

BMJ Open Efficacy of a new day surgery management mode based on WeChat: a study protocol for randomised controlled trials

Yun Shi ¹, Junyu Yan,² Shuangwen Wang,³ Yifan Li,³ Xiaoqian Deng⁴

To cite: Shi Y, Yan J, Wang S, *et al.* Efficacy of a new day surgery management mode based on WeChat: a study protocol for randomised controlled trials. *BMJ Open* 2022;**12**:e058204. doi:10.1136/bmjopen-2021-058204

► Prepublication history for this paper is available online. To view these files, please visit the journal online (<http://dx.doi.org/10.1136/bmjopen-2021-058204>).

Received 25 October 2021
Accepted 04 July 2022



© Author(s) (or their employer(s)) 2022. Re-use permitted under CC BY-NC. No commercial re-use. See rights and permissions. Published by BMJ.

¹Department of Anesthesiology, Children's Hospital of Fudan University, Shanghai, China

²Department of Anesthesiology, Karamay Hospital of Integrated Traditional Chinese and Western Medicine, Karamay, Xinjiang Uyghur, China

³West China School of Medicine, Sichuan University, Chengdu, Sichuan, China

⁴Department of Anesthesiology, Sichuan University West China Hospital, Chengdu, Sichuan, China

Correspondence to
Dr Xiaoqian Deng;
50058837@qq.com

ABSTRACT

Introduction There is an enormous imbalance between the rapid development of day surgery and the current conventional medical services. Hence, an effective day surgery management mode should be developed that can be used to constantly follow up on patients both preoperatively and postoperatively. In this study, WeChat was chosen as the platform. This study aimed to investigate the feasibility and effectiveness of a new day surgery management mode.

Methods and analysis This randomised controlled study investigated the efficacy of a new day surgery management mode based on WeChat. The target number of participants was 1000 per group. The application (app) will send personalised information based on the medical history of the patient and the type of surgery at different time points preoperatively and postoperatively. The healthcare worker can follow up the patient and acquire clinical data by simply signing into the app. The patient and the healthcare worker can also engage in video or voice chats using the app when necessary. Multiple departments, including anaesthesiology, internal medicine, surgery, nursing and psychology, will participate in this new mode.

Ethics and dissemination Ethical approval was obtained from the West China Hospital of Sichuan University Biomedical Research Ethics Committee. Results of this study will be published in peer-reviewed journals and presented at international conferences.

Trial registration number ChiCTR2100050793.

INTRODUCTION

Day surgery refers to the completion of an operation in which the patients are admitted and discharged within 1 day (24 hours) according to the initial medical treatment plan.^{1 2} The main advantage of day surgery is to facilitate patients' turnover and to improve the utilisation rates of hospital beds.³ With the development of microsurgical technology and anaesthesia technology, day surgery has been rapidly developed in European and American countries, where the proportion of day surgery reaches 80%–90%.^{4 5} At the same time, the medical treatment expense has

STRENGTHS AND LIMITATIONS OF THIS STUDY

- ⇒ Based on the Orem theory of self-care and the information–motivation–behavioural skills model, the new management mode was designed to meet the patient's individual requirements.
- ⇒ This was not a blinded study.
- ⇒ The conclusion may not be directly applicable to all patients.

decreased by 40%–60% based on day surgery mode.^{6 7} More than 250 types of day surgeries are performed in China. However, day surgery, which constitutes 20% of all elected surgeries, is currently at the early stage of development in China.⁸ There is lack of improvement and modification. Insufficient perioperative information, low patient satisfaction, delayed recovery of physical function, increased incidence of complications and undertreatment of pain after surgery are common issues associated with day surgery.^{9–11}

In China, a general practitioner-based referral system is not adopted. The patient only consults with a healthcare worker about the surgery when he or she makes the surgery appointment at the clinic. However, communication is typically inefficient in such situations. It is difficult for most patients to understand and remember all professional medical knowledge in such a short period of time. More than 80% of patients complain that they do not have sufficient information about the upcoming surgery and therefore feel nervous^{12 13} and neglected.^{14 15} All of these factors lead to decreased patient compliance, insufficient preoperative preparation and high surgery cancellation rate.^{9 16–20}

Postoperative recovery management is another question. The day surgery mode is supported by full-fledged family physicians and community hospitals in advanced countries. Healthcare services are constantly



provided to patients after their discharge. However, this situation is different in China. The patient and their caregiver play a major role in postoperative recovery management.²¹ Usually, hospital nurses usually send the patient a pamphlet and provide health education prior to surgery. The patient receives a lot of information related to the surgery, but he or she does not understand the point of learning all of this information. This becomes as a great challenge for patients and caregivers without any medical background, which makes them feel helpless and nervous when discharged. The patient probably encountered several problems that were beyond expectations, including postoperative complications, pain, nausea and vomiting, wound infection and early rehabilitation exercise. All of these factors may lead to delayed postoperative recovery and unplanned readmission for consultation.^{1 22 23}

