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Evaluation of a mobile-application educational intervention on the knowledge, attitude, and practice of patients in postoperative care for lumbar disk herniation surgery: A randomized control trial

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Abstract

Objective: We aimed to evaluate the impact of a mobile-based educational program on patients' postoperative care for lumbar disk herniation surgery.

Methods: A randomized controlled trial was conducted at Fayaz-Bakhsh Hospital, Tehran, Iran. Patients with lumbar disc herniation surgery experience were randomized to the intervention and control groups (learning with the LUmbar CAring Training-app). Participants' knowledge, attitudes, and practices of postoperative care for lumbar disc herniation surgery were assessed using a validated questionnaire at three-time points: pre-test (baseline), post-test one (immediately after program completion), and post-test two (8 weeks after program completion). The primary outcome measures were knowledge, attitudes, and practices scores variations. Secondary outcomes were not considered in our study.

Results: In total, 150 patients were enrolled, with 75 patients in each group. Patients in the intervention group demonstrated increased knowledge, modified attitudes, and practice than those in the control group ($p < 0.05$). The post-test knowledge, attitudes, and practices scores in the intervention group were significantly higher than those in the control group ($p < 0.05$).

Conclusion: Mobile-application-based education was a practical and feasible approach to improve patients' postoperative care for lumbar disc herniation surgery in Iran.

Keywords

health education, mobile application, knowledge, attitude, intervertebral disc disease

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Introduction

Low back pain (LBP) is a leading cause of disability worldwide, affecting up to 80% of individuals at some point in their lives[1]. Lumbar disc herniation (LDH) is a common cause of LBP and radiculopathy,[2,3] which can have significant negative impacts on health[4] The most common symptoms of LDH include waist and leg pain, tingling sensations, and abnormalities in lower limb muscular strength.[5] The incidence of disc herniation increases with age and is nearly universal after the age of 60.[6] Due to the gradual progression of the disease, initial symptoms may be subtle and alleviated by rest, leading individuals to overlook the condition as it worsens.[7] LDH predominantly affects young and middle-aged individuals, with a higher incidence in men than women.

In some countries, the prevalence of LDH has reached 15–30%.[8] Data from China's Ministry of Health indicates that the incidence of LDH is relatively high and increasing, at around 5–10%.[7,9] In Iran, LDH is the most common cause of LBP, accounting for approximately 53% of all cases and representing the leading cause of disability in individuals

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over the age of 40.[10] While most individuals can manage their symptoms with analgesics and rehabilitation, surgical intervention may be necessary for those with persistent and challenging symptoms.[11] Although surgery can provide the desired outcomes in most cases, it can also result in complications. Studies have shown that patients who have undergone LDH surgery may experience difficulties in recovery, including pain, numbness, and tingling sensations.[12,13] To prevent these adverse outcomes, patients should receive adequate education and information from healthcare providers, particularly nurses, during the postoperative phase.[14,15]

Effective nursing is a crucial factor in ensuring the success of surgery.[16] Nursing techniques can significantly influence surgical outcomes and can facilitate recovery after surgery.[15] For patients with LBP following surgery, the American Physical Therapy Association recommends postsurgical education on general precautions, exercise, and resuming physical activity.[17] Additionally, the American Medical Association advises that doctors and nurses should educate patients using simple language and educational aids, repeating materials as necessary, and providing feedback in the patient's language.[7]

Following surgery for LDH, patients must undergo a prolonged rehabilitation phase during which they may encounter various challenges. Because LDH is a chronic condition with a protracted disease course, effective patient education is essential during rehabilitation.[18] Providing patients with an effective training program to refresh their knowledge and address their concerns can improve the quality of patient care.[19] Rehabilitation efficacy can be enhanced and consolidated through knowledge, attitude, and practice (KAP)-based rehabilitation education.[18] By assessing patients' knowledge about the surgery and their condition, their attitudes toward the treatment and recovery process, and their practices in managing their symptoms and adhering to postoperative care, researchers can identify areas where interventions may be necessary to improve patient outcomes. For example, if patients have limited knowledge about their condition or the surgery, educational interventions can be developed to enhance their understanding and support informed decision-making. Similarly, if patients have negative attitudes toward the treatment or recovery process, interventions can be designed to address these attitudes and improve adherence to postoperative care. The KAP model divides the process of behavior change into three stages: knowledge acquisition, attitude formation, and behavior formation. This model can be applied to effectively change health behaviors.[20] By focusing on KAP, researchers can gain a comprehensive understanding of the factors that influence the success of lumbar disc surgery and inform the development of interventions to improve patient outcomes.

