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ORIGINAL RESEARCH

Association Between Pre-Hospital e-Education via QR Code and Hospital Stay in Inguinal Hernia Patients Undergoing General Anaesthesia: A Retrospective Study

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Purpose: Exploring the retrospective analysis of the association between pre-hospital e-education via QR code and the hospital stay for inguinal hernia patients undergoing general anesthesia.

Patients and Methods: A retrospective study was conducted to explore the association between pre-hospital e-education utilizing QR code and hospital stay in patients with inguinal hernia repair under general anesthesia between August 2022 to June 2024. Patients were categorized into two groups based on their engagement with the pre-hospital e-education: those who accessed the pre-hospital e-education (viewing group) and those who did not (non-viewing group). The t-tests or Mann–Whitney *U*-tests were utilized to compare the means of the two groups, while the chi-square test was used to assess the rates between the two groups. To further explore the relationship between pre-hospital e-education and hospital stay, as well as other related factors, correlation analysis and multiple linear regression analysis were carried out.

Results: There were significant differences in the patient's hospital stay, the time to first postoperative ambulation and dietary, anxiety, pain, and patient satisfaction. The analyses revealed statistically significant correlations between viewing pre-hospital e-education via QR code and hospital stay, the time to first postoperative ambulation and dietary, anxiety, pain, as well as patients' satisfaction ($P<0.05$). This fully adjusted linear regression analysis revealed a significant negative correlation between viewing the pre-hospital e-education and hospital stay ($\beta = -4.06$, 95% CI: −6.43, −1.70; $P = 0.002$). Similarly, a negative correlation was observed between viewing the pre-hospital e-education and the time to first ambulation ($\beta = -0.71$, 95% CI: −1.25, −0.17; $P = 0.015$), as well as the time to first postoperative dietary ($\beta = -1.20$, 95% CI: −1.71, −0.34; $P = 0.006$) after controlling for relevant covariates.

Conclusion: Effective pre-hospital e-education via online QR codes may reduce hospital stay and improve the patient experience in day surgery under general anesthesia.

Keywords: pre-hospital, e-education, inguinal hernia, general anesthesia, day surgery, hospital stay

Introduction

Day surgery has emerged as a widely adopted, cost-effective strategy aimed at optimizing healthcare resources by reducing hospital stay and minimizing costs, all while maintaining high standards of care and patient satisfaction.[1,2] The 2019 Day Surgery Guidelines emphasize the initial efforts in the early 2000s to expand the use of day surgery and outline more recent developments that focused on minimizing hospital stay durations and enhancing the quality of postoperative recovery.[3]

To shorten hospital stay, reduce postoperative pain, and achieve faster post-operative recovery, several preoperative health educational methods have been used and developed.[4] For example, one pilot study found that online

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communication education using video materials is as effective in improving students' confidence as face-to-face, which can be seen as an effective, convenient, and useful way.[5] During the perioperative period or postoperative rehabilitation period, health education plays a crucial role in improving patients' health behavior, accelerating the postoperative recovery process and early rehabilitation, enhancing patient compliance, and reducing complications.[6,7] However, the timing for early recovery can vary considerably between patients due to differences in both the educators and the content of health education, which directly influences their hospital stay.[8,9] Hence, there is a need to administer and standardize the health education quality of early recovery to shorten the hospital stay.

Inguinal hernia is a common surgical condition, affecting approximately 20 million people worldwide.[10] In most cases, the occurrence of inguinal hernias is related to the weakness of the abdominal wall and an increase in intra-abdominal pressure, such as from prolonged coughing, constipation, obesity, or heavy physical labor. Inadequate treatment or unclear health education may lead to serious complications such as bleeding, wound infection, and pulmonary and cardiovascular complications that endanger the patient's life.[11] Therefore, preoperative health education is of paramount importance and should not be neglected. Comprehensive preoperative education enables patients to grasp the necessity of the surgical procedure, recognize potential postoperative symptoms, and adopt appropriate rehabilitation strategies. Such educational interventions can significantly alleviate patient anxiety, facilitate a more rapid recovery, enhance postoperative compliance, reduce the duration of hospital stay, and ultimately minimize healthcare costs.[12]

With the development of technology, the relatively mature QR code was born and has been widely applied in various fields such as education, economics, and the healthcare industry.[13,14] Therefore, in conjunction with QR code technology, our department has also developed and utilized it in our daily clinical work. Retrospective studies can help analyze historical data and identify key factors relating to the length of hospital stay. In our previous retrospective observational study from 2020 to 2021, we assessed the impact of take-home video on patients with inguinal hernia and found that this approach effectively reduced the time to mobilize.[15] Currently, this approach has been incorporated into our department's usual care procedures. For further investigation, this study aims to continue exploring the application of pre-hospital e-education videos over the past two years to provide a more comprehensive understanding of their effectiveness, especially for hospital stay. Although this retrospective study cannot establish causality, it provides important correlations and trends that can lay the groundwork for future prospective research.