Given the above scenario, a variety of perioperative medical services are required owing to the rapidly growing number of cases for day surgery. Patients need different information for different types of operations at different time points.^{24 25} Hence, there is an urgent need to create a professional day surgery management mode that is composed of a multidisciplinary team and includes medical services provided to the patients along with their caregivers both preoperatively and postoperatively until they fully recover from the surgery.^{9 26–28}

The new day surgery management mode using a small application (app) has become a widespread concern in recent years.^{29–32} The app is based on a mobile intelligent terminal. Users can make voice or video chats using the app anytime and anywhere; therefore, the management is very convenient and not limited by time and place. The information provided via the app is presented not only in text but also in videos and pictures, which is appealing and effective. Moreover, this is a good platform for saving the clinical data. Investigators can easily collect, integrate and analyse the data. Thus, a new day surgery management mode was developed based on the WeChat app. WeChat is one of the most popular social media applications in China. More than 900 million individuals use WeChat, and 150 million of them spend more than 2 hours a day using this app.³³ It has been used as an active service platform, communicating instantly, sharing photos, searching and downloading information, and pushing information for the users.^{34–36} The integration of WeChat in medical services can provide potential opportunities for innovation. However, only a few studies have investigated the use of WeChat in the management of day surgery.

In this study, a new day surgery management model was developed based on WeChat. This study aimed to investigate whether it is effective in decreasing the day surgery case cancellation rate compared with the conventional management mode. This study also aimed to investigate whether the new management mode has an impact on the medical cost, quality of operative recovery, patient's anxiety level and pain level, unplanned readmission rate,

Table 1 ASA grade definition

ASA grade	Definition
ASA I	A normal healthy patient
ASA II	A patient with a mild systemic disease: no functional limitations and/or no more than 1 well-controlled disease
ASA III	A patient with a severe systemic disease that is not life-threatening: some functional limitation and no more than 2 well-controlled diseases or 1 severe systemic disease
ASA IV	A patient with a severe systemic disease that is a constant threat to life: functional limitation due to an existing severe, life-threatening disease
ASA V	A moribund patient who is not expected to survive beyond the next 24 hours without surgery
ASA VI	A brain-dead patient whose organs were removed with the intention of transplanting them into another patient

ASA, American Society of Anesthesiology.

incidence of postoperative infection and complications, and patient's satisfaction.

METHODS

Study design

This was a single-centre, parallel-group (ratio 1:1), randomised controlled trial. Patients who underwent day surgery at the West China Hospital of Sichuan University were recruited in this study. The trial will be reported in accordance with the Standard Protocol Items: Recommendations for Interventional Trials reporting guidelines.

Participants

Inclusion criteria

1. Age: 18–75 years. Those who are over 75 years old are excluded from the study, because we are afraid that they have difficulties using a new communication medium.
2. American Society of Anesthesiology grade (table 1): I–II.
3. Able to communicate in Chinese.
4. Able to read and write in Chinese.
5. Participants or caregivers who owned a smartphone.
6. The participant or his caregiver handled the smartphone well.
7. Participants with internet access.

The investigator will have a short conversation and test with the patient to ensure the following issues: (1) WeChat has been downloaded on the patient's smartphone. If not, the investigator will help to download the app. (2) The patient can handle the app well, including checking the messages, searching the answer for a common question and typing in the answer on the online questionnaire. (3) The patient knows how to use the camera so that he can take a clear picture when the surgeon needs to access the

wound site. (4) The patient knows how to launch a phone call when necessary.

Exclusion criteria

1. With chronic pain.
2. With psychiatric disorders.
3. Allergy to anaesthetics.
4. With communication difficulties.
5. Healthcare worker.
6. With surgery history.

Quit criteria

1. Day surgery was changed to hospital admission.
2. The surgery was performed ahead of time.
3. Participants who decided to withdraw from the study.
4. Participants who were unable to complete the questionnaires.

Setting/recruitment

This study was conducted at the West China Hospital of Sichuan University. Patients who presented for day surgery and met the eligibility criteria were recruited consecutively. A statement, including the background, objectives, methods, benefits and risks, was distributed to the patient, and the patient was included if he agreed to participate in the study. Informed consent was obtained from all participants. They were informed that the intervention would not harm their interests. They were also encouraged to contact healthcare workers whenever necessary.

Patient and public involvement

Patients and the public were not involved in the design of the study.

