

Original Article

Impact of fast-track surgery-oriented care pathways on perioperative rehabilitation indices in patients undergoing radical prostatectomy for prostate cancer

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Abstract: Objective: This study was conducted to evaluate the effects of Fast-Track Surgery (FTS)-oriented care pathways on perioperative rehabilitation indicators in patients undergoing radical prostatectomy for prostate cancer. Methods: The clinical data of 120 patients admitted to Sichuan Cancer Hospital & Institute who underwent radical prostatectomy for prostate cancer from September 2020 to October 2022 were collected and retrospectively analyzed. The patients were divided into a control group (n=60, receiving standard care) and an FTS group (n=60 patients receiving FTS-oriented care) according to different nursing methods. The perioperative rehabilitation indices were compared between the groups. Results: The FTS group exhibited shorter hospitalization duration ($P=0.001$), postoperative anal exhaust time ($P=0.012$), drain removal time ($P=0.007$), gastrointestinal recovery time ($P=0.008$), and a lower total complication rate ($P=0.016$) compared to the control group. The scores of Visual Analog Scale (VAS) ($P=0.001$, $P=0.003$, $P=0.015$) and Activities of Daily Living (ADL) ($P=0.011$, $P=0.005$, $P=0.007$) at 24, 48, and 72 hours postoperatively were significantly lower in the FTS group than in the control group. Hospitalization cost ($P=0.002$) and medication expenses ($P=0.016$) were notably lower in the FTS group. During a 12-month follow-up, the FTS group showed a significantly lower complication rates (3.33%) compared to the control group (18.33%) ($P=0.009$). Conclusion: The application of FTS-oriented nursing pathway in patients undergoing radical prostatectomy for prostate cancer significantly enhances postoperative rehabilitation, reduces pain, lowers hospitalization and medication costs, and improves postoperative quality of life, which contributes positively to the nurse-patient relationship and patient outcome.

Keywords: Accelerated rehabilitation, fast-track surgery-oriented nursing pathway, prostate cancer, radical prostatectomy, perioperative rehabilitation indices, pain management, quality of life

Introduction

Prostate cancer is a malignant epithelial tumor that occurs in the prostate, predominantly affecting elderly men and exhibiting a higher incidence in developed regions such as Europe and North America [1]. In 2008, the number of new cases of prostate cancer worldwide reached 914,000 cases, accounting for 13.8% of the total numbers of malignant tumors in men, with an incidence rate of 28.5 cases per 100,000 and a mortality rate of 7.5 per 100,000, which is ranked the second most common tumor in men. In 2012, there were 1.112 million new cases of prostate cancer

worldwide, accounting for 15% of all malignant tumors in men [2].

A study conducted in China indicated that the incidence of prostate cancer in 2012 was 9.92 per 100,000, ranking sixth in incidence of malignant tumors in Chinese men, and second in malignant tumors in the genitourinary system. The incidence of prostate cancer in China increases gradually after 55 years of age, with 70-80 as the peak age group [3]. Recent epidemiological analyses revealed an annual increase in the incidence of prostate cancer in China, along with a trend toward younger age [4].

Effects of FTS-oriented care pathways

Proactive surgery is crucial for enhancing the prognosis of patients with prostate cancer. Concurrently, refined patient care plays a pivotal role in prognosis improvement. However, conventional measures in prostate cancer care primarily emphasize the reduction of complication incidence, with limited focus on the perioperative recovery process [5, 6]. The Accelerated Rehabilitation Surgery (ARS), commonly referred to as Fast-Track Surgery (FTS)-oriented care pathway, has emerged as a progressive nursing model. The aim of this approach is to mitigate postoperative stress and trauma through a comprehensive array of perioperative treatments and interventions, thereby expediting the postoperative recovery process and enhancing patient prognosis [7].