Materials and Methods

Theoretical Background

The Health Belief Model (HBM) emphasizes that an individual's awareness of health issues will promote corresponding specific behaviors toward health, which can reasonably explain the impact of various psychosocial factors on health behaviors.[16] It is now widely used in health education and preventive health care to analyze which factors affect the medical and medical behavior of people. This theory can lead to the development of health education: by explaining disease-related knowledge and influencing patients' perceptions and attitudes towards health behaviors, it helps patients accelerate their recovery.

The Introduction of Pre-Hospital e-Education

First, based on the HBM theory, our team formed a corresponding pre-hospital health education program focusing on early recovery (See Table 1). Second, our team conducted several group discussions to design the pre-hospital education, including the specific content, presentation form, involved participants, and their allocation of work. We then decided to present this kind of pre-hospital health education in an online format. After revising and finalizing the specific content of the education, we invited nurses from our department, and medical specialists from the multidisciplinary team (MDT) to participate by writing scripts, playing roles, and recording videos. The video can be viewed in Appendix file 1. The total duration of the video was 19 minutes. The online QR code was automatically published through a smart system, and the path is presented in Figure 1. This video has also been found to be informative in instructing patients to perform their first activities out of bed early in our previous retrospective study.[15] To further explore the overall impact of this pre-hospital

Table 1 Pre-Hospital Health Education Program Focused on Early Recovery

Items	Contents	Place	Way	Time
Health education on perceived sensitivity and perceived severity.	Public science education to specialized diseases knowledge: concept, pathogeny, signs and symptoms, consequences of untimely surgical treatment, surgical procedure, points for attention in postoperative recovery, etc.	Pre-hospital (Home)	1.Viewing online QR code. 2.Reading the health education brochure issued.	Viewing the video for 5 min; Reading for 5–10 min.
Health education on perceived Barriers (Relevant knowledge, skills and coping methods to help patients overcome difficulties).	Perioperative cooperation process, points for attention and skills of recovery. The contents of the pre-hospital video includes: 1. Preoperative assessment: contraindications of surgery, skin preparation, bowel preparation, etc. 2. Management programs to prevent pain. 3. Cooperation requirements for postoperative first ambulation: how to eat safely for the first time after surgery; a skill of first ambulation; observation of postoperative complication; how to prevent fall, etc. 4. -Standardized discharge. 5. Family health management and cooperation after surgery, etc.	Pre-hospital (Home)	1.Viewing online QR code. 2.Reading the health education brochure issued.	Viewing the video for 10 min; Reading for 5–10 min.
Health education on perceived benefits (Change patients' wrong or unclear ideas).	1. Interview's content of "peer support education": Preoperative psychological experience. 2. Psychological experience after entering the operating room. 3. Postoperative psychological experience. 4. Suggestions for peers who are about to undergo surgery for the same disease, etc.	Pre-hospital (Home)	Viewing online QR code.	Viewing the video for 4 min.

education on instructing patients on hospital stay and to better utilize it in the daily clinical work of the department, we ultimately presented this video in the form of a QR code.

Study Design

A retrospective observational study was conducted continuously from August 2022 to June 2024 in the day surgery care unit of a tertiary hospital. Each participant received a health education leaflet, which included a QR code linked to a department-specific pre-hospital e-education video. Each admitting nurse provides patients with a detailed explanation of the content on the education leaflet and informs them that they can scan the QR code to view the e-education video. Participants were free to choose whether to view the video for a more comprehensive understanding of the information provided. This study complies with the Declaration of Helsinki and was approved by the ethics committee of the Shenzhen Nanshan People's Hospital (LW-2022-006).

