

The effects PROSTATE care model in the perioperative management of patients underwent radical prostatectomy: An initial experience

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Abstract

Purpose To evaluate the effectiveness after implementing the PROSTATE care model which aims to prepare and support patients for radical prostatectomy.

Methods: The PROSTATE care model was raised and developed based on literature review and available clinical practice guidelines. A total of 673 patients with prostate cancer were enrolled, including 295 patients who received conventional nursing pathway after radical prostatectomy between January 2015 and December 2017, and 378 patients after initiation of PROSTATE care model between January 2018 and December 2020. Length of hospital stay, postoperative outcomes, continence of patients, patient satisfaction and other related patient outcomes were compared between the two groups.

Results: After implementation, the average length of stay decreased from 9.19 ± 1.03 to 7.64 ± 0.98 days ($p < .01$) without compromising quality of care. Time to remove pelvic drainage tubes dropped from 9.66 ± 9.12 to $7.88 \pm .44$ days ($p = .014$), and urinary catheter shortened from 13.08 ± 2.13 days to 9.79 ± 2.40 days ($p < .01$). Moreover, patients ambulated earlier ($p = .028$), and recovered faster from incontinence at 3-month pad test (2.69 ± 2.26 vs 3.98 ± 2.74 , $p = .01$) with a raised patient ($p = .010$).

Conclusion: The PROSTATE care model is focused on the patient-orientated care with efforts from multi-disciplinary team. This model ensures the perioperative safety, promotes faster recovery and improves quality of life without increasing complication rates.

1 Introduction

The prevalence of prostate cancer remains the second in male adults worldwide [1] and the incidence raises rapidly in China these years [2]. The benchmark treatment for patients with localized prostate cancer is radical prostatectomy, either via open, laparoscopic or robot-assisted approach [3]. However, patients might suffer urinary incontinence, erectile dysfunction, and other related medical and social difficulties after whatever ways of surgeries [4, 5]. Healthcare providers and patients should realize the possibility of postoperative complications, and efforts to reduce the rate and improve the quality of life are on the advance globally [5, 6]. Currently enhanced recovery after surgery (ERAS) pathways [7, 8, 9] are acceptable tools to promote accessibility and availability of patient care. ERAS requires a multi-disciplinary approach and evidence-based care to optimized patient care [10], which makes the equality and equity possible under the same standard [9, 10]. Although surgeons' acceptance of several elements in the protocols remain low in China [7, 11], the promising outcomes encourages the implementation of ERAS in China. With the cooperation between different professions, the length of stay (LOS) decreased without increasing unnecessary tests and complications [12, 13].

ERAS was first introduced in colorectal surgery, and then extended to other surgeries like radical prostatectomy [10]. Within the ERAS era, patient management after the surgery relates to patient outcomes and satisfaction [7]. Patients after radical prostatectomy are usually discharged with stitches, urinary catheter and (or) a drainage tube with a shorter LOS [14, 15]. The transition from the hospital to

home challenges patients and their family members [15, 16]. Patients might struggle with pain, prolonged lymph drainage, sexual dysfunction and other discomfort at home [8, 17]. Even after the removal of the urinary catheter and the drain, the incidence of urinary incontinence was reported as high as 80% [18–20]. Given the traditional care pathway fails to meet the patients' perioperative needs, an evidence-based multidisciplinary care model was suggested in our department since January 2016. We embed all related evidence and clinical practice into PROSTATE care model to promote patient-centered care to ensure safety, faster recovery physically and psychologically, and improve quality of life. This study aims to explore the effectiveness of self-developed PROSTATE care model in our department to improve patient outcomes and the possibility for further implementation. We reported our initial experience and compared the clinical outcomes before and after the implementation of PROSTATE care model.

2 Materials And Methods

2.1 Study Population

The study was approved by Institutional Review Board of RJ Hospital, School of Medicine, SJU University (Ethical number: KY2018-212). It was a retrospective research with a total of 673 patients who underwent whatever approach of radical prostatectomy between January 2015 to December 2020. All patients were male adults and had the surgery in our hospital by sub-professional urological surgeons in prostate cancer. Patients with severe comorbidities, like end-stage renal disease, heart failure, and other systematic diseases were excluded from the study. Three hundred seventy-eight of 673 patients were under the PROSTATE care model since January 2018 (PROSTATE group), while a historical cohort of 295 patients were under traditional care pathway between January 2015 and December 2017 (pre-PROSTATE group).

