

Construction of the Whole Process Management System of Day Surgery Based on the SaaS Model in the Context of the Medical Association

Xiaojuan Huang, Ping Lai, Yan Wu, Chulei Ji, Xianjie Zhang*

Anesthesia and Surgery Center, Deyang People's Hospital, Deyang, Sichuan, China.

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***Corresponding author:** Xianjie Zhang, Anesthesia and Surgery Center, Deyang People's Hospital, Deyang, Sichuan, China.

Abstract

Objective: To construct a whole-process management system for day surgery based on the SaaS model within the medical association context, and provide a theoretical basis for the high-quality development of day surgery. **Methods:** Based on literature research and survey research, the first draft of the SaaS-based full-process management system for day surgery in the context of medical consortium was prepared. The Delphi method was used to determine the full-process management system for day surgery based on the SaaS model in the context of the medical consortium after the experts' correspondence. **Results:** A total of two rounds of expert correspondence consultation were conducted. The positive degree of experts was 100.00%, and the expert authority coefficient was 0.834 and 0.864. The Kendall harmony coefficient of expert opinion was 0.170 and 0.175 ($p < 0.05$). The SaaS model-based whole-process management system of day surgery under the background of medical association includes seven first-level indicators, 17 second-level indicators, and 67 third-level indicators. **Conclusion:** The whole process management system of day surgery based on the SaaS model under the medical association's background, constructed using the Delphi method, is scientific and reliable. It can provide reference for the masses to offer professional, standardized, and homogenized medical care services.

Keywords

Day surgery, Whole process management, SaaS model, Medical association

Introduction

Day surgery is defined as an operation in which the patient's admission, surgery, and discharge are completed within a single working day (24 hours), excluding outpatient surgery, and the extended discharge of special patients within 48 hours [1]. The Opinions of the General Office of the State Council on Promoting the High-Quality Development of Public Medical Institutions place particular emphasis on day surgery, calling for medical institutions to expedite the implementation of day surgery in order to better cater to the needs of patients. Furthermore, it emphasizes the necessity to render this type of surgery safer and more efficient through scientific management, precise diagnosis, delicate treatment, and effective monitoring and evaluation [1, 2]. However, at present, the management of day surgery in China's medical institutions is complicated and not yet unified. The Software as a Service (SaaS) model, aimed at utilizing Internet technology, allows enterprises to easily provide consumers with high-quality wireless access nodes. The enterprise can install various programs on the service platform within the company to cater to the different needs of consumers. Consumers can choose different programs and use them in different ways to enjoy a

more convenient service experience [3]. By adopting the SaaS model, the expenses of primary hospitals can be greatly reduced, which is undoubtedly a highly valuable solution. Against this backdrop, we will examine the current medical information environment and future development trends, and based on these findings, we will optimize the hospital's operation model by implementing scientific and technological measures. This will enable us to achieve better quality of care, better adapt to the needs of human health, and enable more people to access better treatment.

1. Methods: Construction of the whole process management system of day surgery based on the SaaS model in the context of the medical association

1.1 Preparation of correspondence questionnaires

1.1.1 Literature review

The literature review includes “Internet +”, “Day surgery”, “Whole process management”, “SaaS model”, “Medical association” and other search terms were used to search common databases at home and abroad, including CNKI, Wanfang database, VIP database, PubMed, Web of Science, CINAHL.

1.1.2 Semi-structured interviews

The purposeful sampling method was used to conduct semi-structured interviews with patients from the day surgery centers of three hospitals in the Sichuan region, administrators of the primary hospitals within the hospital consortium, and healthcare personnel involved in day surgery. After pre-interview and group discussion, the outline of the interview was determined: (1) Please discuss the importance of managing the entire process of day surgery. (2) What do you believe are the indicators of whole process management in day surgery? Please share your thoughts in detail. (3) What is the significance of developing this system for day surgery?