Study Population

Inclusion criteria of the patients were as follows: (1) 18 years old and above; (2) clinically diagnosed with unilateral inguinal hernia, undergoing the first hernia repair surgery; (3) classified as ASA grades I or II according to the American Society of Anesthesiologists;[17] (4) patients with normal preoperative vital signs and no related clinical symptoms or

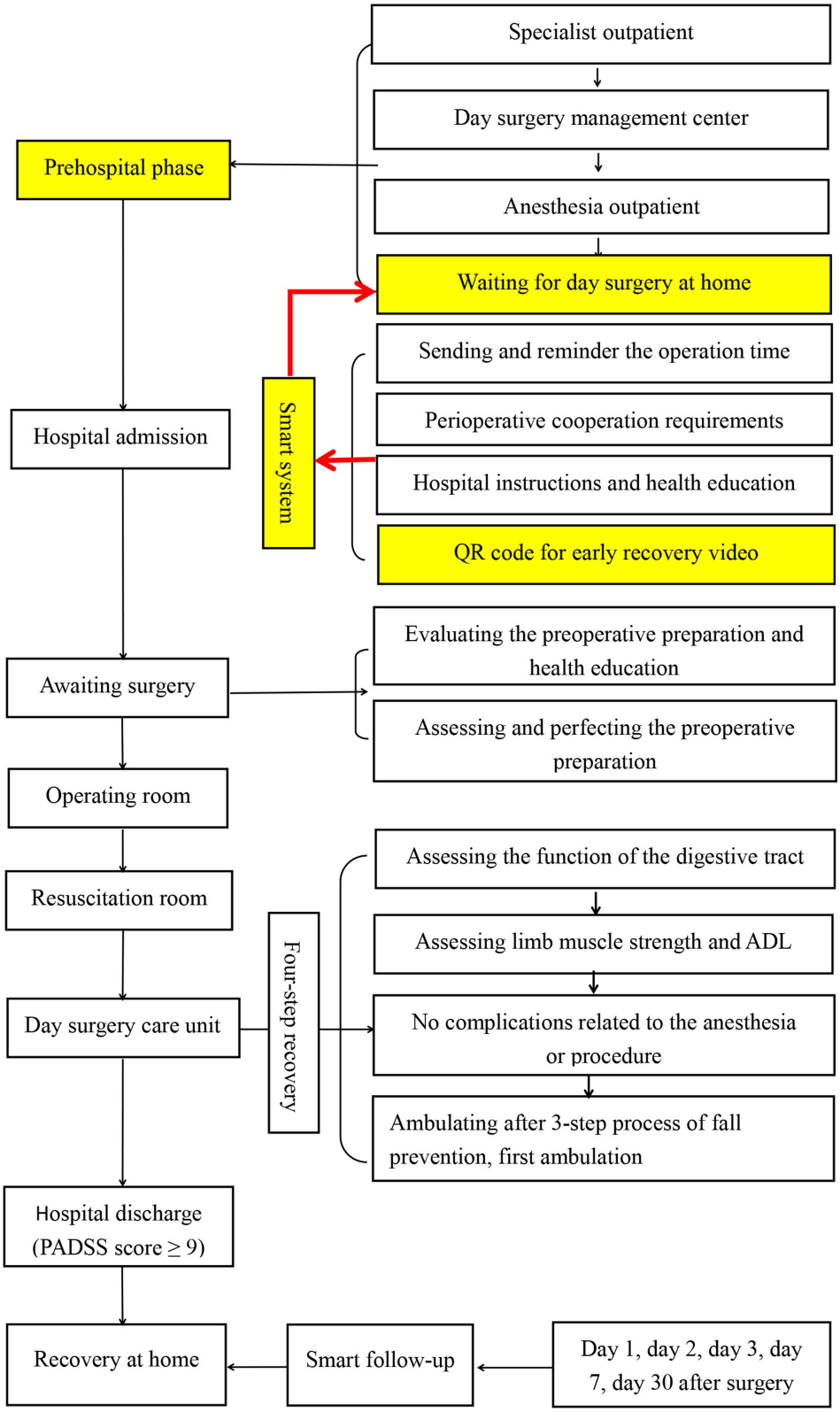

Figure 1 The path of using pre-hospital e-education via QR code in our clinical practice.

signs; (5) patients making their initial appointment at our day surgery care unit. Exclusion criteria were as follows: (1) patients with general contraindications, including fever, use of anticoagulant medications, significant comorbidities, or poor overall health; (2) patients with contraindications to anesthesia;[17] (3) patients who refuse or have sudden contraindications to general anesthesia; (4) patients with missing outcomes data.