2.2 Establishment of the PROSTATE care model

First was the establishment of the PROSTATE multi-disciplinary team with the nurse manager as the leader. The purpose of this team was to revolve the care model to improve patient outcomes after the surgery. The team included 2 urological surgeons, 1 clinical nurse specialist, 2 specialty nurses (one in wound, ostomy and continence, and another in prostate care), 1 rehabilitation nurse and 1 assisting physician with at least 5-year experience in urology.

Second was a comprehensive literature review. We used the search terms “radical prostatectomy”, “enhanced recovery after surgery/ERAS”, “education”, “rehabilitation”, “specialty care”, “post-prostatectomy incontinence/PPI”, “incontinence”, “quality of life”, “patient outcomes” in both Chinese and English. We searched peer-reviewed articles to explore the prostate cancer related care pathway for peri-operation management in CNKI (China National Knowledge Infrastructure), PubMed, EMBASE, and Web of Science database. Specialty nurses and research nurse reviewed all articles and wrote a draft with other team members.

Third was the establishment of the care model. After literature review, catheter management, incontinence, and pain management were identified as the three most annoying symptoms related to quality of life after the surgery. Evidence related to ERAS protocols in radical prostatectomy and concerns after the surgery were all considered to promote patient care. The team embedded all evidence into the PROSTATE care model, that is, P for Patient-centered Care, R for Reconstruction and Nerve Reservation, O for Oral Food and Nutrition, S for Specialty Support, T for Triple Catheters Management, A for Affordable Counsel, T for Thrombosis prevention, and E for Exercise (Table 1). The care model was reviewed and revised by the experts from other hospitals including 2 experienced urological surgeons in prostate cancer and continence respectively, 3 clinical nurse specialists, and 1 research nurse with at least Master's degree before the implementation.

Table 1
The Content of the PROSTATE Care Model

Codes	Leaders	Contents
P- Patient-oriented care	Nurse manager	<p>Fully implemented the patient-oriented care</p> <hr/> <p>Comprehensively assess the patient</p> <hr/> <p>Make personalized nursing plan based on patients' assessment and their self-care need.</p> <hr/> <p>Supervise and participate in the implementation of nursing plan.</p> <hr/> <p>Contact and coordinate with other team members timely and effectively.</p> <hr/> <p>Adjust patients' care plan based on clinical status and feedback from both patients and team members.</p>
R- Reconstruction	Urological surgeon in prostate cancer	<p>Reserve urethra as long as possible to achieve the reconstruction of the bladder neck and urethra to relieve the incontinence after the surgery.</p> <hr/> <p>Reserve the nerve and vessel as much as possible to improve the sexual function.</p> <hr/> <p>• Precisely target at the lymphadenectomy to reduce the incidence of lymphorrhagia and lymphocele.</p>
O- Oral food and nutrition	Nutritionist	<p>Guide the fast fasting before the surgery.</p> <hr/> <p>Teach patient to drink liquid after postoperative breaking wind and turn to normal diet gradually. Drink water as much as possible after catheter removal.</p> <hr/> <p>Arrange counselling on nutrition for patients with mal-nutrition or eat disorder.</p>
S- Specialty support	WOC Nurse and Nurse specialist in anesthesia	<p>Provide wound care and management for high-risk patient (e.g. diabetes, obesity).</p> <hr/> <p>Instruct tips after the stitch and tube removal.</p> <hr/> <p>Pain management after the surgery</p>
T- Triple Catheter Management	Specialty nurse in prostate care	<p>Safely fasten of post-operation three catheters (Central Venous Catheter/Peripheral central vein, negative drainage tube, and urinary catheter)</p> <hr/> <p>Appropriate traction of the urinary catheter to stop bleeding by adding pressure and avoid bladder spasm.</p> <hr/> <p>Select appropriate flushing speed with the three-balloon urinary catheter after the surgery.</p>