Blinding

Owing to the nature of the study, the participants, caregivers and health workers were not blinded to the two interventions. This was one of the limitations of the present study. The participants in each group did not have any information about the other groups.

Randomisation

The patients were numbered according to the order of appointment. The patient numbers were transferred into random orders and divided into two groups using SPSS V.20.0 analysis software in advance. The patient number in each group was protected in sealed envelopes. The investigator generates and maintains random numbers. The recruited participants were randomly assigned to two groups according to their order of appointment.

Intervention

(1) App group (intervention group): the day surgery management mode was based on WeChat (figure 1). When the participant made an appointment for day surgery, he or she was provided with a link to download the app. The participant created a new account using their inpatient number as the username and reset their own password. The participant

set a time frame that he or she would like to receive information about the surgery.

Based on the date of surgery and the medical history of the patient, related information, including preoperative preparation, preoperative and postoperative functional exercises, and methods of managing pain, was automatically sent to the participant both preoperatively and postoperatively. In addition to the medical information, the general information of the health worker team was also sent to the participant. Simultaneously, the app sent regular reminders to the participant for crucial issues at the appointed time (figure 2). All information was expected to help the participants obtain positive psychological suggestions and to promote their self-care ability. The participant can research and read the information whenever necessary. In addition, participants can launch video chats or make phone calls at any time for help. However, details of the patient's feedback were made available to the investigators. The app automatically sends alarms to the investigators as soon as the patient reports a critical value. The electronic questionnaires were sent via WeChat. The participant completed and sent back the questionnaire through WeChat, installed in the mobile phone.

(2) Control group (convention group): the participant was provided with a pamphlet and health education after making an appointment for day surgery. The aforementioned information was printed and sent out as a pamphlet (figure 3). Two days prior to the scheduled appointment, a reminder was sent to the participant's phone. When the patients were discharged, they were provided with an emergency contact number to contact the healthcare workers whenever necessary. At the same time, the questionnaires were provided in stamped and addressed envelopes that were numbered and arrayed according to the time to finish them. The participants were required to complete and return all questionnaires chronologically. If the investigator does not receive the mail on the scheduled day, he will make a phone call visit to conduct the assessment. An investigator followed up all patients by phone 1 day and 1 month after surgery.

All participants were reminded that the information sent out to them, whether via WeChat or via pamphlet, was aimed at improving their quality of perioperative life. They were encouraged not to feel anxious if they have difficulty processing all of the information. They were instructed to call the city emergency line 120 during emergency situations.

Comparator

1. Quality of recovery (QoR) was assessed using the QoR-9 Scale (table 2).
2. Anxiety level: anxiety level is assessed using a Visual Analogue Scale (VAS). The score is determined by the distance on a 10 cm scale, with scores ranging from 0 ('no anxiety at all') to 100 ('extreme anxiety'). If the participant reports the anxiety score via the app, it will automatically read the data and provide the corresponding recommendations and will ask the participant whether he or she needs to consult with a healthcare worker. The app automatically sends alarm to the investigators if the patient's score is ≥ 7 .