The FTS concept, rooted in evidence-based medicine, was initially proposed by the Danish surgeon Kehlet. This model was adopted earlier in nursing interventions in European and American countries. It has been substantiated that the FTS model breaks down the constraints of traditional nursing models, significantly accelerating the postoperative recovery of surgical patients [8]. Radical prostatectomy holds affirmative significance in improving the prognosis of prostate cancer patients, but it causes obvious trauma on patients. Postoperative pain and complications as well as reduction in living ability accentuate the necessity of perioperative rehabilitation in radical prostatectomy patients. Conventional nursing approaches tend to be passive, lacking systematic and holistic care, whereas FTS nursing aptly compensates for the aforementioned deficiencies. Currently, the studies on FTS nursing mode in perioperative interventions for patients undergoing radical prostatectomy are scarce, which to a certain extent restricts the widespread adoption of this nursing measure.

For these reasons, this study retrospectively analyzed the effectiveness of the FTS model in the perioperative care of patients with prostate cancer undergoing radical surgery, centered on postoperative pain and recovery, length of hospitalization, and cost aspects, etc.

Materials and methods

Study design and patient screening

In this retrospective study, the clinical data of the patients who underwent radical prostatec-

tomy for prostate cancer at Sichuan Cancer Hospital & Institute between September 2020 and October 2022 were collated and analyzed. A total of 159 patients were initially screened according to the research period and procedure. According to the inclusion and exclusion criteria, 120 patients were finally included and further divided into a control group (n=60, receiving standard care) and an FTS group (n=60 patients receiving FTS-oriented care) according to different nursing methods. The intervention began on the first day of the patient's admission and continued until the patient's discharge. The study adhered to the principles of the Declaration of Helsinki and was approved by the ethics committee of Sichuan Cancer Hospital & Institute. The research design is shown in **Figure 1**.

Inclusion criteria: Patients had definitive pathological diagnoses and underwent radical prostatectomy in our hospital; Patients with complete demographic and clinical data available in the hospital information system; Patients with comprehensive information on clinical indicators; Patients with detailed records of perioperative complications; Patients who underwent preoperative and postoperative evaluations of pain intensity and quality of life.

Exclusion criteria: Patients with concomitant psychiatric disorders; Patients with other malignant tumors; Patients with severe hepatic or renal dysfunction; Patients with incomplete research data.

Nursing interventions

The specific measures for the FTS group are outlined below: Prior to intervention, healthcare personnel underwent comprehensive group training to ensure a thorough understanding of the FTS-oriented care principles and practices. Preoperative measures involved delivering health education and surgical knowledge to patients. Psychological interventions were tailored according to the patients' psychological states. Nutritional support, including high-calorie diets, high-quality protein, and vitamins, was provided before surgery. Additionally, patients underwent an enema and were equipped with compression stockings preoperatively. Intraoperative interventions included liquid warming and maintenance of body temperature during surgery. Postoperative interventions included elevating the patient's head

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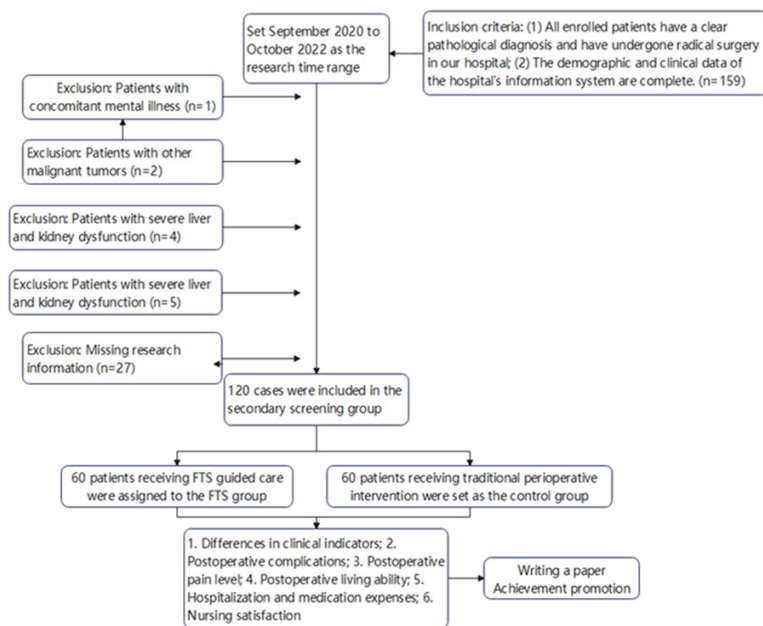