Abbreviations: WOC, wound ostomy and continence

Codes	Leaders	Contents
		Keep unobstructed and negative for negative drainage tube, and record the output
		Education about self-care for patients discharge with tubes and catheters
A- Affordable Counsel	Nurse manager	Achieve optimal patient outcomes within patients' economic burden.
		Assess patients' psychological status and assess patients' acceptance against physiological changes after the surgery.
T- Thrombosis prevention	Specialty nurse in prostate care	Educate patients and their family member about the importance and significance of venous thromboembolism prevention.
		Demonstrate the clinical manifestations of lower limb thrombosis and pulmonary thrombosis.
		Select and wear appropriate graduated support stockings
		Daily check and care for skin under the socks.
E- Exercise	Rehabilitation Nurse	Assist patients to walk in the ward if the ultrasound of lower extremities is fine at the first day after the surgery.
		Assist patients to exercise the right pelvic floor muscle
		Routinely assess the severity of the incontinence and refer to the urology physicians without improvement in continence.
Abbreviations: WOC, wound ostomy and continence		

When all members in the PROSTATE multi-disciplinary team reached an agreement on the framework of the care model, the detailed implementation plan were carried out. The nurse manager invited one nutritionist and one nurse specialist in anesthesia with at least 5-year joined the team after they agreed to fulfill their responsibilities of nutrition support and pain management respectively. The nurse manager was in charge of communication and coordination; urologists supervised and ensured the quality of operations; one specialty nurse in prostate cancer nursing monitored and implemented the peri-operation care plan; one full-time WOC nurse was in charge of high-risk wounds and the removal of surgical stitches and catheters after discharge; one rehabilitation nurse guided the patients pelvic floor muscle training who suffered PPI three months after the surgery; one assisting physician arranged admission and follow-up phone calls.

2.3 Implementation of the PROSTATE care model

After the patient was admitted, the nurse manager and the specialty nurse in prostate would assess the patient physical, social, and psychological health and needs with self-reported questionnaire. If patients had concerns about the surgery or the following recovery, related specialty nurses or physicians would

step in before the surgery. Urologists in prostate would reserve the nerve and urethra with advance technologies during the surgical possible to improve postoperative outcomes. After the surgery, patients with eating disorders, intestinal obstruction or other related issues would be supported by nutritionist.

The first day after the surgery, nurse specialist in anesthesia would assess the patient's pain level and adjust the patient-controlled analgesia. If the ultrasound of the lower leg was normal, the patient was advised to get off the bed to walk as early as possible. Patients wore graduated support stockings to prevent thrombosis. Specialty nurse in prostate care would check the patient every day after the surgery. Specialty nurse selected the appropriate flushing speed to avoid the blockage of the three-balloon urinary catheter, and fastened the urinary catheter with appropriate traction to stop bleeding and avoid bladder spasm. The nurse also needed to check the negativity of the drainage and fastened the tube to keep unobstructed. Education was necessary, like how to self-care with the catheter and tubes after discharge. The quality of pelvic muscle floor training (PFMT) was crucial to the recovery of continence. Specialty nurse instructed the patient with illustrations and videos.

The nurse manager assessed the patient and made the discharge plan. The patient would go to the wound care clinic 8-10 days after the surgery. The WOC nurse removed the stitches and urinary catheter. During this process, the nurse would restate the method for PFMT exercise and self-care after the removal of the urinary catheter. Patients were advised to take the shower when arriving at home and drink at least 3 litre liquid every day within one month. If the patient was still incontinence after three months, the continence care nurse stepped in.

2.4 Evaluation

2.4.1 Postoperative outcomes

The primary endpoint is post-operative complications, including surgical wound infection, deep venous thrombosis, urinary tract infection, re-insertion of urinary catheters, and symptomatic lymphocele. The secondary endpoints are the LOS, patient satisfaction, and time of first water intake, first ambulation and pelvic drainage tube and ureteral catheter removal. Hospital designed patient satisfaction questionnaire includes ward environment, service attitude, specialty support, and patient outcomes with 25 points respectively.

2.4.2 Rehabilitation outcomes

Patients received the assessment of urination by International Consultation on Incontinence Questionnaire Short Form (ICIQ-SF) questionnaire and 1-hour pad test. ICIQ-SF was tested with high internal consistency reliability globally [21]. This questionnaire was used to assess the frequency, severity, and overall quality of life, ranging from 0 to 21. The higher the score was, the severity of incontinence and its impact on quality of life was implied.

One-hour pad test²² was used to the severity of incontinence. This test required patients to finish walking, going upstairs and downstairs, sit up and down, and other related activities in 30 minutes and compared

the weight of the pad. The adding weight below 2g was slight incontinence, 2-10g was moderate incontinence, and over 10g was severe incontinence.

