  - NO