Figure 1. Flow diagram of research design.

with pillows, encouraging a semi-recumbent position on the day of surgery, and vigilant monitoring of the patient's vital signs. Pain management was a key focus, with active pain interventions customized to each patient's specific needs. Preoperative hyperalgesia management was employed, followed by using postoperative analgesia pumps. Pain intensity was actively assessed using a visual analog scale (VAS). Postoperative activities included instructions for the patient to engage in turning over and foot movement exercises 6 hours after surgery. Postoperative dietary measures involved stimulating the patient's dietary intake upon awakening. Chewing gum was used to stimulate salivary secretion and expedite intestinal peristalsis, thereby aiding in the recovery of gastrointestinal function. A small amount of liquid food was given on the first postoperative day, which was increased on the second day, and gradually transitioned to a regular diet [9].

Besides, 60 patients receiving routine care were set as the control group. A liquid diet was adopted on one day before surgery. Patients with acute urinary retention were first catheterized. Rigorous preoperative preparations were undertaken. Postoperatively, patients were instructed to rest in a supine position for 6 hours, followed by resuming normal eating after this period. Routine electrocardiographic moni-

toring was implemented. Additionally, patients received anti-inflammatory and hemostatic treatments as prescribed by the attending physician. Simultaneously, patients were actively provided with comprehensive health education.

Outcome measures

Primary observation indicators: (1) The duration of hospitalization, postoperative anal exhaust time, drain removal time, and gastrointestinal function recovery time were collected and compared between the two groups. (2) The occurrence of complications such as nausea, vomiting, abdominal distension, and incision

infection during the perioperative period was collected and compared between the two groups. (3) Hospitalization costs and medication expenses were gathered and compared between the two groups. (4) The occurrence of long-term complications was followed up in patients from both groups (with October 2023 as the follow-up endpoint), and the incidence rates were compared.

Secondary observation indicators: (1) Pain in the two groups of patients was assessed using VAS [10] before surgery and 24 h, 48 h, and 72 h postoperatively (this scale uses a straight line from 0 to 10 to represent pain intensity, with 0 indicating no pain and 10 indicating severe pain; participants selected a point on the scale to indicate their intensity of pain), and inter-group comparisons were conducted. (2) The Activities of Daily Living (ADL) Scale [11], consisting of 14 items with a total score of 100, was used to evaluate and compare the quality of life of patients in both groups. A higher score on this scale indicates a better quality of life. (3) Patient satisfaction with nursing was assessed at the time of discharge using a customized scale developed by the hospital, and the patient satisfaction was categorized into three levels: very satisfied, satisfied, and dissatisfied with a maximum score of 100 points.

Effects of FTS-oriented care pathways

Table 1. Comparison of patient demographics ($\bar{x} \pm s$)

General clinical data		FTS group (n=60)	Control group (n=60)	t/ χ^2	P
Literacy	Middle school and below	20	15	1.008	0.604
	High school and junior college	32	36		
	College and above	8	9		
Marital status	Married	54	50	1.154	0.283
	Widowed	6	10		
Medical payment methods	Self-pay	7	9	0.686	0.408
	Medical insurance	53	51		
Average age (years)		56.96 \pm 5.69	55.36 \pm 6.98	1.376	0.171
Clinical staging	T1-T2c	12	10	2.051	0.359
	T3a	13	20		
	T3b-T4	35	30		
PSA (ng/ml)		70.59 \pm 15.65	71.51 \pm 16.32	0.315	0.753
Gleason score		6.92 \pm 1.32	6.95 \pm 0.98	0.141	0.888
Body mass index (kg/m ²)		21.63 \pm 2.51	22.01 \pm 2.15	0.891	0.375

FTS: Fast-Track Surgery; PSA: Prostate-Specific Antigen.