Traditional health education methods have limited effectiveness in improving the knowledge and behavior of patients with LDH.[21] However, advancements in information technology have provided new opportunities for patient education, particularly in postoperative care. Mobile and web-based training programs have become increasingly popular, replacing traditional face-to-face sessions.[22] Individuals with Internet access can consult online resources to inform their health decisions.[23] Research groups worldwide are exploring the potential of mobile-based training to promote health and prevent disease. The rapid development of mobile phone-based applications has introduced a new approach to health promotion and disease prevention. Numerous studies have demonstrated the effectiveness of mobile phones in delivering educational interventions in various health fields, including type 2 diabetes mellitus,[24] weight loss and physical activity promotion,[25] self-management behavior improvement,[26] and prevention of sexually transmitted infections.[27] These findings suggest that new technologies can play a crucial role in improving patient education and outcomes, particularly in postoperative care.

A review of previous research indicates that there has been no investigation into the effectiveness of mobile-based training for patients who have undergone surgery for LDH. As a result, there is a need to develop and evaluate an educational intervention program for postoperative care for LDH surgery. Such a program should focus on improving patients' knowledge, attitudes, and practices to facilitate their recovery and improve their outcomes. Three main research assumptions were defined as follows:

1. Knowledge enhancement: Patients who participate in the mobile-based educational intervention will demonstrate a statistically significant increase in their knowledge regarding postoperative care for LDH surgery.
2. Attitude improvement: Patients who engage in the mobile-based educational intervention will exhibit a measurable positive shift in their attitudes toward postoperative care for LDH surgery through a mobile-based educational intervention.
3. Practice modification: Patients who are exposed to the mobile-based educational intervention will exhibit significant changes in their postoperative care for LDH surgery through a mobile-based educational intervention.

Methods

Participants, randomization, inclusion criteria, and sample size

We designed a parallel-group randomized controlled trial to perform the present study, which was prospectively registered at the Iran Clinical Trial Registry with Trial Registration Number: "IRCT20210117050059N1"; View in: https://www.irct.ir/trial/54628) on June 03, 2021. In short, the study setting was Fayaz-Bakhsh Hospital a Central Government Hospital for LDH and Discectomy operations, in Tehran, Iran.