1.1.3 Interview process quality control

The researcher includes nursing and anesthesia master's degree students, and the research direction is qualitative research. The researchers have mastered the basic methods of qualitative research and interview skills. The whole research process uses the ensemble method to reduce the Hawthorne effect, and reflective records are written after each interview to analyze and improve the effect of subsequent interviews. In time, the audio-recorded data, along with the non-verbal behavioral data, are converted into textual data to ensure the authenticity of the data.

1.1.4 Formulating the first draft of the full-process management system for day surgery based on the SaaS model in the context of the medical association

After the literature review and semi-structured interviews, the group preliminarily formulated the full-process management system into 7 first-level indicators, 17 second-level indicators, and 56 third-level indicators following discussion. The first round of correspondence questionnaire was divided into three parts. These are the introduction, which introduces the background, significance, methodology, precautions for filling in the questionnaire, and contact information; the general information of the experts, including gender, age, education level, title, familiarity with the content of the study, and the basis for judgment; and the main text of the questionnaire, which includes the detailed indicators and an explanation of the way to judge the importance of the indicators.

1.2 Expert Correspondence

1.2.1 Selection of experts

According to the Delphi method expert selection principle, experts must be people with rich practical and theoretical experience in their specialty or related specialties [4]. Inclusion criteria: having more than 10 years of management experience in day surgery; having a master's degree or higher, and having a high level of professionalism, actively participating in this study, being able to give timely feedback on the findings, and giving a satisfactory response. Exclusion criteria: those who withdrew from the study in the middle of the study or recovered incomplete information from the questionnaire, and those who were in conflict with the expert's subject.

1.2.2 Implementation of expert correspondents

The questionnaires were distributed by email from June to December 2023, and they were collected within two weeks to one month. After the first round of correspondence questionnaires were collected, the group members were organized to sort and analyze them. After the group discussion, the indicators were adjusted according to the screening criteria of the indicators to form the second round of correspondence questionnaires. Based on the results of the second round of inquiries, the indicators were further discussed and revised. After the results of the second round

of correspondence questionnaire were agreed upon by all experts, the correspondence questionnaire was stopped, and the whole process management system of day surgery based on the SaaS model in the context of medical association was formed. The criteria for the screening of indicators were: (1) The mean of importance assignment ≥ 3.50 points; (2) The coefficient of variation < 0.25 ; (3) The full score rate $> 60\%$ [5].

1.3 Statistical analysis

Data were entered using Epidate 3.1, and the results were statistically processed using SPSS 27.0 statistical analysis application software. The statistics included mean, standard deviation, frequency, probability. The results of statistical processing were based on Kendall's W and its associated coefficient of variation to reflect the experts' enthusiasm for participation, level of recognition, and the impact on the results.

2. Results

2.1 General information of experts

A total of fifteen experts, including five males and ten females, from three hospitals of the medical association in the Sichuan region participated in this study. Among them, twelve had a master's degree, three had a doctoral degree; nine were associate senior physicians, and six were full senior physicians; in terms of years of experience in this specialty, three had 10-15 years, five had 16-20 years, three had 21-25 years, and four had over 25 years; their work fields included four-day surgery doctors, five-day surgery nurses, and six-day surgery managers.

2.2 Degree of motivation and authority of experts

Fifteen questionnaires were distributed in each of the two rounds of correspondence, with a 100% recovery rate, indicating a high degree of motivation among the experts. The degree of authority of the experts was expressed by the coefficient of expert authority (Cr), which was determined by two factors: the basis of judgment of the expert on the issue and the expert's familiarity with the issue. The basis of judgment is expressed in Ca, and the degree of familiarity is expressed in Cs. The expert authority coefficient $Cr = (Ca + Cs)/2$. It is generally considered that the research results are reliable if the expert authority coefficient Cr is greater than or equal to 0.7. After two rounds of correspondence, the authority coefficient of experts increased to 0.834 and 0.864, respectively.

2.3 Degree of harmonization of experts' opinions

It is typically conveyed through the coefficient of variation and Kendall's harmony coefficient. After two rounds of expert consultation, a consensus conclusion was ultimately reached (Table 1).