Grouping

Despite both groups having access to the QR code, participants were divided into two groups based on their engagement with the pre-hospital e-education: those who viewed the video (viewing group) and those who did not view the video (non-viewing group). This classification was based on video engagement records tracked through cuplayer (https://cuplayer.com). The groups were defined as follows: the viewing group consisted of patients who watched at least 80% of the video and completed the accompanying questionnaire, while the non-viewing group included those who did not finish the question, or watched less than 20% of the video (See Figure 2). Our nursing staff will assess each patient on the day of surgery to determine if they have viewed the online QR codes and at least 80% of the content. If a patient has not viewed the QR code, viewed less than 80%, or refuses, we will inquire about the reasons, offer further explanation, encourage re-viewing, and assign them to the non-viewing group. This grouping enabled a comparative analysis of the impact of video viewing on outcomes.

Data Collection

Data were collected from the electronic medical record by clinicians and departmental self-collected statistical data. To minimize external factors, we retrospectively reviewed cases of inguinal hernia repair performed by the same anesthesiologist and surgeon using a standardized protocol, which included uniform general anesthesia (propofol, remifentanil, muscle relaxants, and NSAIDs), preoperative quadratus lumborum block, and a 5-day postoperative regimen of oral diclofenac sodium.

Measures

Demographic information was collected at baseline. Measures of the independent variable and dependent variable were collected. The independent variable (categorical variable) was whether viewed pre-hospital e-education or not. The primary dependent variable (continuous variable) was hospital stay. Hospital stay refers to the duration from admission to discharge.[15] The secondary dependent variables included the time to first ambulation, time to first dietary, anxiety scores (measured by the Self-Rating Anxiety Scale[SAS]),[18] pain scores (assessed using the Numeric Rating Scale[NRS]),[19] and patient satisfaction (evaluated through a satisfaction survey developed by our hospital).[20] The details of the departmental self-collected indicators include the time to first dietary, the time of first ambulation, and the duration of the first ambulation. The time to first ambulation is calculated as follows:[15] upon hospital admission, a record form for the time to the first ambulation is issued, and following a patient's first ambulation from bed after surgery. The duration of the first ambulation: the patient were recommended to walk for at least 15 minutes. The time to first dietary is the time to first solid or liquid food ingestion after evaluating gastrointestinal tract function. Detailed evaluation criteria of the covariates were given in Appendix File 2. The research variables of the hospital stay, the time to first ambulation, and the time to first dietary overview were shown in Appendix File 3.

Statistical Methods

Empower Stats (version 3.4.3) was used to analyze the data. The t-tests (for data with a normal distribution) or Mann–Whitney *U*-tests (for data with a skewed distribution) were employed to assess the differences in means between the viewing group and non-viewing group. Count data are expressed as [n (%)] and analyzed using the chi-square test. Through Pearson/Spearman correlation analysis, we examined the relationship between viewing pre-hospital e-education and all other variables to select the variables for inclusion in the regression model. Then, after adjusting for confounding variables, we conducted a multiple linear regression analysis between the pre-hospital e-education and the statistically significant variables based on correlation analysis. The statistical significance of the difference is $P<0.05$.