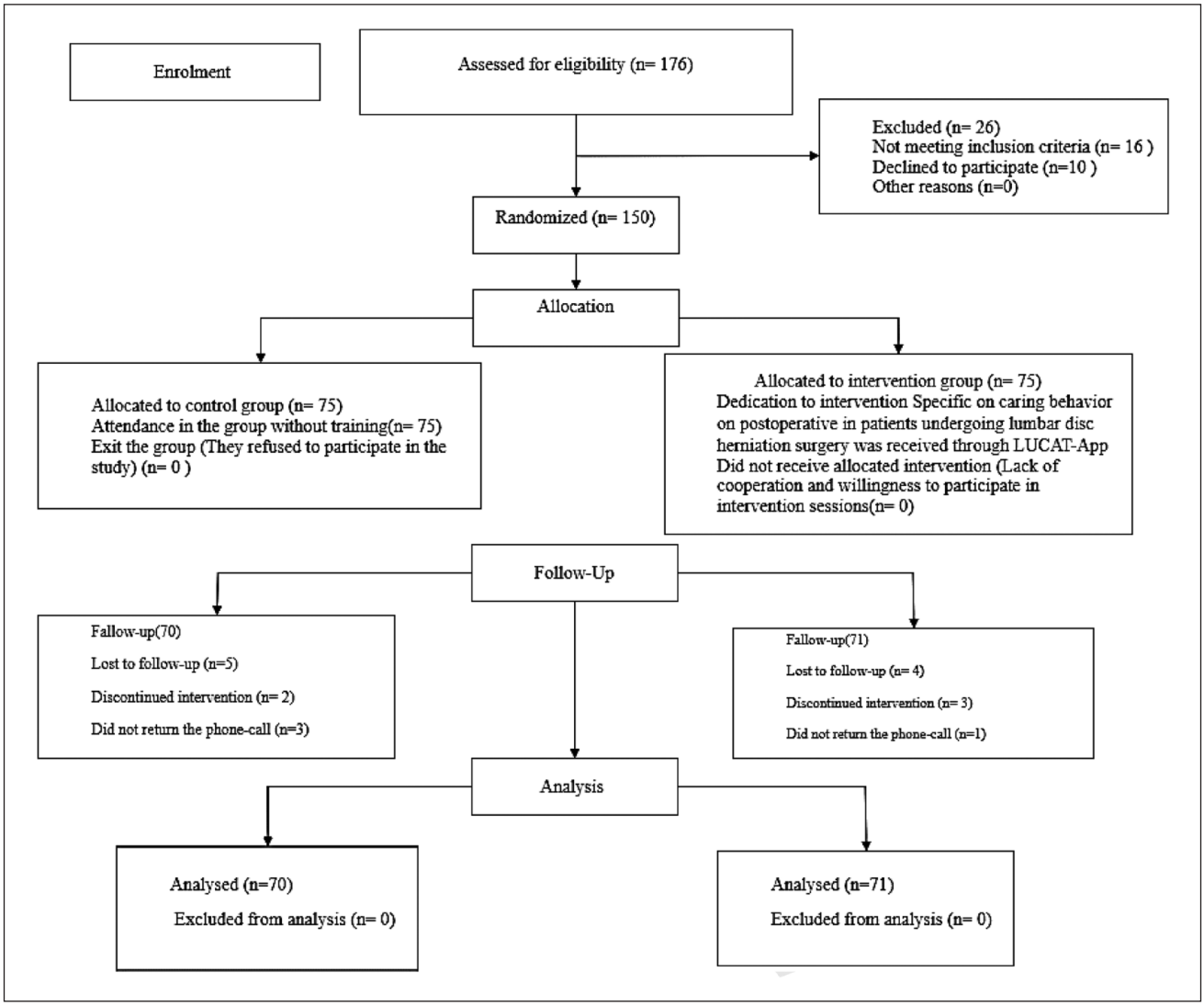

Figure 1. Consort diagram: Depicted is the Consolidated Standards of Reporting Trials (CONSORT) diagram describing participant flow and randomization into the conventional or study bundles, and subjects analyzed for outcomes.

This study used a block randomization method to assign eligible patients to the experimental and control groups in a 1:1 ratio. A trained researcher (SSE; the first author) identified eligible patients and provided them with information about the study. Once they volunteered and signed informed consent, they were randomly assigned to the groups using a quadratic blocking method. Initially, 176 patients were assessed for eligibility. Of the 176 participants, 26 patients did not meet the inclusion criteria. A total of 150 participants were enrolled in two parallel groups; 75 were assigned to the experimental group (smartphone application group) and 75 to the control group (Figure 1: Consort diagram). Allocation concealment was ensured by keeping randomization lists in the custody of an investigator not involved in the study intervention.

The inclusion criteria for eligible participants were: (1) patients admitted for elective LDH surgery at Fayaz-Bakhsh Hospital; (2) possession of a smartphone and the ability to use it; (3) no prior training related to the intervention; and (4) willingness to participate in the study and provide informed consent. The study excluded patients with illiteracy, cognitive disorders, or serious psychological illnesses that may hinder their participation

With a power of 0.8 and a significance level of 0.05, it required 64 participants in each group according to a Chi-square test in the G-power statistical analysis program. For this study, a minimum sample size of 75 participants was calculated for each group based on a 10% lost follow-up rate.

Data collection and measurement

A total of three-time points were collected for both groups between May 22, 2021 and August 2021: baseline (pre-test), immediately following the completion of the intervention

Table 1. Educational content of the LUCAT-App.