Nursing quality assessment

In the assessment of nursing quality, supervision during nursing interventions was conducted by the head nurse to ensure the effective implementation of nursing work. This guaranteed that all nursing activities strictly adhered to the required standards.

To ensure the accuracy and authenticity of data collection and entry, both processes were undertaken by two persons, both of whom had relevant medical qualifications.

Statistical methods

Statistical Package for the Social Sciences (SPSS) version 22.0 was used for data analysis. Measurement data such as age, pain intensity, and ADL scores conformed to a normal distribution and were expressed as mean \pm standard deviation (SD), and the t-test was employed for comparison between groups. Measurement data at different time points were compared by repeated measures ANOVA, followed by post-hoc Bonferroni test. Counting data such as patient satisfaction and complication rates were represented as percentages, and the chi-square test was utilized to examine the differences between groups. A multivariate regression analysis was conducted to determine the impact of nursing factors on clinical outcomes of patients. A *P*-value of less than 0.05 was considered indicative of statistical significance.

Results

Comparison of demographic and clinical data of patients between two groups

The demographic data, including variables such as age, education level, marital status, and healthcare payment method, were collected from the hospital information system for patients in both groups. In addition, clinical data including clinical stage, PSA level, Gleason score, and BMI were also obtained. Comparative analysis between the two groups revealed no statistical differences in these demographic and clinical data (all *P*>0.05), as illustrated in **Table 1**.

Comparison of postoperative rehabilitation outcomes between the two groups

The FTS group exhibited significantly shorter durations of hospitalization, time to postoperative anal exhaust, drain removal, and gastrointestinal function recovery compared to the control group (*P*=0.001, *P*=0.012, *P*=0.007, *P*=0.008). These findings suggest superior postoperative rehabilitation outcomes in the FTS group, as shown in **Figure 2**.

Comparison of postoperative complication incidence between the two groups

There were 4 cases of nausea and vomiting, 8 cases of abdominal distension, and 1 case of incision infection in the FTS group, with a total

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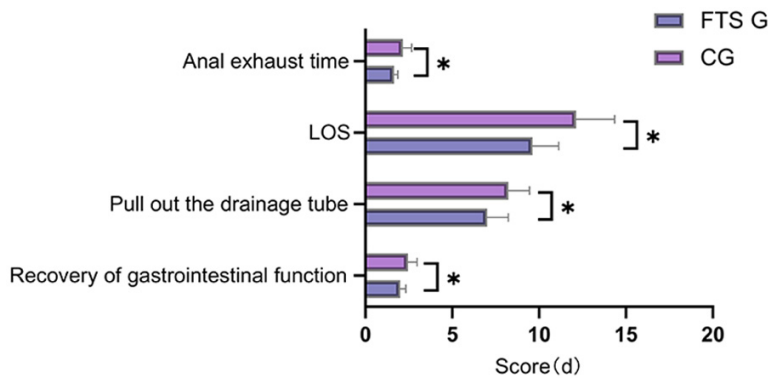


Figure 2. Comparison of clinical indices. The FTS group exhibited significantly shorter duration of hospitalization, time to postoperative anal exhaust, drain removal, and gastrointestinal function recovery compared to the control group. Compared with the control group, * $P < 0.05$. FTS: Fast-Track Surgery.