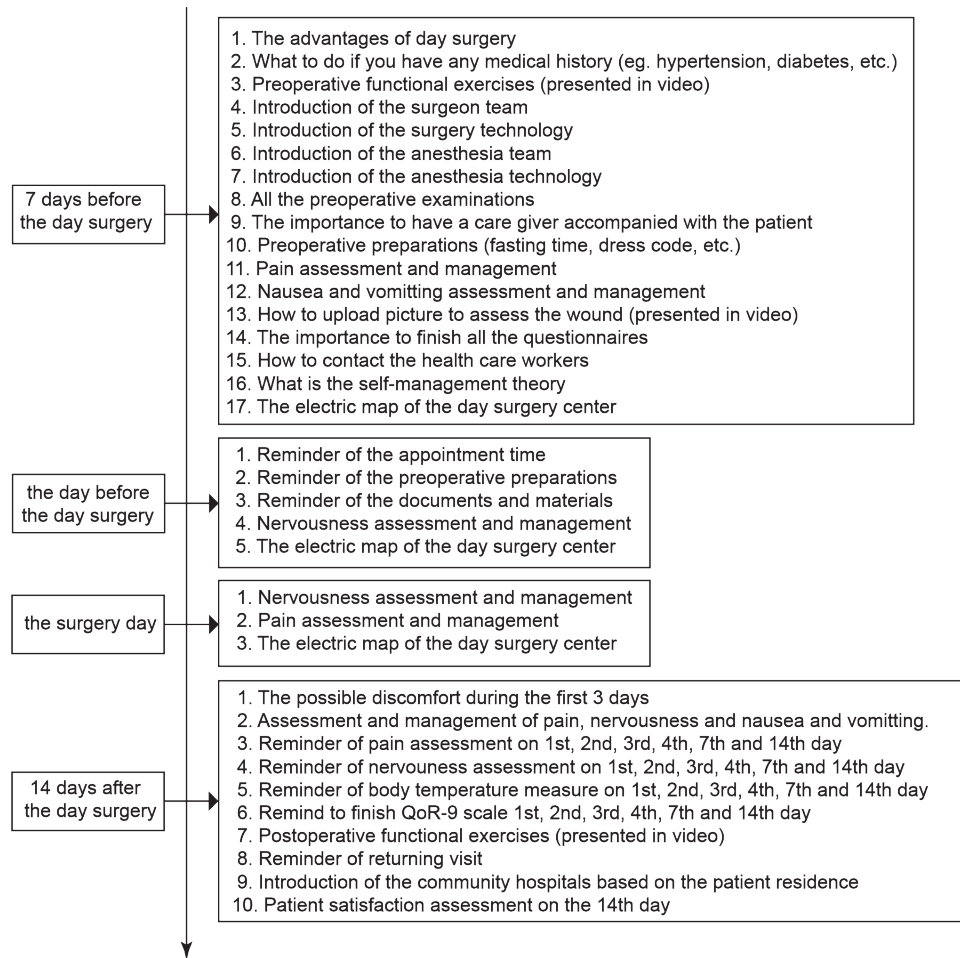


Figure 1 The information sent to the patient at different time points based on their individual health history. QoR-9, Quality of Recovery-9 Scale.

3. Pain level: pain level is assessed using VAS as well. The score is determined by the distance on a 10 cm scale, with scores ranging from 0 ('unacceptable pain') to 10 ('no pain at all'). If the participant reports the pain score via the app, it will automatically read the data and provide the corresponding recom-

mendations and will ask the participant if he or she needs to consult with a healthcare worker. The app automatically sends alarm to the investigators if the score is ≥ 7 .

4. Postoperative degree of satisfaction: the postoperative degree of satisfaction is assessed using a hundred-mark

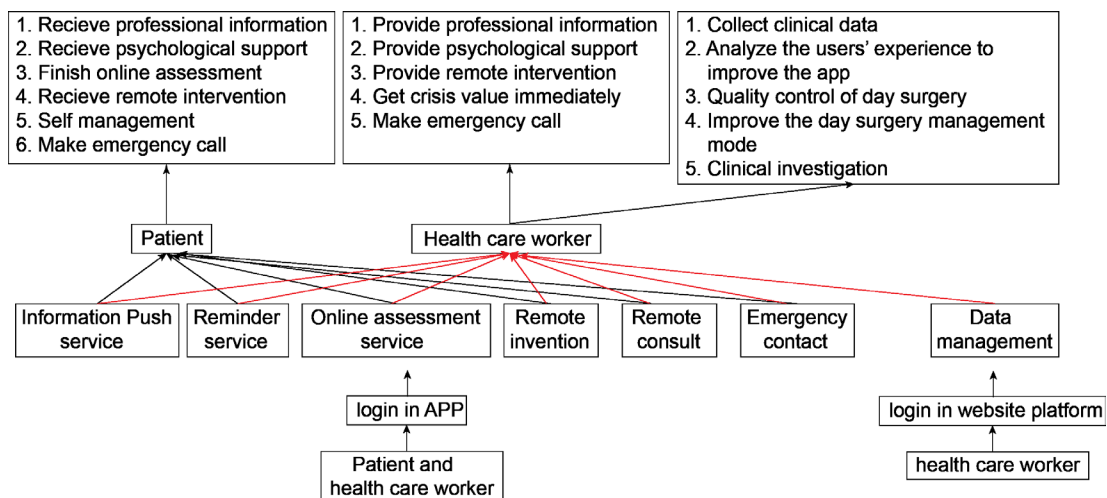


Figure 2 The new day surgery management mode based on WeChat.



Figure 3 The pamphlet sent out to the patient preoperatively.

system, with scores ranging from 0 ('not satisfied at all') to 100 ('very satisfied').

5. Economic cost: the economic cost of the participant and his or her caregiver, whose day surgery is cancelled due to insufficient preoperative preparation, consists of transportation fees, accommodation fees and lost wages. In addition, the economic cost of the partici-

pant and his or her caregiver consists of medical expenses due to unplanned readmission.

6. The recovery day: the patient feels recovered from the surgery and can take care of himself or herself.

Outcomes

Primary outcome

Case cancellation rate: the day surgery is cancelled by healthcare workers due to insufficient preoperative preparation.