Knowledge	
Edu-Obj.	Increasing patients' knowledge about LDH
Behav-Obj.	Patients should be able to describe the signs and symptoms of LDH
	Patients should be able to describe daily activities for postoperative care for LDH surgery
	Patients should be able to explain how and when to use a medical belt as postoperative care for LDH surgery
Edu-Obj.	Increasing patients' knowledge of postoperative care for LDH surgery
Behav-Obj.	Patients should know about wound management in postoperative care for LDH surgery
	Patients should know about the type and way of exercises in postoperative care for LDH surgery
	Patients should know how long to drive in postoperative care for LDH surgery
	Patients should know the time of suturing as postoperative care for LDH surgery
	Patients should know about sexual activity in postoperative care for LDH surgery
Edu-Cont.	Familiarity with lumbar disc herniation, signs, and symptoms, daily activities, use of medical belts, wound care, exercise, driving or traveling, time to suture, sexual in postoperative care for LDH surgery
Pres-For	Short videos, long and short texts, images
Attitude	
Edu-Obj.	Modify some misconceptions about postoperative care for LDH surgery
Behav-Obj.	Misconceptions about sex after LDH surgery
	Answer the key points and common questions related to beliefs and misconceptions about postoperative care for LDH surgery
Edu-Obj.	Increase patient participation in adopting effective postoperative care for LDH surgery
Behav-Obj.	Answers to patients' common questions about postoperative care for LDH surgery
	Correcting misconceptions about daily activities after LDH surgery
	Correcting misconceptions about exercise after LDH surgery
	Correcting misconceptions about driving after LDH surgery
	Correcting misconceptions about wound management after LDH surgery
Edu-Cont.	Misconceptions and myths related to sexual activity, pregnancy, driving, exercise, daily activity, etc. after lumbar disc surgery
Pres-For	Motion graphics, live experiences of the patient as stories
Behavior	
Edu-Obj.	Improve patients' performance to return to normal life faster and reduce complications from non-compliance with postoperative care for LDH surgery
Behav-Obj.	Provide the necessary training for wound management
Edu-Obj.	Increase patient participation after surgery
Behav-Obj.	Learn about the doctor's appointment time
	Learn about the right time to pull the stitches
Edu-Cont.	Pieces of advice from the surgeon and operating room nurses for postoperative care for LDH surgery
Pres-For	Long and short texts, videos, online counseling, motion graphic

Behav-Ob.: behavioral objectives; Edu-Con: educational content; Edu-Ob.: educational objectives; Pres-Four, presentation form.

(post-test 1), and 8 weeks after the completion of the intervention (post-test 2). Patients' knowledge, attitudes, and practices about postoperative care for LDH surgery were assessed by a valid 13-item questionnaire at three-time points. The questionnaire[28] consisted of four sections: (1) sociodemographic characteristics of the patients, including gender, age, education, history of training in postoperative care for LDH surgery, and history of LDH surgery, marital status; (2) knowledge (14 items; scored from correct (2 points), I do not know (1 point) and wrong (0 points) of postoperative care for LDH surgery; (3) attitudes (13 items; scored with a 5-point Likert scale[29] ranging from completely agree (5 points) to disagree (1 point)) toward postoperative care for LDH surgery; and (4) practices (11 items; scored in yes (1 point) and no (0 points)) in postoperative care for LDH surgery. The content validity and reliability of the questionnaire were demonstrated by content validity ratio (CVR) = (0.49–1.00) and CVI = (0.8–1.00), Cronbach's α = (0.767–0.977). The questionnaire was tested on a population of 94% (Supplemental material).

Development and implementation of the training program

We developed an educational module for the self-learning component of our study; a smartphone application called LUmbar CAring Training (LUCAT). This part of the study was designed in several following steps.

Step 1: Preparation and assessment of the educational content for the LUCAT-app.

The educational content was developed regarding postoperative care for LDH surgery,[30] and educational need assessment results were conducted by asking one main question; what are the main educational needs about caring behavior after the operation? This question was asked of 10 patients, 10 nurses, and 5 sergeants at Fayaz-Bakhsh Hospital 1 month before implementation started. The educational needs were outlined and content preparation and content creation were initiated to ensure that the content would be appropriate for various forms of presentation. These forms included motion graphics videos, photos, long and short messages, online consultations, etc. In the application. Given KAP constructs, the LUCAT app includes educational content on postoperative care for LDH surgery classified into three main areas such as LDH signs and symptoms (knowledge), misconceptions about postoperative care for LDH surgery (attitude), postoperative daily activities (practice) such as driving, wound management, sexual relationship consideration, and several tips about postoperative care for LDH surgery. Before designing the LUCAT-app, the accuracy, comprehensibility, eloquence, purposefulness, and fluency of its content were approved from two points of view. First, from the perspective of experts like operating room nurses, neurologists, sergeants, Persian language editors, and health education specialists. These experts provided feedback on the content through several rounds of online questionnaires using Delphi techniques until a consensus was reached. Second, feedback was also gathered from 5 to 7 patients similar to the target group but not part of the study. These patients, as end-users of the application, helped ensure that the content was accurate, comprehensible, eloquent, purposeful, and fluent from their perspective (Table 1).