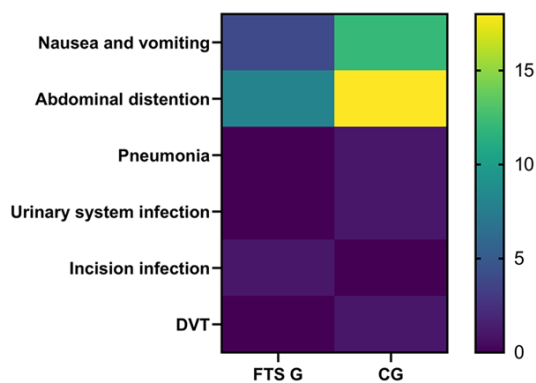


Figure 3. Comparison of postoperative complications between the two the groups. The total incidence of complications in the FTS group was 21.67% (13/60), which was significantly lower than 55.00% (33/60) in the control group ($P < 0.05$). FTS: Fast-Track Surgery.

complication rate of 21.67% (13/60). The control group had 12 cases of nausea and vomiting, 18 cases of abdominal distention, 1 case of lung infection, 1 case of urinary system infection, and 1 case of lower extremity deep vein thrombosis (DVT), resulting in a higher total complication rate of 55.00% (33/60). The difference between the two groups was statistically significant ($P = 0.016$), as indicated in **Figure 3**.

Comparison of postoperative pain intensity between the two groups

VAS was utilized to assess pain before and after surgery, and the results revealed that there was no statistical difference in VAS score between the groups prior to surgery ($P > 0.05$).

However, the VAS scores of patients in the FTS group were significantly lower than those in the control group at 24, 48, and 72 hours postoperatively ($P = 0.001$, $P = 0.003$, $P = 0.015$), as shown in **Figure 4**.

Comparison of postoperative living ability between the two groups

The ADL scale was utilized to assess the quality of life of the patients. There was no significant difference in ADL score between the two groups

before surgery ($P > 0.05$). However, the ADL scores of patients in the FTS group were significantly lower than those in the control group at 24, 48, and 72 hours postoperatively ($P = 0.011$, $P = 0.005$, $P = 0.007$), as illustrated in **Figure 5**.

Comparison of hospitalization and medication costs between the two groups

The intergroup comparison revealed that both the hospitalization costs and medication expenses for patients in the FTS group were significantly lower compared to the control group ($P = 0.002$, $P = 0.016$) (**Figure 6**).

Comparison of patient satisfaction

In the FTS group, there were 50 cases of very satisfied and 10 cases of satisfied, with a total satisfaction rate of 100.00% (60/60). While the control group reported 32 cases of very satisfied, 17 cases of satisfied, and 1 case of dissatisfied, leading to a total satisfaction rate of 98.33% (59/60). The difference in satisfaction rates between the two groups was not statistically significant ($P = 0.102$), as depicted in **Figure 7**.

Comparison of the occurrence of long-term complications in the follow-up of patients

Follow-up of patients occurred in both groups until October 2023, which revealed that in the FTS group, there was 1 case of urinary incontinence and 1 case urethral anastomotic stenosis. While in the control group, there were 5 cases of urinary incontinence, 4 of erectile dys-

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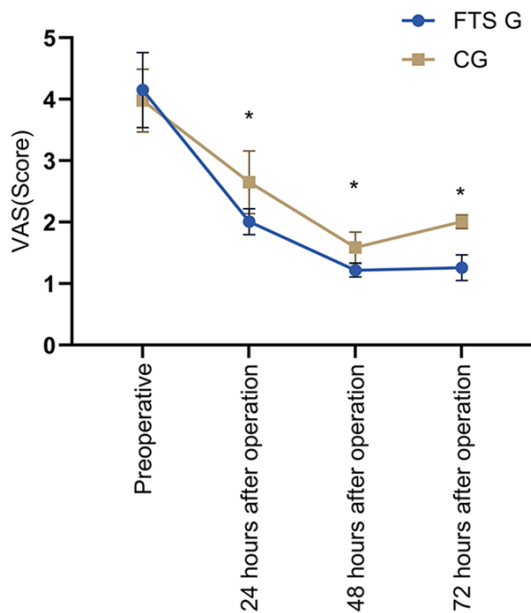


Figure 4. Comparison of postoperative pain intensity between the two groups. The VAS scores of patients in the FTS group were significantly lower than those in the control group at 24, 48, and 72 hours postoperatively. Compared with the control group, * $P < 0.05$. VAS: Visual Analog Scale; FTS: Fast-Track Surgery.