Secondary outcome

1. Unplanned readmission rate in 1 month: the patient is readmitted to the hospital unplanned, whether as an outpatient or inpatient, within 1 month after the surgery.
2. The recovery day: the patient is asked if he or she has recovered and can take care of himself or herself on the seventh day after the surgery. If he or she says no, the patient will be asked the same question once a week until he or she recovers and can take care of himself or herself.
3. No show rate: the patient does not come on the scheduled operation day without any prior notice.
4. Postoperative complication within 1 month: all postoperative complications that occur within 1 month after the surgery are investigated by over the phone and documented.

Table 2 Quality of Recovery-9 Scale

Question	Scale	Crisis value
Is your overall situation good?	1: always, 2: almost, 3: often, 4: occasionally and 5: never	≥4
Do you have constant support from healthcare workers?	1: always, 2: almost, 3: often, 4: occasionally and 5: never	≥4
Can you understand the medical education?	1: always, 2: almost, 3: often, 4: occasionally and 5: never	≥4
Can you take care of yourself?	1: always, 2: almost, 3: often, 4: occasionally and 5: never	≥4
Can you micturate normally?	1: always, 2: almost, 3: often, 4: occasionally and 5: never	≥4
Is there any failure of stool or gas pass?	1: always, 2: almost, 3: often, 4: occasionally and 5: never	≥4
Can you breathe smoothly?	1: always, 2: almost, 3: often, 4: occasionally and 5: never	≥4

5. QoR: the QoR was investigated and recorded using the QoR-9 Scale on the 1st, 2nd, 3rd, 4th, 7th and 14th day after surgery.
6. Anxiety level: the anxiety levels of the participants were investigated and recorded on the day of surgery, and on the 1st, 2nd, 3rd, 4th, 7th and 14th day after surgery. In addition, the participant was instructed to report the anxiety score whenever necessary.
7. Pain level: during the first 4 days after surgery, the pain level of the participants was assessed twice a day, in the morning and night, before they took routine analgesics. On the 7th day and 14th day after surgery, it was assessed once a day. In addition, the participants were instructed to report the pain score whenever necessary.
8. Incidence of nausea and vomiting: the incidence of nausea and vomiting within 48 hours after surgery was recorded.
9. Incidence of wound infection: signs of wound infection were assessed and recorded.
10. Postoperative degree of satisfaction: the postoperative degree of satisfaction of the participants was investigated and recorded by phone follow-up 1 month after surgery.
11. Health cost: the economic cost of the participants was calculated and compared.
12. Patient's compliance: the percentage completeness of each question was recorded.

Sample size estimation

The day surgery cancellation rate at our institute in 2016 was 7.2%. It is considered clinically significant if the cancellation decreases by 50% when the new day surgery management mode is used. Thus, the minimal sample based on a power of 90% and a significance level of 0.05 was calculated for 826 patients in each group. Considering a loss of follow-up rate of 20%, the sample size was increased to 1000 patients in each group.

Ethics

This study was approved by the West China Hospital of the Sichuan University Biomedical Research Ethics Committee (date and version identifier: 31 October 2019, approved number of ethics committee: year 2019-1004). Patients who met the inclusion criteria were provided with a detailed explanation of the project, including its objective and aim. The participants were assured that they will not be treated with prejudice, regardless of whether they agreed or disagreed to participate in the study. They were allowed to withdraw from the study at any time. If the patient accepts the invitation to participate in the study, a signed informed consent form will be required.

To assure the safety, all the participants are reminded that the information sent out to them, whether via pamphlet or via WeChat, is useful for them to improve the quality of perioperative life. They do not need to be nervous if they have difficulties processing all the information. They are free to launch a video chat or a phone

call for real-time help when necessary. In emergency situations, a phone call to city emergency line 120 is the recommended priority approach.

To ensure security and confidentiality, all patients were numbered according to the appointment order, and no identifiers were used in the data sheets. The data sheets containing the patient's identification numbers and personal information and the data sheets containing the patient's identification numbers and indices were stored separately. All hard data storage and the laboratory laptop were encrypted as per the West China Hospital (WCH) policy and stored in locked cabinets in the laboratory. The data were stored on a password-protected, double-encrypted, secure server. The de-identified data will be destroyed 5 years after publication.

Data collection

The participants in the intervention group completed all the electronic questionnaires via WeChat. The investigators were allowed to sign into the app and export the data. The participants in the control group completed all the prepared questionnaires, and they were provided to them before discharge. The questionnaires were mailed back to the investigators.

Statistical analysis

Data are analysed using SPSS V.20.0. Statistical significance was set at $p \leq 0.05$. All continuous variables are tested for normality. For normally distributed data, these are expressed as means and SD, and the t-test is used. For non-normally distributed data, these are presented as median and IQR, and Mann-Whitney U test is used. The enumeration data are presented as number or percentage, and χ^2 test is used. The data are analysed following the intention-to-treat principles.