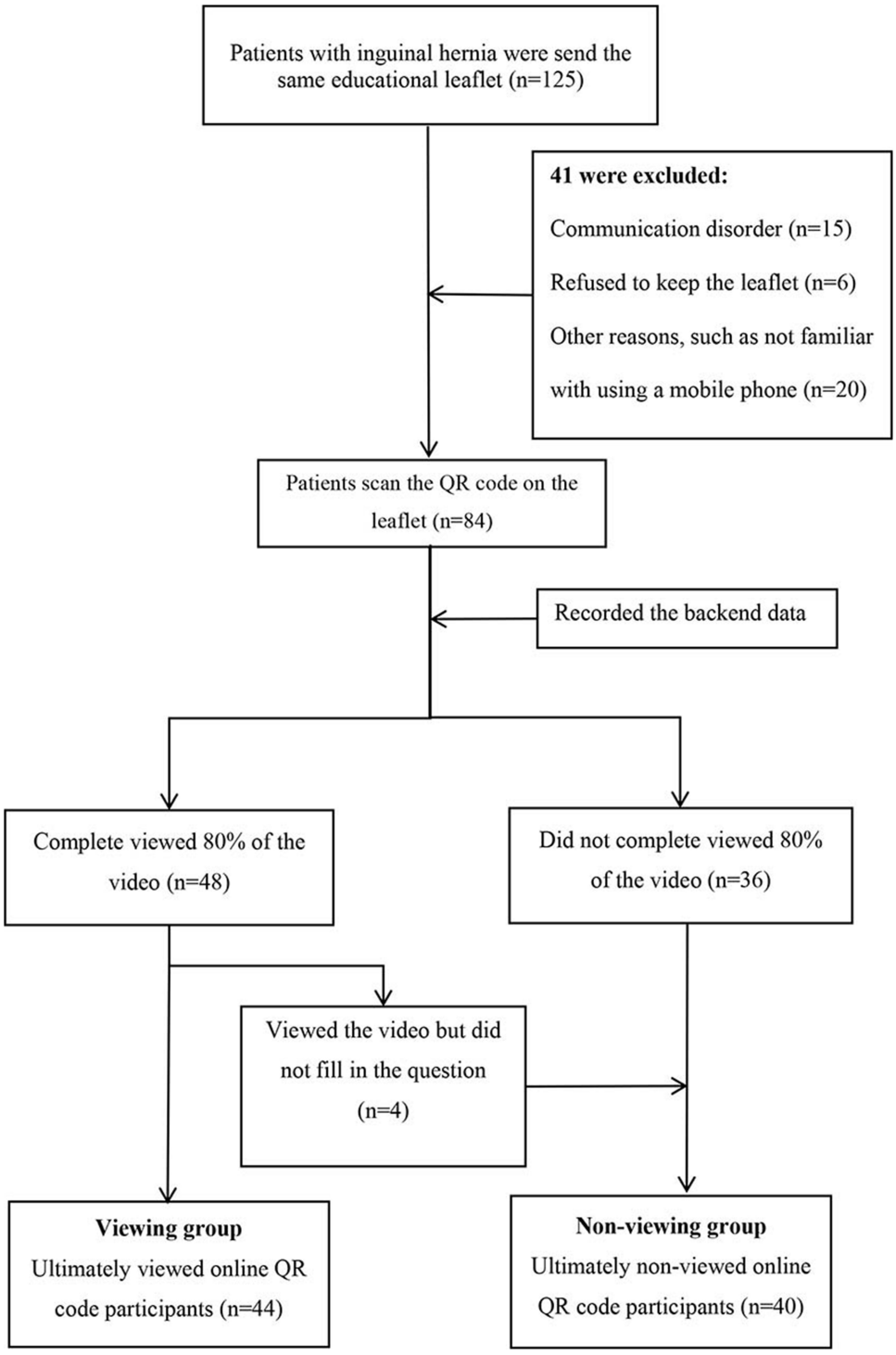

Figure 2 Flow diagram.

Results

Participants' Baseline Characteristics in the Two Groups

Based on the baseline characteristics of the two groups, there was no significant difference ($P>0.05$). Within 3 days post-surgery, all follow-up complications were slight nausea and vomiting in two groups. One had minor pain after activity within 1st week. Details of the results are presented in Table 2.

Table 2 Characteristics of Participants at Baseline [n (%)/Mean ± SD]

Variables	Viewing Group (n=44)	Non-Viewing Group (n=40)	*P*
Age (years)	43.34 ± 14.67	44.42 ± 14.00	0.730
Gender (n, %)			0.423
Female	7 (15.91%)	4 (10.00%)	
Male	37 (84.09%)	36 (90.00%)	
Education level (n,%)			0.592
Primary school and below	1 (2.27%)	0 (0.00%)	
Middle school	6 (13.64%)	3 (7.50%)	
High school	6 (13.64%)	7 (17.50%)	
College and above	31 (70.45%)	30 (75.00%)	
Occupation (n, %)			0.696
Employed	36 (81.82%)	34 (85.30%)	
Unemployed	8 (18.18%)	6 (15.00%)	
BMI (kg/m^2)	22.98±2.26	22.40±2.36	0.255
Surgical history (n,%)			0.696
Yes	8 (18.18%)	6 (15.00%)	
No	36 (81.82%)	34(85.00%)	
Follow-up complications			
Three days postoperative	2(4.55%)	4(10.00%)	0.418
Week 1 and Month 1	1(2.27%)	0(0.00%)	1.000

Comparison of Clinical Data Between Two Groups

The hospital stay, time to first ambulation, time to first dietary, anxiety, and patient satisfaction in the group that watched the online QR code were considerably higher than those in the non-viewed group, except for pain levels, which did not differ significantly between the two groups ($P<0.05$) (Table 3). Pain scores ranged from 1 to 5 within 120 minutes post-surgery. Due to delays in administering oral pain medication as prescribed, 11 patients in both groups initially experienced pain scores of 4 to 5. However, their pain was effectively controlled once the medication was administered.

