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Use of mobile applications for preoperatory optimization in bariatric surgery

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Abstract

The primary objetives were: - To analyze the use of Care4Today® by patients with morbid obesity included in the bariatric surgery protocol in our center. - To evaluate its impact on preoperative weight loss. It was performed an observational, prospective and single-center study of patients included in the bariatric surgery program after the implementation of the app mobile Care4Today®. All patients underwent the preoperative weight optimization protocol, based on behavioral weight loss treatment. It was included the access to Care4Today®, which is a mobile application that provides educational material and records the progress in weight loss. The median preoperative weight loss was 13 (9-17) Kg, with 5 (2.5-8.5) Kg lost since the download of the application. Therefore, the average percentage of weight lost since the use of Care4Today® was 41 (±34) % of the total. The most visited content by patients was the educational. Care4Today® proved to be a useful preoperative tool for accessing information and facilitating continuous self-evaluation in patients included in bariatric surgery. Future studies are needed to confirm that its use promotes proper optimization of preoperative weight loss, as well as its long-term maintenance.

Keywords:

- Bariatric
- Optimization
- Application
- Care4Today®

Introduction

Obesity has become a global health problem, with a global increase in prevalence in all age groups. Bariatric surgery (BS) remains the most effective long-term treatment, emerging as a standardized and popularized treatment.

We are living in a technological era in which smartphones are the most widely used tool, accessible to almost 90% of Europeans, as Deloitte demonstrated in his study in 2019.[1] In respect of healthcare, especially in chronic diseases, their use has been popularized through the downloading of mobile applications (apps), which is known as "mHealth". These apps have shown to reduce hospital readmissions in patients with inflammatory bowel disease, improve glycemic management in patients with diabetes mellitus, and even increase treatment adherence in patients with HIV.[2]

Regarding obesity, apps are being incorporated to complement the popular behavioral weight loss (BWL) treatment, which aims to modify certain eating habits and a sedentary lifestyle. In bariatric surgery (BS), BWL has historically been the cornerstone for optimizing preoperative weight but it has not been too successful in maintaining long-term weight loss. In order to address this issue and improve existing outcomes, several apps have emerged. These apps provide patients with information and support, aiming to empower them to take control of their disease and track their progress.[3]

We present a prospective study on the use of the mobile app Care4Today® and its relationship with preoperative weight optimization in patients included in the BS program in a Tertiary Hospital. The aim of this study was to confirm that easy access to information and continuous self-assessment empower patients as the main protagonists of their weight loss progress, thereby increasing their confidence and motivation, and ultimately improving the likelihood of achieving proper weight optimization before BS.

Material and methods

We performed an observational, prospective, single-center study including patients in the BS program after the implementation of the Care4Today® app in 2022. Patients who underwent revisional surgery and those without access to smartphones were excluded.

All patients followed the preoperative weight optimization protocol, which was based on behavioral weight loss (BWL) treatment conducted by a multidisciplinary team of surgeons, nutritionists and psychologists. This protocol included a hypocaloric diet and psychological support groups (in order to modify behaviors and lifestyles). Additionally, starting from 2022, it incorporated access to the Care4Today® mobile app as a novel approach, providing educational materials to solve any doubts or questions that may arise throughout the process. Through the app, patients were able to continuously track their weight loss progress and monitor their physical activity. The application also allowed patients to record all relevant data regarding their medical conditions and treatments (e.g., glycemic management, medication intake). Qualitative variables were expressed as percentages and quantitative variables were reported as mean and standard deviation or median and interquartile range.

Results

A total of 64 patients were included in the study: 42 (65.6%) females and 22 (34.4%) males, with a mean age of 42.8 (±11.2) years. The mean initial BMI was 48.2 (±6.3) kg/m2, and the preoperative BMI was 44.7 (±5.9) kg/m2, resulting in a median total weight loss during the preoperative optimization process of 13 (IQR 9-17) kg. Since the installation of the mobile app, the median weight loss was 5 (IQR 2.5-8.5) kg, resulting in an average percentage of weight lost since the use of Care4Today® of 41 (±34) % of the total weight. Care4Today® was installed in 85.9% of cases in 2022 and 9% in 2023. In the last month of the study (January 2023), there were 581 visits to the app. The main pages visited are shown in Table 1. The most viewed material was educational, the most common concern was "who should I contact in case of preoperative problems" and the least frequently asked question was "waiting list time."

Table 1: Most visited Care4Today® pages between the patients who use the app.