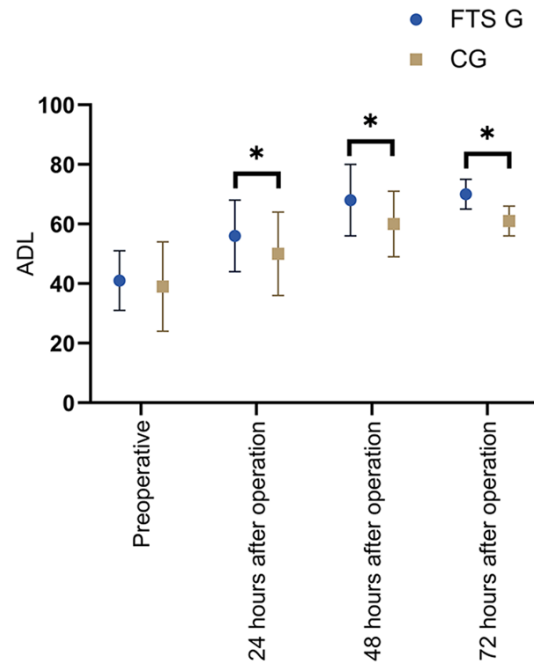


Figure 5. Comparison of postoperative living ability between the two groups. The ADL scores of patients in the FTS group were significantly higher than those in the control group at 24, 48, and 72 hours postoperatively. Compared with the control group, * $P < 0.05$. ADL: Activities of Daily Living; FTS: Fast-Track Surgery.

function, and 2 of urethral anastomotic stenosis. A significant difference was observed in the total incidence of long-term complications between the two groups ($P = 0.009$), as presented in **Figure 8**.

Analysis of prognostic factors for prostate cancer patients undergoing radical prostatectomy

Multivariate regression analysis was performed according to the presence of postoperative complications in patients. The results indicated that there was no significant correlation ($P > 0.05$) between the patient's prognosis and their level of education, marital status, health-care payment method, or age. However, nursing interventions and clinical staging were associated with the patient's prognosis. Notably, general nursing measures and patients at clinical stages T3b-T4 had a higher risk of complications ($P = 0.035$, $P = 0.026$), as shown in **Table 2**.

Discussion

Prostate cancer is a prevalent malignancy among middle-aged and elderly men, especially in developed regions such as Europe and America. In 2020, it was recorded as the third

most common malignant tumor globally, with over 14 million cases, second only to lung and colorectal cancers, and the number of cancer-related deaths in 2020 was approximately 600,000, with prostate cancer accounting for about 5.5% of these cases [12, 13]. Although the prevalence of prostate cancer in China is lower compared to other developed countries, urban areas in China have experienced an incidence rate of 13.01 per 100,000 and a mortality rate of 4.69 per 100,000. With the prolonged life expectancy and dietary adjustments among residents in China, the incidence rate of prostate cancer is steadily increasing annually, posing a significant health threat to the male population [14, 15].