Correlation Analysis

Table 4 presents the correlation analysis of the independent variable (pre-hospital e-education) and its dependent variables. The analysis of variable correlations revealed significant correlations between variables hospital stay, the time to first ambulation, the time to first dietary, anxiety scores, pain scores, and patient satisfaction ($P<0.05$), while no significant correlations were found with age, gender, education level, occupation, BMI, surgery history, and follow-up complications ($P>0.05$).

Table 3 Comparison of Clinical data Between the Two Groups [n (%)/ Mean ± SD]

Variable	Viewing group (n=44)	Non-viewing group (n=40)	*P*
Time to first ambulation (h, mean±SD)	3.10 ± 0.46	3.79 ± 0.69	<0.001
Time to first dietary (h, mean±SD)	2.52 ± 0.58	3.55 ± 0.71	<0.001
Hospital stay (h, mean±SD)	9.52 ± 1.85	12.46 ± 2.52	<0.001
Anxiety (scores)	41.52±5.57	47.08±3.91	<0.001
Pain scores (n, %)			0.423
≤ 3 scores	37 (84.09%)	36 (90.00%)	
>3 scores	7 (15.91%)	4 (10.00%)	
Patient satisfaction (scores)	96.82± 2.98	95.18± 2.39	0.007

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Table 4 Analyzed the Relationships Between Pre-Hospital e-Education and the Other Variables

Variables	Correlation coefficient	*P*-value
Hospital stay	−0.548	<0.001
Age	−0.039	0.722
Gender	−0.087	0.429
Education level	−0.072	0.517
Occupation	−0.043	0.700
BMI	−0.148	0.179
Surgical history	0.043	0.700
Follow-up complications	−0.053	0.630
Time to first ambulation	−0.488	<0.001
Time to first dietary	−0.636	<0.001
Anxiety scores	−0.487	<0.001
Pain scores	−0.259	0.017
Patient satisfaction	0.394	<0.001

Table 5 Multivariate Linear Regression Model

Outcome variables	Viewed online QR code			
	Crude mode	*P*-value	Adjusted mode	*P*-value
	β (95% CI)		β (95% CI)	
Hospital stay	−2.94 (−3.88, −2.01)	<0.001	−4.06 (−6.43, −1.70)	0.002
Time to first ambulation	−0.68 (−0.93, −0.43)	<0.001	−0.71 (−1.25, −0.17)	0.015
Time to first dietary	−1.02 (−1.30, −0.75)	<0.001	−1.20 (−1.71, −0.34)	0.006
Anxiety scores	−5.55 (−7.63, −3.48)	<0.001	−3.58 (−8.35, 1.19)	0.148
Pain scores	−0.01 (−0.41, 0.38)	0.946	−0.77 (−1.63, 0.10)	0.093
Patient satisfaction	1.64 (0.48, 2.81)	0.007	2.25 (−6.23, 4.73)	0.082

Multivariate Linear Regression Model

We constructed crude and adjusted models, and the effect sizes (β) and 95% confidence intervals were defined. Viewing the online QR code was used as the independent variable, and hospital stay, the time to first ambulation, the time to first dietary, anxiety scores, pain scores, and patient satisfaction were analyzed sequentially as the outcome variables. All variables, except the independent and outcome variables, were used as adjustment factors. A stepwise multiple linear regression analysis was then performed. The results of multiple linear regression analyses are presented in Table 5. In the unadjusted model, this linear regression analysis observed a negative correlation between viewed online QR codes and outcome variables in turn except for pain scores ($P<0.05$). In adjusted model, the linear regression analysis showed that patients in the viewed online QR code group were associated with a decreased time to hospital stay (β=−4.06, 95% CI: −6.43,−1.70; $P = 0.002$), the time to first ambulation (β=−0.71, 95% CI:−1.25,−0.17; $P = 0.015$), as well as the time to first dietary (β=−1.20, 95% CI:−1.71,−0.34; $P = 0.006$) respectively.

This indicates that as the viewing of the pre-hospital e-education increases, the hospital stay duration decreases. Similarly, increasing video viewing is associated with a shorter time to first ambulation and time to first dietary.