Step 2: Designing the mobile application.

This step is followed by three subsections:

(a) Designing the User interface (UI) and User experience (UX) of the LUCAT App.

LUCAT app has been written in Java. A team of app designers created the application's technical structure, UI, and UX.

(b) The LUCAT- app usability

The LUCAT app beta was assessed through a Usability Test method.[31] No specific validated tools were used during the testing. Instead, several patients who were not under study but had the same characteristics as the research participants were requested to install the LUCAT app on their phones. They were then asked about the application's efficiency, page colors, icon placements, speed of access to content, order of content placement, and user-friendliness. These questions were asked verbally and by telephone. This method was deemed sufficient for assessing the app's usability because it allowed direct feedback from end-users in a convenient and accessible manner. After a thorough review by the research team, the collected comments were sent to the app design team. Corrections were made and the app was given to 10 patients. After receiving partial satisfaction from these users, the final version of the application was released and prepared for educational intervention. Currently, the app is available on Cafe Bazaar, the most famous online Android app store in Iran. The LUCAT app ver. 1.0.0 can be downloaded via the following link: https://cafebazaar.ir/app/ir.lucat

Step 3: Procedures; pre-test stage; educational stage; post-test stage.

All patients with the inclusion criteria were explained the objectives of the study by the first author (SSE). She was an experienced operating room nurse with more than 10 years of job experience in Fayaz-Bakhsh Hospital. Patients were explained how the app functioned. For privacy considerations, accessibility to the app for each person was personalized with their username and password which was provided at the initial registration.

Pre-test stage. Before installing the LUCAT app, patients in both the intervention and control groups completed the pre-test. The pre-test was done via the aforementioned questionnaire in an online format, which was sent via social media (WhatsApp) to patients.

The educational stage. The LUCAT app was installed for the intervention group once the pre-test was complete. The intervention group could access educational content at any time and place for 8 weeks.

Post-test stage. The first post-test was done for both the intervention and control groups immediately after the training period was completed. At the end of the first post-test, LUCAT app users received a notification from the first researcher (SSE) through WhatsApp that reminded them to complete the questions in another 4 weeks.

The control group only completed the pre-test and post-test. In other words, the control group received no educational content. Nevertheless, at the end of the intervention period (8 weeks), the control group was also provided with educational content via the LUCAT app.

Statistical analysis

Data were analyzed by SPSS software version 22 (IBM Corp, New York, USA). Normality tests were examined with skewness and kurtosis for continuous data. Frequencies and percentages mean and standard deviations were determined for the baseline information. Homogeneity between the two

Table 2. Frequency distribution of demographic characteristics of the participants in each group.

Characteristics	Experimental ($n=70$)	Control ($n=71$)	p*
Gender; *n* (%)			
Male	33 (47.1)	44 (62)	0.077[b]
Female	37 (52.9)	27 (38)	
Marriage; *n* (%)			
Single	32 (45.7)	36 (50.7)	0.553[b]
Married	38(54.3)	35 (49.3)	
Job; *n* (%)			
Housemaker	24 (34.3)	12 (16.9)	0.126[b]
Worker	13 (18.6)	17 (23.9)	
Employee (Clerk)	20 (28.6)	27 (38.0)	
Freelancer	13 (18.6)	15 (21.1)	
Education; *n* (%)			
Under Diploma	4 (5.7)	2 (2.8)	0.736[c]
Diploma	17 (24.3)	19 (26.8)	
Bachelor	29 (41.4)	33 (46.5)	
Master	20 (28.6)	17 (23.9)	
Training history; *n* (%)			
No	69 (98.6)	71 (100)	0.496[c]
Yes	1 (1.4)	0 (0)	
Surgical history; *n* (%)			
No	69 (98.6)	71 (100)	0.496[c]
Yes	1 (1.4)	0 (0)	
Age (Years); mean(±SD)	43.34 (9.25)	42.51 (8.30)	0.573[a]

[a]Independent sample *t*-test.
[b]Pearson's chi-square test.
[c]Fisher's exact test.
*Significance level: $p < 0.05$.

groups was assessed using the Chi-squared test, Fisher's exact test, and independent *t*-test. The differences in scores before the intervention, immediately after, and 8 weeks after the program's completion for general acquired in each subscale of knowledge, attitudes, and practice were analyzed with repeated-measures analysis of variance (ANOVA).