DISCUSSION

There is an enormous imbalance between the rapid development of day surgery and the current conventional medical services. Hence, an effective day surgery management mode should be developed to constantly follow up patients both preoperatively and postoperatively.

In this study, WeChat is chosen as the platform. Multi-departments are involved to set up the new mode. We consult with many experts from multidepartments who are experienced in their own fields. They envisage the common perioperative needs of patients in their respective professional fields and provide answers to common questions. The information sent out to the patients is designed following their suggestions. All patients volunteer to participate in the study, and signed informed consent is obtained before they are included.

The staff that use this new mode for day surgery management are composed of 15 healthcare workers, including 6 nurses, 5 anaesthesiologists, 3 surgeons and 1 psychologist. The detailed information about the study, including the objects, benefits and risks, and privacy

assurance, is introduced to the patients by the nurse when they come to day surgery centre for appointment. If the patient agrees to participate in the study, the nurse will assess the patient eligibility. The nurse is responsible for health education and guidance of self-nursing at home. The anaesthesiologist is responsible for preoperative assessment and treatment of the postoperative pain, nausea and vomiting. The surgeon is responsible for treatment of postoperative complications. The psychologist is responsible for psychological support. Briefly, the healthcare staff can easily follow up the patient reading the retrieved data, while the patients' self-care capability is enhanced via the app. When the patient calls for a real-time consult, it is first answered by a surgeon in charge of the daytime operation ward, considering that most of the perioperative problems are surgery-related problems. If the surgeon cannot answer the question, he will transfer the patient to the doctor or nurse in relevant departments.

Patients' personal information is sent through this app based on the medical history of the patient and the type of surgery at different time points preoperatively and postoperatively. The healthcare worker can follow up the patient and obtain clinical data by simply signing into the app. The patient and the healthcare worker can also engage in video or voice chats via the app when necessary. It was anticipated that this app can be used to follow up the patient throughout the whole process, improve the patient's self-management ability and provide timely online medical consultations. Consequently, it was developed to decrease the day surgery case cancellation and unplanned readmission rates after discharge, which cause serious medical resource waste,³⁷ and to improve the rates of patient recovery from surgery.

The QoR scores correlated well with patient satisfaction scores, confirming convergent validity.^{38 39} The QoR-9 Scale is a simple instrument containing nine questions to evaluate postoperative changes in emotion, well-being, social function and physical disability. It has been proven to have good validity and reliability, including convergent validity, discriminant construct validity, inter-rater agreement, test-retest reliability and internal consistency.⁴⁰ At the same time, the QoR-9 Scale is easier and more feasible for the patient (only about 2 min required to finish the questions). Thus, it is the most frequently used tool for measuring health-related quality of life after anaesthesia and surgery.^{41 42}

The QoR-9 score, the incidence of wound infection, the level of pain and the incidence of postoperative complication are taken as the secondary outcomes regarding the patient clinical outcome. Besides, 'the recovery day' is also taken as one of the secondary outcomes, though it is not a completely objective index, since the new mode is based on the Orem self-care theory. The recovery day is identified as the day the patient feels recovered, which means the patient can take care of himself or herself and return to work. It is considered to reflect the patient brief self-access of the general health status.^{43 44}

However, the participants, investigators and healthcare workers could not be blinded to the intervention, which was a limitation of this study. On the other hand, the results could not be applicable to all patients, since the patients who refuse to participate in the study might potentially be resistant to the new management mode based on the app, while the elderly might have difficulties adapting to the new management. We hope to include these patients in future study, if the new management mode is proven to be effective. Overall, the results of this study indicate the feasibility and effectiveness of the new day surgery management mode based on the app.

Trial status

This trial was registered in the China Registry of Clinical Trials (ChiCTR2100050793). Recruitment will begin on 2 January 2022. The recruitment of participants is expected to end by 2 July 2023.

Contributors All authors were involved in the concept and design of the study. XD designed the study. YS and XD drafted the manuscript. SW and YL provided valuable revisions. JY helped to revise the manuscript and the language editing. All authors read and approved the final version of the manuscript.

Funding Supported by grants to XD from the National Natural Science Foundation of China (no. 72074162).

Disclaimer The funding sources had no role in the design of the study and writing of this manuscript and will not have any role during its execution, analyses, interpretation of the data or decision to submit results.

Competing interests None declared.

Patient and public involvement Patients and/or the public were not involved in the design, or conduct, or reporting, or dissemination plans of this research.

Patient consent for publication Obtained.

Provenance and peer review Not commissioned; externally peer reviewed.