Discussion

Advantages of Pre-Hospital e-Education via Online QR Code

As medical informatization has improved the medical service industry, the Chinese government has devoted a great deal of resources to enhancing infrastructure.[21] To improve the quality of care and operational efficiency, our hospital has implemented informatization as a means of enhancing the patient experience. We have endeavored to establish a smart

hospital by organizing and reorganizing the entire diagnostic and treatment process. In 2018, we applied to become the first batch of internet hospitals in Guangdong Province. By presenting the need to our hospital's information department, the pre-hospital e-education video was presented in the form of an online QR code and automatically sent to pre-hospitalized patients with day surgery through a smart system, enhancing interactions between ward nurses and pre-hospitalized patients, which reduce patients' anxiety.[22] This study found that patients who viewed pre-hospital e-education via QR code had their hospital stay shortened by 4.06 hours compared to those who did not, with an overall reduction in hospital stay (Table 5). Similarly, previous studies reported hospital stay of approximately 24 hours for inguinal hernia repair patients (Favaro et al) and (10.24±2.78) hours (Zhang et al), highlighting the potential of pre-hospital education to reduce hospitalization time.[8,9] Thus, we have shown that effective interaction and connection between ward nurses and pre-hospital patients is achieved using the platform of the hospital's smart system (See Table 4). Moreover, the smart system follow-up shows that both groups of patients experienced only mild nausea, vomiting, and pain during the first week after discharge, which can be controlled and alleviated at home through the use of oral medications and resting during the stay-at-home (See Table 2), indicating that this study is based on safety and reduced hospital stay (See Table 3).

The Association Between Pre-Hospital e-Education and Hospital Stay

This study examines the association between pre-hospital and e-education in patients with inguinal hernia. The link between pre-hospital e-education and hospital stay is both complicated and correlative. Although previous research has indicated that preoperative health education might contribute to shorten patients' hospital stay,[4,23,24] this retrospective observational study only identified an association between pre-hospital e-education and hospital stay, which could only provide clues for the causal relationship between these two factors.

In a busy clinical environment with constrained time and a high volume of patients, nurses must implement scientifically validated and standardized health education methods.[20,25,26] Such methods are vital for improving patient compliance and effectively reducing hospital stay while ensuring patient safety. Evidence suggests that interventions based on the Health Belief Model (HBM) have demonstrated significant benefits in areas such as timely vaccination, nutritional behavior, and adherence to self-care practices.[20,25,26] By applying this theoretical framework, this study aims to evaluate and optimize the impact of standardized pre-hospital e-education via QR code on early recovery and hospital stay, highlighting the importance of evidence-based education practices in achieving better clinical outcomes in patients with day surgery under general anesthesia.

According to patients' confidence in health providers,[27,28] peer education by peers,[29] and early recovery for shortening hospital stay,[30] the pre-hospital e-education was developed (See Table 1). This pre-hospital e-education has unique advantages: ①View in Online QR Code Time. We chose the pre-hospitalization period because patients are often highly concerned about their surgery and seek more information during this time[31] and patients who viewed the videos in conjunction with their needs could have a multiplier effect. ②Strategies for Enhancing Adherence. The pre-hospital health education program consisted of three parts, namely knowledge, attitude, and practice toward early recovery (See Table 1). Pre-hospital e-education video recorded by the attending surgeon (5 min), these include specialized concepts, pathogeny, signs and symptoms, consequences of untimely surgical treatment, surgical procedure, points for attention in postoperative recovery, etc. Attitude video recorded by peers (4 min), a peer with the same condition was invited to share her perioperative experience. In this study, the -anxiety scores significantly decreased in patients with day surgery after viewing the online QR code (See Table 3). Practice video recorded by ward nurses. It has been shown that patients should eat and ambulate earlier after surgery,[3,30] and the results of this study suggest that early eating and ambulation may contribute to a reduction in hospital stay (See Table 4). Even though early postoperative ambulation has been shown to reduce hospital stay, few hospitals objectively measure ambulation to determine outcomes.[32] The latest guideline also states that early dietary and ambulation may result in a shorter hospital stay,[3] but there is no corresponding standard for how long to eat and ambulate after surgery. Therefore, the Post-Anesthesia Discharge Scoring System (PADSS) was used as a theoretical basis to develop evidence-based, clustered first ambulation skills to ensure that patients eat and move early after surgery safely.[15] At the same time, the patient was better able to follow the care dose in health education to cooperate with early postoperative recovery.