2.5 Data Collection and Statistical Analysis

Patient data were compiled in our prostate cancer database. Statistical analysis was conducted using SPSS 19.0 (IBM Corporation, Armonk, NY, USA). Quantitative data were presented as mean \pm standard deviation and analyzed using t-tests. Numerical data were compared by chi-square tests. *P* values <0.05 were considered statistically significant.

The WOC nurse and nurse manager designed and assigned the data base to all team members. Perioperative data was collected from hospital electronical information system by the assisting physician. The specialty nurse in prostate care recorded the time of the first water intake, first ambulation, the removal of drainage tube, LOS and patient satisfaction before discharge. The WOC nurse supplemented the day of the urinary catheter removal when patients came to remove the stitches and urinary catheter.

The assisting physician recorded postoperative complications when patients came to the urological surgeons one month after the surgery for follow-up, while the rehabilitation nurse evaluated the urinary control function through ICIQ score and pad test for the first time and reevaluated three month after the surgery.

3 Results

3.1 Population demographics

Six-hundred and seventy-three patients underwent radical prostatectomy in our hospital between January 2015 and December 2020. Table 2 demonstrates the characteristics of two groups of patients under PROSTATE care model and before the model respectively. Results show no difference in the baseline regarding age, neoadjuvant treatment use, Gleason score, and ways of treatments clearance of lymph nodes, pathologic outcomes, and comorbidities.

Table 2
 Perioperative Demographics and Clinical Characteristics

Variables	PROSTATE (n=378)	Pre- PROSTATE (n=295)	P value
Age (years) ¹	68.38 ± 5.87	67.68 ± 6.43	.139
Neo-adjuvant treatment, n (%)	182 (48.15)	115 (38.98)	.067
Gleason Score ^a	7.15 ± 0.91	7.14 ± 0.92	.802
PSA, ng/ml ¹	24.86 ± 25.44	27.01 ± 35.75	.364
Modality of treatment, n (%)			
Robotic	279 (73.81)	154 (52.20)	.070
Laparoscopic	74 (19.58)	98 (33.22)	
Open	25 (6.61)	43 (14.58)	
Extent of lymph node dissection, n (%)			.080
Limited	31 (8.20)	16 (5.42)	
Extended	31 (8.20)	17 (5.76)	
Pathological Positive, n (%)	154 (40.74)	106 (35.93)	.580
Comorbidity, n (%)			.700
Hypertension	33 (8.73)	30 (10.17)	
Diabetes	35 (9.26)	26 (8.81)	
Others	13 (3.44)	10 (3.39)	
Two or more	3 (0.79)	2 (0.68)	
Abbreviations: PSA, prostate-specific antigen;Others includes cardiocerebrovascular diseases, pulmonary diseases and other systematic diseases.			
¹ Values given are mean ± SD			

3.2 Postoperative outcomes

After implementing PROSTATE care model, data regarding patient outcomes and perioperative recovery were collected (Table 3). The significantly decreased length of stay from 9.19 to 7.64 days did not company an increase in complications. Contrarily, the complication rate dropped from 14.2–8.5% ($p<.05$) despite an increase in surgical procedures. At the early stage after the surgery, 56.9% patients started to walk at the first day after surgery, comparing 50.2% before implementing PROSTATE care model ($p<.05$). And patient safety was not compromised with earlier removal of both urinary catheters and drainage

tubes. Every patient can afford the surgery, and no patient discharged because of unaffordable cost. Patient-centered care was achieved with available multidisciplinary team, and the overall patient satisfaction improved significantly from 94.00 to 96.39 ($p < .01$).