Open access This is an open access article distributed in accordance with the Creative Commons Attribution Non Commercial (CC BY-NC 4.0) license, which permits others to distribute, remix, adapt, build upon this work non-commercially, and license their derivative works on different terms, provided the original work is properly cited, appropriate credit is given, any changes made indicated, and the use is non-commercial. See: <http://creativecommons.org/licenses/by-nc/4.0/>.

ORCID iD

Yun Shi <http://orcid.org/0000-0002-4628-4112>

REFERENCES

- Jiang L, Houston R, Li C, *et al*. Day surgery program at West China Hospital: exploring the initial experience. *Cureus* 2020;12:e8961.
- Yan L, Rong F, Gao M, *et al*. Complications and feasibility analysis of ambulatory surgery for gynecological diseases in China. *Medicine* 2021;100:e23995.
- Goldfarb CA, Bansal A, Brophy RH. Ambulatory surgical centers: a review of complications and adverse events. *J Am Acad Orthop Surg* 2017;25:12–22.
- Glass PSA. The future and safety of ambulatory surgery. *Southern African Journal of Anaesthesia and Analgesia* 2014;20:59–61.
- Gilmartin J, Wright K. The nurse's role in day surgery: a literature review. *Int Nurs Rev* 2007;54:183–90.
- Skattum JEB, Trondsen E, Mjland O. Outpatient laparoscopic surgery: feasibility and consequences for education and health care costs. *Surg Endosc* 2014;18:796–801.
- Mitchell M. Day surgery nurses' selection of patient preoperative information. *J Clin Nurs* 2017;26:225–37.
- Tang M-Y, Li Z-C, Dai Y, *et al*. What kind of a mobile health APP do patients truly want? A pilot study among ambulatory surgery patients. *Patient Prefer Adherence* 2019;13:2039–46.