The recovery of the ability to ambulate in a day surgery care unit is critical. The first ambulation skills consist of five phases, to be able to eat and move, with no discomfort, to sing the trilogy, and then ambulate. ①Before Eating. Upper and

lower gastrointestinal tract function needed to be restored. Nurses evaluate swallowing ability through standardized assessment, including auscultating bowel sounds and using the water swallow test, to observe the patient's ability to swallow safely and monitor for signs of difficulty or aspiration. ②Before Moving. Nurses assess limb muscle strength by having patients perform specific movements or resistance exercises, allowing for observation of muscle function and identification of any weakness or impairment. ③No Discomfort. Nurses need to evaluate patients for the absence of surgical and anesthetic complications after surgery, including monitoring vital signs, blood glucose levels, pain, anxiety, and wound condition, and checking for symptoms such as dizziness, nausea, vomiting, and the ability to urinate spontaneously. ④Singing the Trilogy. The singing trilogy refers to the patients feeling no dizziness maintained per position, in the 30s by changing the position in the sequence (upper body, lower body, and standing position). ⑤To Ambulate. Patients were recommended to be required to walk for at least 15 minutes after the first postoperative ambulation. This study showed that the time to first dietary and ambulation was (2.52 ± 0.58) hours and (3.10 ± 0.46) hours in the viewed online QR code group respectively, which was less than the non-viewed group (See Table 3). Further, we also concluded that the effect of viewing online QR code videos on early eating and ambulating was decreased by 1.20 hours (β=−1.20, 95% CI: −1.71, −0.34; *P*= 0.006) and 0.71 hours (β=−0.71, 95% CI: −1.25, −0.17; *P*= 0.015) in the adjusted model respectively (See Table 5).

Similar to previous findings, we discovered (See Table 4) that there was a significant correlation between viewed pre-hospital e-education via QR code and hospital stay, the time to first ambulation, the time to first dietary, anxiety scores, pain scores, and patient satisfaction,[33–35] but we performed multiple linear regression analysis between viewed pre-hospital e-education and the variables of statistically significant based on correlation analysis, only hospital stay, the time to first ambulation, and the time to first dietary were statistically significant (See Table 5). Although education levels did not differ significantly between the viewing and non-viewing groups *(P* = 0.592), the majority of participants had a college education or higher. One possible explanation is that higher education levels may enable better comprehension of the recovery process, leading to more proactive recovery behavior. However, this also suggests that while education level itself may not have been a confounding factor, monitoring patient education and comprehension is important. Future research could further explore the impact of pre-hospital health e-education on patients with different education levels to ensure its effectiveness across diverse educational backgrounds and validate our findings.

Limitations of the Study

This study suggests that pre-hospital e-education could be seen as a useful way to shorten the hospital stay for patients with inguinal hernia. However, the findings of this study should be cautiously considered owing to its limitations. The results of this study should be treated cautiously. First, data were collected retrospectively, although we attempted our efforts, there might be some possible minor errors in the medical record document. Second, this study only included patients with inguinal hernia from one hospital with a small sample size, which might influence the statistical power and limit the generalizability of our findings. Third, differences in anesthesia and surgical techniques may affect outcomes, highlighting the need for future research to control for these variables to strengthen result validity. Fourth, a key limitation is the self-selection bias between patients who chose to watch the video and those who did not. Besides, due to the retrospective nature of the study design, we are only able to identify associations between variables rather than establish clear causal relationships. One limitation of this study is that several variables, such as education level, did not show significant differences due to sample size or population limitations in this research. Future studies could better assess the impact of these factors. The next step is to conduct a multicenter randomized study with larger sample size, more diverse samples, or a prospective randomized trial or a before and after trial to further clarify the quantitative relationship between efficient health education and hospital stay in patients undergoing day surgery.

Conclusion

This retrospective observational study suggests a potential association between pre-hospital e-education and hospital stay in inguinal hernia patients undergoing general anesthesia, though causality remains to be confirmed. Future prospective studies are required to validate the causal relationship and further explore the impact of such interventions.

Data Sharing Statement

The data supporting the findings of this study are available upon reasonable request from the corresponding author.

Ethics Approval and Informed Consent

This study was approved by the ethics committee of the Shenzhen Nanshan People's Hospital (LW-2022-006). Participants were allowed to freely participate or withdraw and were respected. Scanning the QR code implied consent to join the study.

Consent for Publication

All authors have read and approved of the final manuscript.

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Author Contributions

All authors made a significant contribution to the work reported, whether that is in the conception, study design, execution, acquisition of data, analysis and interpretation, or in all these areas; took part in drafting, revising or critically reviewing the article; gave final approval of the version to be published; have agreed on the journal to which the article has been submitted; and agree to be accountable for all aspects of the work.

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Disclosure

The authors report no conflicts of interest in this work.

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