Advancements in medical science in recent years have promoted the blossoming of various specific tumor factor screening techniques, facilitating early diagnosis of prostate cancer [16]. For patients with early-stage prostate cancer who have not yet exhibited lymphatic or distant metastasis, clinical recommendations lean towards the timely implementation of radi-

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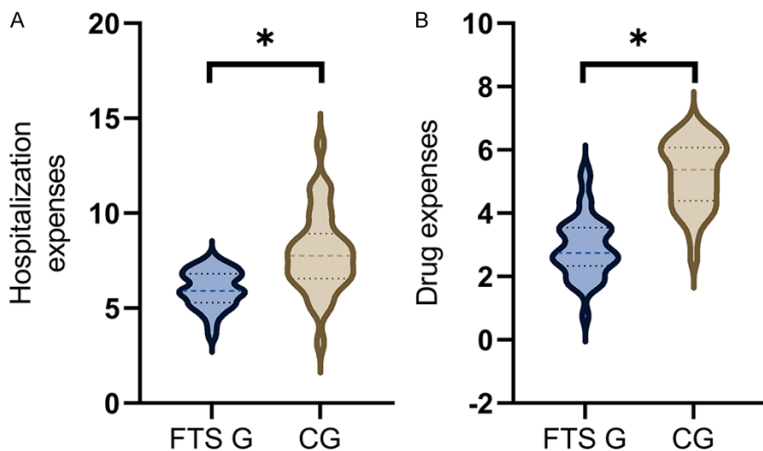


Figure 6. Comparison of hospitalization and medication costs between the two groups. The hospitalization expenses (A) and medication costs (B) of patients in the FTS group were significantly lower than those in the control group. Compared with the control group, $*P < 0.05$. FTS: Fast-Track Surgery.

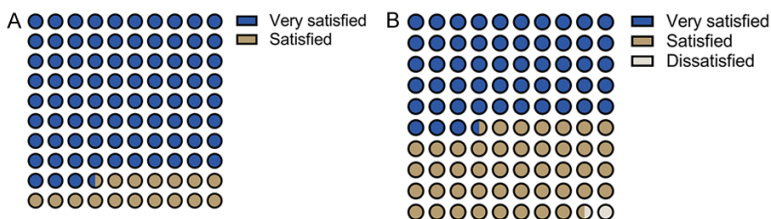


Figure 7. Comparison of patient satisfaction between the two groups. The satisfaction rate of patients in the FTS group was 100.00% (A), and the satisfaction rate was 98.33% in the control group (B), with no statistically significant difference between the two groups ($P > 0.05$). FTS: Fast-Track Surgery.

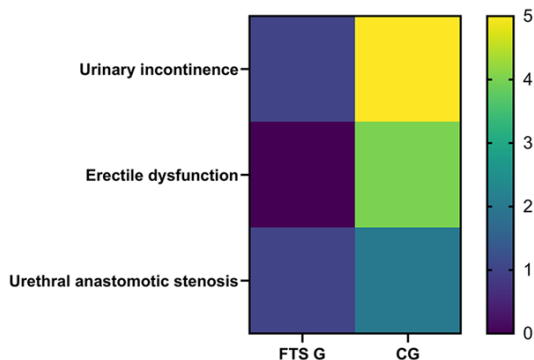


Figure 8. Comparison of the occurrence of long-term complications. At the 12th month of follow-up, the complication rate in the FTS group was 3.33%, markedly lower than the 18.33% observed in the control group ($P < 0.05$). FTS: Fast-Track Surgery.

cal prostatectomy, even for some advanced cases (e.g., cT3), as it holds considerable therapeutic value [17]. However, studies indicate that radical prostatectomy, characterized by its

complexity, substantial trauma, high incidence of postoperative complications, prolonged patient recovery cycles, and elevated hospitalization costs, necessitates enhanced perioperative nursing care measures to expedite patient recovery [18].

This study retrospectively analyzed the clinical efficacy of FTS-oriented care pathways in patients undergoing radical prostatectomy by adopting a grouping and comparison method. The findings revealed that, in terms of postoperative recovery indices such as hospitalization duration, postoperative anal exhaust time, drain removal time, and gastrointestinal function recovery time, patients who received FTS-oriented care exhibited significantly better outcomes compared to those in the control group receiving conventional nursing. This indicates that FTS-oriented care accelerates the postoperative recovery of patients undergoing

radical prostatectomy, verifying similar findings from other studies [8].