Ethical consideration

This study has been ethically approved by Tarbiat Modares University's Faculty of Medical Sciences (IR.MODARES. REC.1399. 209). Participant confidentiality was maintained by the Declaration of Helsinki on Ethical Principles in Medical Research. The data collected were not assigned to anyone, and no personal data were used when storing the data. Therefore, the research team can only access the data collected in this study.

Results

There were no significant differences between the experimental and control groups in age (43.34 ± 9.25) and (42.51 ± 8.30) years, respectively; ($p=0.57$). The two groups were homogeneous regarding education, job, Training History, Surgical History, and Gender (Table 2). Table 2 shows that the percentage of males in the experimental group is 47.1%, whereas the control group is 62%. This difference is not statistically significant ($p=0.077$). Similarly, there is no significant difference between the two groups in terms of marital status, with both groups having a similar proportion of singles and married individuals ($p=0.553$). In terms of job category, the experimental group had a higher percentage of housemakers (34.3%) than the control group (16.9%). However, this difference is not statistically significant ($p=0.126$). The distribution of workers, employees (clerks), and freelancers is similar between the two groups. The two groups have a similar distribution of education levels, with no significant differences in the proportion of individuals with under-diploma, bachelor, and master's degrees ($p=0.736$). Furthermore, both groups have similar training and surgical history, with only one individual in the experimental group having a training history, and none having a surgical history. Lastly, the mean age of the experimental group is 43.34 years with a standard deviation of 9.25, whereas the mean age of the control group is 42.51 years with a standard deviation of 8.30. The difference in mean age between the two groups is not statistically significant ($p=0.573$).

Repeated measures ANOVA was used to examine the effect of the intervention on the variables. The results showed

Table 3. Mean and standard deviation of the knowledge, attitude, and behavior.

Variables	Before (pre-test)	After Immediately	Post-test 8 weeks later	p[a]		
				Interaction	Within group	Between-group
Knowledge; mean (±SD)						
Experimental	13.34 (1.93)	27.27 (1.99)	26.84 (2.08)	**<0.001**	**<0.001**	**<0.001**
Control	13.76 (2.05)	12.80 (2.22)	12.69 (2.29)			
p[b]	0.217	**<0.001**	**<0.001**			
Attitude; mean (±SD)						
Experimental	39.98 (4.26)	56.22 (5.73)	55.74 (5.72)	**<0.001**	**<0.001**	**<0.001**
Control	40.52 (3.94)	41.45 (4.72)	41.47 (4.71)			
p[b]	0.44	**<0.001**	**<0.001**			
Behavior; mean (±SD)						
Experimental	10.08 (.98)	10.28 (.98)	9.95 (.89)	**<0.001**	**<0.001**	**<0.001**
Control	9.92 (1.03)	9.01 (1.29)	8.30 (.99)			
p[b]	0.361	**<0.001**	**<0.001**			

[a]Two-way repeated measures ANOVA.
[b]Independent sample *t*-test.
*Significance level: $p < 0.05$.
Bold values indicate statistically significant differences with a p-value of less than 0.001.

that the effect of group ($p < 0.001$), the effect of time ($p < 0.001$), and also the interaction ($p < 0.001$) was significant. Since the interaction was significant, an independent *t*-test was used to compare the two groups at different times in the study. The results of the independent *t*-test showed that the two groups did not have a statistically significant difference in any of the variables before the intervention. However, after intervention this difference was significant and the mean in the experimental group was higher than in the control group. In the 8 weeks following the study, this difference was significantly greater in the experimental group than in the control group ($p < 0.001$) (Table 3).