Table 1. Degree of harmonization of expert advice

Rounds	Coefficient of variation	Kendall's harmony coefficient	χ^2 value	P
First round	0.000~0.112	0.170	196.899	<0.001
Second round	0.000~0.110	0.175	236.720	<0.001

2.4 Results of expert consultation

According to the screening criteria of the indicators, and taking into account the opinions of the experts, the research team decided to make the following changes to the indicators: There are no changes in the primary indicators; there are no changes in the secondary indicators; in the tertiary indicators, the phrase "nurses in day wards remind patients by telephone of the precautions to be taken for surgery and related publicity on the day before the surgery" is replaced by "patients are reminded by telephone of the precautions to be taken for surgery and related publicity on the day before the surgery"; and "precautions related to pipeline self-care" is replaced by "precautions related to pipeline care". The tertiary indicators increased the "willingness and ability to complete post-discharge care", "kidney function", "abdominal color ultrasound", "CT", "small risk of airway damage", "postoperative pain can be relieved by oral medication", "appointment person", "appointment date", "doctor in charge", "pressure ulcer risk and preventive measures", "fall and fall risk and preventive measures", "VTE risk and preventive measures", "burn risk and preventive measures", deleted "blood gas analysis", "use of bed linen unit facilities".

The finalized whole-process management system of day surgery based on the SaaS model in the context of

medical association contains 7 primary indicators, 17 secondary indicators, and 67 tertiary indicators, as shown in Table 2.

Table 2. The whole process management system of day surgery based on the SaaS model in the context of medical association

Indicators	Significance ($\bar{x} \pm s$, points)	Coefficient of variation
1 outpatient initial screening	5.00±0.00	0.000
1.1 the condition is not complicated and the physical condition is good	4.87±0.34	0.070
1.1.1 conscious, no psychiatric history	5.00±0.00	0.000
1.1.2 non-general anesthesia surgery: ASA grade I-II, ASA grade III but stable systemic condition for more than three months	5.00±0.00	0.000
1.1.3 surgery under general anesthesia: ASA grade I-II, age under 65 years	5.00±0.00	0.000
1.1.4 meet the relevant requirements of surgery for each disease	4.87±0.34	0.070
1.2 the service radius is small	4.80±0.40	0.083
1.2.1 willing to undergo day surgery	5.00±0.00	0.000
1.2.2 understand and recognize the operation and anesthesia method	5.00±0.00	0.000
1.2.3 patients and their family members understand the contents of perioperative care	4.80±0.40	0.083
1.2.4 willing and able to complete post-discharge care	4.80±0.40	0.083
2 pre-operative examination	5.00±0.00	0.000
2.1 laboratory examination	5.00±0.00	0.000
2.1.1 routine blood test	5.00±0.00	0.000
2.1.2 coagulation function ; blood clotting function	5.00±0.00	0.000
2.1.3 routine urianlysis	4.74±0.44	0.093
2.1.4 liver function	5.00±0.00	0.000
2.1.5 renal function	5.00±0.00	0.000
2.2 accessory examination	4.93±0.25	0.051
2.2.1 electrocardiographic examination	5.00±0.00	0.000
2.2.2 chest X-ray	5.00±0.00	0.000
2.2.3 abdominal ultrasound	4.53±0.50	0.110
2.2.4 CT	4.67±0.47	0.101
3 surgical evaluation	5.00±0.00	0.000
3.1 low risk	5.00±0.00	0.000
3.1.1 clear clinical diagnosis	5.00±0.00	0.000
3.1.2 the medical institution has carried out mature surgical procedures	5.00±0.00	0.000
3.1.3 surgery is expected to take less than 2 hours	4.80±0.40	0.083
3.1.4 low risk of perioperative bleeding	4.93±0.25	0.051
3.1.5 low risk of airway damage	4.87±0.34	0.070
3.2 fast recovery, high safety	4.87±0.34	0.070
3.2.1 postoperative pain can be relieved with oral medication	4.60±0.49	0.107
3.2.2 able to resume diet quickly	4.87±0.34	0.070