- 9 Deng X, Liang S, Li H, *et al.* A cross-sectional study to assess the difference in perception of day surgery information between patients and medical staff in China. *Patient Prefer Adherence* 2019;13:381–7.
- 10 Pavlin DJ, Chen C, Penaloza DA, *et al.* Pain as a factor complicating recovery and discharge after ambulatory surgery. *Anesth Analg* 2002;95:627–34.
- 11 Jaensson M, Dahlberg K, Nilsson U. Factors influencing day surgery patients' quality of postoperative recovery and satisfaction with recovery: a narrative review. *Perioper Med* 2019;8:3.
- 12 Mitchell M. General anaesthesia and day-case patient anxiety. *J Adv Nurs* 2010;66:1059–71.
- 13 Salzmann S, Rienmüller S, Kampmann S, *et al.* Preoperative anxiety and its association with patients' desire for support – an observational study in adults. *BMC Anesthesiol* 2021;21:149.
- 14 Gilmartin J, Wright K. Day surgery: patients' felt abandoned during the preoperative wait. *J Clin Nurs* 2008;17:2418–25.
- 15 Gobbo M, Saldaña R, Rodríguez M, *et al.* Patients' experience and needs during perioperative care: a focus group study. *Patient Prefer Adherence* 2020;14:891–902.
- 16 Cho H-S, Lee YS, Lee SG, *et al.* Reasons for surgery cancellation in a general Hospital: a 10-year study. *Int J Environ Res Public Health* 2018;16. doi:10.3390/ijerph16010007. [Epub ahead of print: 20 12 2018].
- 17 Alves EC, Oliveira J, Ginestal M, *et al.* Cancellation on the day of surgery in an ambulatory setting due to patient factors: a preliminary study. *Acta Med Port* 2021;34:708–9. doi:10.20344/amp.16573
- 18 Gaucher S, Boutron I, Marchand-Maillet F, *et al.* Assessment of a standardized pre-operative telephone checklist designed to avoid late cancellation of ambulatory surgery: the AMBUPROG multicenter randomized controlled trial. *PLoS One* 2016;11:e0147194.
- 19 Hoffman AS, Matlow A, Shroff M, *et al.* Factors impacting same-day cancellation of outpatient pediatric magnetic resonance imaging under anesthesia. *Pediatr Radiol* 2015;45:99–107.
- 20 Haufler K, Harrington M. Using nurse-to-patient telephone calls to reduce day-of-surgery cancellations. *Aorn J* 2011;94:19–26.
- 21 MingJun H, Yan D, JiPing L, *et al.* Thirty-Day unplanned readmission after ambulatory laparoscopic cholecystectomy in Western China: a retrospective study. *Cureus* 2021;13:e13932.
- 22 Coley KC, Williams BA, DaPos SV, *et al.* Retrospective evaluation of unanticipated admissions and readmissions after same day surgery and associated costs. *J Clin Anesth* 2002;14:349–53.
- 23 Semple JL, Sharpe S, Murnaghan ML, *et al.* Using a mobile APP for monitoring post-operative quality of recovery of patients at home: a feasibility study. *JMIR Mhealth Uhealth* 2015;3:e18.
- 24 Newell S, Jordan Z. The patient experience of patient-centered communication with nurses in the hospital setting: a qualitative systematic review protocol. *JBIG Database System Rev Implement Rep* 2015;13:76–87.
- 25 Wongkietkachorn A, Wongkietkachorn N, Rhunsiri P. Preoperative needs-based education to reduce anxiety, increase satisfaction, and decrease time spent in day surgery: a randomized controlled trial. *World J Surg* 2018;42:666–74.
- 26 Granziera E, Guglieri I, Del Bianco P, *et al.* A multidisciplinary approach to improve preoperative understanding and reduce anxiety: a randomised study. *Eur J Anaesthesiol* 2013;30:734–42.
- 27 Lloyd GM, Kirby R, Hemingway DM, *et al.* The rapid protocol enhances patient recovery after both laparoscopic and open colorectal resections. *Surg Endosc* 2010;24:1434–9.
- 28 Ortiz J, Wang S, Elayda MA, *et al.* [Preoperative patient education: can we improve satisfaction and reduce anxiety?]. *Rev Bras Anesthesiol* 2015;65:7–13.
- 29 Wiseman JT, Fernandes-Taylor S, Barnes ML, *et al.* Conceptualizing smartphone use in outpatient wound assessment: patients' and caregivers' willingness to use technology. *J Surg Res* 2015;198:245–51.
- 30 Liguori S, Stacchini M, Ciofi D, *et al.* Effectiveness of an APP for reducing preoperative anxiety in children: a randomized clinical trial. *JAMA Pediatr* 2016;170:e160533.
- 31 Martin LA, Finlayson SRG, Brooke BS. Patient preparation for transitions of surgical care: is failing to prepare surgical patients preparing them to fail? *World J Surg* 2017;41:1447–53.
- 32 Deng X, Wang Y, Zhu T, *et al.* Short message service (SMS) can enhance compliance and reduce cancellations in a sedation gastrointestinal endoscopy center: a prospective randomized controlled trial. *J Med Syst* 2015;39:169.
- 33 Chen X, Zhou X, Li H, *et al.* The value of WeChat application in chronic diseases management in China. *Comput Methods Programs Biomed* 2020;196:105710.
- 34 Li X, Li T, Chen J, *et al.* A WeChat-Based self-management intervention for community middle-aged and elderly adults with hypertension in Guangzhou, China: a cluster-randomized controlled trial. *Int J Environ Res Public Health* 2019;16. doi:10.3390/ijerph16214058. [Epub ahead of print: 23 Oct 2019].
- 35 Zhang X, Chen X, Kourkoumelis N, *et al.* A social Media-Promoted educational community of joint replacement patients using the WeChat APP: survey study. *JMIR Mhealth Uhealth* 2021;9:e18763.
- 36 Montag C, Becker B, Gan C. The multipurpose application WeChat: a review on recent research. *Front Psychol* 2018;9:2247.
- 37 Henderson BA, Naveiras M, Butler N, *et al.* Incidence and causes of ocular surgery cancellations in an ambulatory surgical center. *J Cataract Refract Surg* 2006;32:95–102.
- 38 Chan MTV, Lo CCK, Lok CKW, *et al.* Psychometric testing of the Chinese quality of recovery score. *Anesth Analg* 2008;107:1189–95.
- 39 Anetsberger A, Blobner M, Krautheim V, *et al.* Self-Reported, structured measures of recovery to detect postoperative morbidity. *PLoS One* 2015;10:e0133871.
- 40 Myles PS, Hunt JO, Nightingale CE, *et al.* Development and psychometric testing of a quality of recovery score after general anesthesia and surgery in adults. *Anesth Analg* 1999;88:83–90.
- 41 Saal D, Heidegger T, Nuebling M, *et al.* Does a postoperative visit increase patient satisfaction with anaesthesia care? *Br J Anaesth* 2011;107:703–9.
- 42 Herrera FJ, Wong J, Chung F. A systematic review of postoperative recovery outcomes measurements after ambulatory surgery. *Anesth Analg* 2007;105:63–9.
- 43 Tamhankar AP, Mazari F, Olubaniyi J, *et al.* Postoperative symptoms, after-care, and return to routine activity after laparoscopic cholecystectomy. *JLS* 2010;14:484–9.
- 44 Vonk Noordegraaf A, Anema JR, Louwse MD, *et al.* Prediction of time to return to work after gynaecological surgery: a prospective cohort study in the Netherlands. *BJOG* 2014;121:487–97.