Discussion and conclusion

LDH is a health problem that impacts patients' quality of life and daily routine, both pre- and postoperatively. Therefore, it is imperative to provide the patient with sufficient information[32]. In this study, the knowledge mean score in postoperative patients undergoing LDH surgery in the experimental groups increased 8 weeks after the educational intervention. Knowledge acquisition is vital because it is strongly associated with attitude modification and behavior change.[33,34] The findings of a study in the Neurosurgery Clinic of a university hospital in Turkey[19] were consistent with our study results. They revealed that patients who received computer-assisted training had significantly higher information scores following discharge than those in the control group, and their knowledge increased over time. Another study[35] also had in line with our research's outcomes. Based on this study, the majority of changes in mean scores occurred in the first 6 weeks. It appears that the higher scores in the experimental group can be attributed to their more frequent use of audiovisual training methods. This is due to their entertainment content. An additional advantage of such programs is that patients can watch videos numerous times to consolidate their knowledge. The majority of patients in the present study stated that they enjoyed Internet-based training and would recommend such training programs to others. Accordingly, several studies favor the use of smartphone apps for educating users and improving knowledge with continuous efficiency of up to 1 year. In this study, the mean score of attitudes and practice in postoperative patients undergoing LDH surgery increased dramatically in the experimental group. This score was sustained for almost 8 weeks. This pattern was similar to that observed for knowledge and is consistent with similar studies.[18,19,36] Although the experimental group in the present study ultimately had improved practice capacity, the results showed that the practice following the discharge of patients who were trained using the app-aided program was significantly higher. The higher practice of patients in the experimental group may be attributed to the fact that they experienced less pain, asked the consultant more questions, and had more accurate information scores due to the training videos on pain and movement management, which enabled knowledge to be put into practice more easily. A review of previous studies in Iran indicates that there has been no investigation of the effects of app-based training programs intended for patients undergoing LDH surgery. Researchers have reported that interactive training programs can be used more effectively to enhance patient knowledge. This includes patients with burns,[37] patients with prostate cancer,[37] orthopedic patients,[38] and patients with breast cancer.[37,39] Given the convenience of smartphones, users have increased.[40] However, very few studies have evaluated health education effectiveness through mobile applications.[41] Therefore, it is necessary to develop updated smartphone applications and use them to

evaluate the effectiveness of patient education. Since similar studies were rarely available in Iran, this study may have significant implications. Previous studies have shown that mobile phones effectively improve patients' health behaviors.[42–44] This article supports the idea that well-designed connected health technologies, including digital health, mobile, and telehealth, can better support patient rehabilitation, and provide an opportunity to increase adherence to care and rehabilitation behaviors.[39,45]

This study, like all scientific research, has its limitations. The most significant limitation of this study was access to patients applying for elective surgery during the COVID-19 pandemic. Since this study was conducted during the third wave of COVID-19 in Iran, hospital admissions for surgery were very limited. Therefore, the sampling period was extended. On the other hand, the low digital literacy of the patients participating in the study to use the mobile application led to a longer training period for the patients. Another limitation was that we did not measure clinical outcomes such as pain, disability, and quality of life (QOL) after LDH surgery. This is because assessing these outcomes would require a longer follow-up period, whereas our study was designed to assess the impact of the educational intervention on behavioral changes with a rapid follow-up. Despite these limitations, our study provides valuable insights into the impact of an educational intervention on behavioral changes in patients undergoing LDH surgery. For future studies, it would be beneficial to consider assessing clinical outcomes such as pain, disability, and QOL. This would provide a more comprehensive evaluation of the effectiveness of the educational intervention on postoperative care for LDH surgery.

Conclusion

In conclusion, this study is the first to examine the effects of a mobile-based educational program on care behaviors after LDH surgery in Iran. Our findings show that the program had positive effects on participating patients' knowledge, attitudes, and practices. Mobile applications, such as the LUCAT app used in our study, are effective for patient education. Based on our results, it appears that such educational programs can facilitate and enhance postoperative patient training.

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Author contributions

Fatemeh Zarei: Conceptualization; Formal analysis; Investigation; Methodology; Supervision; Writing—review and editing. Soheila Sadeghpour Ezbarami: Investigation; Methodology; Writing—original draft; Writing—review and editing. Shima Haghani: Data curation; Investigation; Writing—review and editing. The authors read and approved the final manuscript.

Availability of data and materials

The datasets used and/or analyzed during the current study are available from the corresponding author upon reasonable request.

Declaration of conflicting interests

The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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Ethics approval and consent to participate

We confirm that ethical approval was applied for conducting this research. The target of the study was to collect survey responses from human participants on educational intervention on the knowledge, attitude, and practice of patients. No human data, human tissue, or any clinical data was collected for this study. We also declare that we have taken written consent from survey respondents to participate in the evaluation study.

Consent for publication

The patient(s) has obtained written informed consent to publish this paper.

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Supplemental material

Supplemental material for this article is available online.

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