3.2.3 no special post-operative care is required	4.80±0.40	0.083
3.2.4 brief recovery after surgery can meet the discharge criteria	5.00±0.00	0.000
4 day surgery appointment registration	4.93±0.25	0.051
4.1 registration according to the surgery schedule	4.93±0.25	0.051
4.1.1 reservationist	4.67±0.47	0.101
4.1.2 reservation date	4.80±0.40	0.083
4.1.3 schedule a surgery appointment	5.00±0.00	0.000
4.1.4 patient-related information	5.00±0.00	0.000
4.1.5 surgeon	5.00±0.00	0.000
4.2 fill out the reservation form	4.80±0.40	0.083
4.2.1 the appointment form indicates the date and time of the proposed surgery	4.93±0.25	0.051
4.2.2 phone the day before the operation to remind the patient of the operation precautions and related education	4.93±0.25	0.051
5 health education	5.00±0.00	0.000
5.1 admission education	5.00±0.00	0.000
5.1.1 day hospitalization process	4.73±0.44	0.093
5.1.2 charge nurse	4.53±0.50	0.110
5.1.3 medical doctor in charge	4.93±0.25	0.051
5.1.4 ward environment	4.87±0.34	0.070
5.1.5 hospitalization, companionship system	4.93±0.25	0.051
5.2 dietary education	4.80±0.40	0.083
5.2.1 dietary structure	4.60±0.49	0.107
5.2.2 dietary precautions	4.93±0.25	0.051
5.3 medication education	5.00±0.00	0.000
5.3.1 role of drugs	4.87±0.34	0.070
5.3.2 precautions for medication	4.87±0.34	0.070
5.4 physical activity education	4.93±0.25	0.051
5.4.1 precautions for physical activity	4.93±0.25	0.051
5.4.2 the "trilogy" of first get-out-of-bed activities	5.00±0.00	0.000
5.5 specialist education	5.00±0.00	0.000
5.5.1 objective and precautions of treatment measures	5.00±0.00	0.000
5.5.2 focused rehabilitation knowledge for specialized diseases	4.87±0.34	0.070
5.5.3 considerations related to plumbing care	5.00±0.00	0.000
5.5.4 correct expression of pain classification	4.53±0.50	0.110
5.5.5 pressure ulcer risks and preventive measures	5.00±0.00	0.000
5.5.6 risk of falling out of bed and preventive measures	5.00±0.00	0.000
5.5.7 VTE risks and preventive measures	5.00±0.00	0.000
5.5.8 risks of burns and scalds and preventive measures	4.86±0.34	0.070

6 admission criteria for surgeons and anesthesiologists	5.00±0.00	0.000
6.1 capable	5.00±0.00	0.000
6.1.1 appointed to the title of attending physician for 3 years or more	5.00±0.00	0.000
6.1.2 qualified to operate at the appropriate level of surgery	5.00±0.00	0.000
6.1.3 skilled in relevant surgical procedures	5.00±0.00	0.000
6.1.4 served as lead surgeon for more than 100 patients or as first assistant for more than 200 patients	5.00±0.00	0.000
6.2 strong doctor-patient communication skills	4.80±0.40	0.083
6.2.1 possess good medical ethics	5.00±0.00	0.000
6.2.2 strong doctor-patient communication skills	4.80±0.40	0.083
7 postoperative rehabilitation and follow up	4.93±0.25	0.051
7.1 rehabilitation measures	4.93±0.25	0.051
7.1.1 wound care	5.00±0.00	0.000
7.1.2 pain management	4.87±0.34	0.070
7.1.3 activity and exercise	5.00±0.00	0.000
7.1.4 healthy diet	4.67±0.47	0.101
7.2 follow up	4.80±0.40	0.083
7.2.1 therapeutic effect	4.93±0.25	0.051
7.2.2 change of the illness	4.93±0.25	0.051
7.2.3 status of recovery	4.93±0.25	0.051
7.2.4 timing of follow-up appointments	4.80±0.40	0.083
7.2.5 satisfaction with medical results	5.00±0.00	0.000

3. Discussion

3.1 The constructed full-process management system of day surgery based on the SaaS model in the context of medical association is scientific and reliable

In this study, the first draft of the full-process management system for day surgery based on the SaaS model in the context of medical associations was constructed by combining literature review, group discussion, and semi-structured interview methods. Based on this foundation, after two rounds of Delphi expert correspondence, following the screening principle of indicators, and after group discussion, the indicators formed during the two rounds of correspondence were added, modified, and deleted. Finally, a formal full-process management system for day surgery based on the SaaS model in the context of a healthcare consortium was formed. The hierarchical analysis method was used to analyze the importance of each indicator, and the expert's judgment result was quantified to determine the weight of each indicator. As a result, the entire research process had a certain degree of scientificity [6].