Prostate cancer patients often require a gastric tube after surgery, which can only be removed after anal exhaust, allowing for oral feeding. Postoperative prolonged gastric tube retention may cause damage to the mucosa of the upper gastrointestinal tract, potentially leading to local inflammatory reactions, hemorrhage, edema, and infections, thus exacerbating the patient's discomfort and mood [19]. Additionally, the indwelling gastric tube can result in excessive loss of digestive fluids, disrupting the acid-base balance of the gastrointestinal tract and consequently prolonging postoperative recovery [20].

FTS-oriented care emphasizes the prompt removal of gastric tubes postoperatively and advocates for the early initiation of oral feeding, thereby stimulating gastrointestinal peri-

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Table 2. Analysis of prognostic factors for prostate cancer patients undergoing radical prostatectomy

Risk factors	B	S.E	Wald	P	OR	95% CI
General nursing	1.359	0.6659	4.265	0.035	3.985	1.065-14.215
T3b-T4	1.885	0.856	4.871	0.026	6.401	1.212-30.265

stalsis and effectively mitigating symptoms such as postoperative abdominal distension. Moreover, the early resumption of feeding plays a crucial role in alleviating adverse reactions such as nausea and vomiting and reducing the incidence of intestinal obstructions [21]. These advantages are evident in the observed differences in complication rates between the two patient groups.

Patients undergoing radical prostatectomy require a preoperative enema, which involves introducing a significant volume of liquid into the intestinal tract. This procedure can increase abdominal pressure, causing irritation to the intestines and potentially leading to postoperative adverse reactions such as bloating, nausea and vomiting, and intestinal edema. These symptoms not only contribute to the patient's discomfort but may also exacerbate anxiety, thereby prolonging the recovery period. Furthermore, DVT is a common postoperative complication after radical prostatectomy. The development of DVT is often attributed to peripheral vasodilation under general anesthesia, which can slow blood flow and increase thrombosis risk [22].

Traditional nursing measures often overlook these factors. In contrast, FTS-oriented care includes the preoperative application of compression stockings to promote venous return, effectively lowering the incidence of DVT. Postoperative encouragement of ankle joint exercises also helps accelerate lower limb blood flow and reduce the risk of DVT [23].

The results of this study also indicated that FTS-oriented care significantly alleviated postoperative pain in patients with prostate cancer. Pain is a common post-surgical symptom in patients undergoing radical prostatectomy, adversely affecting their rehabilitation and increasing the likelihood of postoperative anxiety and depression. Therefore, proactive intervention of postoperative pain is crucial. FTS-oriented care involves preemptive pharmacological interventions before the onset of post-

operative pain, thereby effectively preempting pain manifestation. This approach enhances patient comfort and ease, leading to improved compliance and positively influencing the postoperative recovery process [24].

Regarding the comparison of postoperative ADL scores, patients in the FTS group showed higher ADL scores than those in the control group. The underlying reasons are multifaceted: the reduction in pain and early resumption of postoperative feeding are conducive to the rapid restoration of gastrointestinal functions, which is vital for expediting patients' overall recovery. This is also evident in the lower hospitalization and medication costs observed in the FTS group [25, 26]. Moreover, the alleviation of pain can enhance the comfort levels of patients, enrich their subjective experience and ensure an improved postoperative living ability.

In summary, the FTS-oriented care pathways significantly accelerate the postoperative recovery process in patients undergoing radical prostatectomy for prostate cancer, effectively reduce postoperative pain, decrease hospitalization and medication expenses, and enhance the quality of life in the postoperative period. Additionally, this approach positively impacts the nurse-patient relationship and has potential for widespread application and implementation. However, the limitations of this study lie in its retrospective nature and a relatively small sample size. Large-scale, multicenter prospective studies with prolonged follow-up periods will enhance the data accuracy and solidify the foundation for integrating FTS-oriented care in clinical practice.

Disclosure of conflict of interest

None.

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