Most visited pages	Percentage
Breakdown of pages belonging to the three main blocks.	**43,7**
Educational material	**28,1**
- Lifestyle after the surgery	1,9
- What kind of food should I have to take	1,7
- What is the evaluation and preparation before the surgery	1,5
- What is bariatric surgery	1,5
- Gastric bypass video	1,5
- How can I can maintain my weight loss	1,4
Check-lists	**6,4**
- I'm ready for the surgery	2,6
- Obesity, you are not alone	1,5
- What should I have to take to the hospital?	1,4
Most frequent questions	**5**
- Who will help me in case of doubts?	0,9
- What if I have an emergency?	0,3
- How long is the waiting list?	0,2

Discussion

From the first publication by Lee et al. in 2010 to the current clinical trial led by Hilbert, the literature has attempted to link the use of these apps to weight loss and physical exercise in patients with obesity.[3,4] However, the evidence of the impact of technological advancements on weight loss in patients included in the BS protocol is limited, especially as part of preoperative optimization. The first study that includes this issue was conducted by Mundi et al. in 2015, which concluded that these apps can modify certain behavioral changes in patients and provide them with motivation before surgery.[5] More recently, Sisko concluded in a clinical trial that technology could even improve preoperative anxiety, which could lead to better outcomes after surgery.[6] The published studies that link BS and the use of mobile apps for weight loss or lifestyle modifications are summarized in Table 2.

This study contributes to the literature by examining the novel impact of technology on preoperative weight optimization within a hospital protocol for bariatric surgery (BS).

Most studies assess postoperative outcomes after the use of apps in BS. Authors such as Heuser and Dolan demonstrate that patients highly rate the use of these apps as supportive tools for information (in early and late postoperative periods).[7,8] Other authors, such as Mangieri or Klasnja, conclude that the use of technology can help to maintain weight loss and physical activity after BS.[9,10] However,

regarding the use of technology as a measure of preoperative weight optimization, the published evidence with high-quality studies is limited, including only the work of Mundi in 2015 and Sisko in 2022.[5,6] The former study concluded that apps can modify patient behavior through the use of what is known as ecological momentary assessment (EMA)/ ecological momentary intervention (EMI). In this approach, the app requests information on dietary habits or physical exercise, and after receiving the patient's response, provides real-time advice to improve their behavior. The latter study confirmed better postoperative results when using apps in the weeks leading up to surgery.

Table 2: Published studies that link BS and the use of mobile apps for weight loss or lifestyle modifications.

Year	Design	Sample	Study moment	Objetives	Results	Author
2015	PC	30	PREOP	To assess behavior modification in patients using ecological momentary assessment and real-time interventions (EMA/EMI).	High satisfaction with the application and a significant relationship in behavior modification.	Mundi[5]
2019	EC	56	POP	Assess weight loss Intervention: use of MyFitnessPal app.	Better results in users of the app.	Mangieri[9]
2020	EC	154	POP	To evaluate the effects on promoting physical activity and vitamin supplementation using the PromMera app intervention.	Ongoing.	Bonn[11]
2020	EC	51	POP	Analyze the increase in physical activity. The application indicates the exercise to be performed: fixed goal (minimum the 60th percentile of the patient's own activity) vs variable daily goal.	Patients with a variable daily goal showed an increase in physical exercise participation.	Klasnja[10]
2020	CP	494	POP	Monitoring physical activity and other health-related variables.	No differences in physical activity.	Murphy[12]
2021	CP	854	POP	To analyze the impact of apps on readmission rates, hospital length of stay, emergency department visits, and patient satisfaction.	There were no significant differences found, but patients had fewer visits to the emergency department. 95% of the patients expressed satisfaction.	Heuser[7]
2022	EC	50	PREOP	To study the impact on stress, depression, anxiety, weight and physical activity. Intervention: use of Noom app.	Better results in physical activity and modo states.	Sysko[6]

PC: prospective cohort; CT: clinical trial; PREOP: preoperatory period; POP: postoperatory period; EMA/EMI: ecological momentary assesment/ecological momentary intervention.

In line with the aforementioned literature, we present a study that demonstrates mobile apps can be a beneficial complement to traditional BWL treatment. It was confirmed that nearly half of the preoperative weight loss occurred after the installation of the Care4Today® app. This success can be attributed to the easy access to information throughout the entire preoperative preparation process, the continuous self-assessment in improving dietary habits and physical exercise and the motivation of the patients because of a sense of control.

The limitations of this study include the evaluated time period and the number of patients. Future studies are needed to enhance these limitations and compare the percentage of weight loss (and its maintenance over time) achieved through the use of Care4Today® compared to patients who do not use the app.

Conclusions

In conclusion, Care4Today® is a useful supportive tool for patients and their preoperative optimization, as it has shown to reduce the percentage of weight loss during the preoperative period.

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