Among the 15 experts invited in this study, 80% had worked for more than 15 years, all of whom had master's degrees or above, and 100% had associate senior professional titles or above, indicating that the experts had a high-comprehensive quality. The recovery rate of the questionnaires in the two rounds of expert consultation was 100%, and a total of 23 textual suggestions were put forward, indicating that the experts had a high degree of positivity. The authority degree of experts was more than 0.7, indicating that the authority of experts was high. The coefficient of variation of each index of the two rounds of expert consultation was less than 0.25, and the Kendall harmony coefficients of expert opinions were 0.834 and 0.864, respectively (all indicating that the experts finally reached a consensus after two rounds of consultation, and the degree of coordination was high. The above results show that the whole process management system of day surgery based on the SaaS model in the context of the medical alliance

constructed in this study has a certain reliability.

3.2 The whole process management system of day surgery based on the SaaS model under the background of the medical alliance is more comprehensive and continuous

In this study, a SaaS-based full-process management system for day surgery was constructed by combining relevant government regulations, expert opinions, and several clinical guidelines [7-10]. This system takes into account the uniqueness of the healthcare consortium and the needs of day surgery, including seven key indicators: outpatient screening, preoperative examination, surgical evaluation, day surgery booking and registration, health education, access to surgeons and anesthesiologists, postoperative rehabilitation, and follow-up. The mean importance scores of all indicators are ≥ 4.5 , which is unanimously recognized by experts, reflecting the comprehensiveness and continuity of the content of the whole process management system of day surgery based on the SaaS model in the context of medical associations. Currently, the description of the management content of day surgery is extensive but mainly in general terms, presented in fragmented knowledge, and may involve safety risks such as the omission of diagnostic and therapeutic activities in the implementation process, which is consistent with the results of the study by Lan Xin et al. [11]. On this basis, the whole-process management system of day surgery based on the SaaS model within the healthcare consortium connects each independent diagnostic and treatment activity with standardized language, which is tightly interlocked. This guides day surgery patients and healthcare personnel to work in accordance with the content of the whole-process management system to avoid omission of key diagnostic and treatment activities.

3.3 The SaaS-based full-process management system for day surgery in the context of the medical consortium helps to homogenize the work of day surgery and improve the quality of medical care in day surgery

Full-process management is the standardization of management processes, which can guarantee that all staff members complete their work according to the same specialized, standardized, and homogenized processes [12]. The whole-process management system of day surgery based on the SaaS model in the context of healthcare consortium refines the diagnostic and treatment service activities of day surgery medical and nursing staff so that the staff of primary hospitals in the consortium can refer to the contents of the whole-process of day surgery in order to achieve the homogenization and standardization of the management of day surgery in healthcare consortium. The whole-process management system of day surgery based on the SaaS model in the context of the healthcare consortium constructed in this study is scientific and reliable, and it can provide a reference for the general public to provide specialized, standardized, and homogenized medical care services.

4. Conclusion

The whole-process management system of day surgery based on the SaaS model in the context of the medical association constructed by this study through literature research, comparative analysis, questionnaires, semi-structured interviews, and expert correspondence is scientific and comprehensive. This system is conducive to guiding the staff of day surgery to carry out clinical medical care in a high-efficiency and homogeneous manner, and to ensure the high-quality, specialized, and continuity of patients' medical services. However, no clinical empirical study has been conducted yet. The next step will be to actively improve the whole process management system of day surgery, enrich the content of the whole process management of day surgery with standardized text steps and vivid pictures, and provide a high-quality management process for the development of day surgery.

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