Table 3
Postoperative Outcomes in Patients before and after PROSTATE Care Model

Parameters	PROSTATE (n=378)	Pre- PROSTATE (n=295)	P value
First water intake, n (%)			.183
POD1	364 (96.30)	278 (94.24)	
POD2	13 (3.44)	15 (5.08)	
POD3	1 (0.26)	2 (0.68)	
First ambulation, n (%)			.028
POD1	215 (56.88)	148 (50.17)	
POD2	120 (31.75)	97 (32.88)	
POD3	43 (11.38)	50 (16.95)	
Drainage tube removal, days ¹	7.88 ± 9.44	9.66 ± 9.12	.014
Urinary catheter removal, days ¹	9.79 ± 2.40	13.08 ± 2.13	<0.01
LOS, days ¹	7.64 ± 0.98	9.19 ± 1.03	<0.01
Postoperative complications, n (%)	32 (8.47)	42 (14.24)	.045
Wound complications	1 (0.26)	3 (1.02)	
Deep venous thrombosis	1 (0.26)	2 (0.68)	
Urinary tract infection	7 (1.85)	12 (4.07)	
Urinary retention	5 (1.32)	11 (3.73)	
Lymphocele	10 (2.65)	8 (2.71)	
Lymph leakage	8 (2.12)	5 (1.69)	
Urine leakage	0	1 (0.34)	
Intestinal obstruction	0	0	
Patient satisfaction, points ¹	96.39 ± 2.49	94.00 ± 2.48	<0.01
Abbreviations: POD, postoperative day			
¹ Values given are mean ± SD			

3.3 Rehabilitation outcomes

Patient recovered faster in continence after the new model (Table 4). There was no difference on amount of urinary leakage after immediate removal of urinary catheter. One month later, ICIQ score altered from 7.50 in the Pre-PROSTATE group to 5.50 in the PROSTATE group ($p<.01$), which meant the discomfort of incontinence was relieved. Results of the subgroup quality of life showed no difference at that time between two groups but was significantly improved three months after the surgery. The 3-month pad test also proved the better recovery from continence from 3.98 in the Pre-PROSTATE group to 2.69g in the PROSTATE group ($p=.010$) while 3-month ICIQ score showed no difference ($p>.05$).

Table 4
Rehabilitation outcomes

Parameters	PROSTATE (n=378)	Pre- PROSTATE (n=295)	P value
Urinary leakage after urinary catheter removal, ml ¹	10.76±11.79	11.28±9.88	.480
3-month pad test, g ¹	2.69±2.26	3.98±2.74	.010
ICIQ score ¹			
1-month follow-up	5.57±2.40	7.50±3.32	<0.01
3-month follow-up	2.06±2.08	2.52±2.15	.110
QOL score ¹			
1-month follow-up	2.97±2.13	3.33±2.00	.720
3-month follow-up	1.06±1.45	1.78±1.78	<0.01
¹ Values given are mean ± SD			

4 Discussion

Established enhanced recovery protocols are available in different countries and languages, however, protocols might vary at each institution [9, 17, 23]. PROSTATE care model was developed based on current evidence and clinical practice to ensure the perioperative safety and improve patient outcomes. Our findings proved this innovative model made the treatment affordability, efficiency, and effectiveness. Healthcare providers from different professions were united to provide specific support based on patients' need, especially the pelvic rehabilitation after the surgery that most impacted health-related quality of life [24, 25]. Patients underwent most economical procedures and reached their initial expectations. Patient-orientated care was accomplished through empowerment and empathy. Efforts from both patients and healthcare providers reduced physical and emotional distress encouraged the patient participation and improved their satisfaction and experience. To our knowledge, this is the first care pathway that embed both ERAS protocols and Chinese clinical practice culture for patients after radical prostatectomy. More importantly, this model worth further promotion with several notable findings.

Need assessment is important before the surgery. Sufficient evidence [26, 27] showed that nurse-led assessment can help nurses to collect all patient data and provide patient-centered care. In addition, a nonrandomized controlled feasible study by Veronica Nanton et al. [28] demonstrated comprehensive assessment and enhanced communication between care providers and patients was the foundation for care integration. One and first core element in our model was 'Patient-oriented Care', which pointed out our philosophy of the whole model. Patient's health literacy varies by age, educational level, financial conditions. The PROSTATE care model allows medical staff to assess patient needs and encourage engagement. Shared decision-making combines healthcare providers and patients together to fight for the same goal and stimulates a faster recovery [29]. Efforts afterwards ensured a better patient compliance and recovery physically and psychologically. Treatment based on patients' needs attracted their participation, accelerated functional recovery and improved their satisfaction.

The implementation of PROSTATE care model decreased LOS without increasing complication rates. The average LOS shortens from 9.19 days to 7.14 days after implementing PROSTATE care model. Our LOS was longer than some western studies [14, 23, 30] because we admitted patients one to two days before the surgery. Other similar strategies involved included early ambulation, fast bowel preparation, and specialty support from PROSTATE multidisciplinary team. However, management of pain and sexual function were our weak points due to culture difference. Chinese patients preferred to tolerate pain by themselves instead of pain killers even after prescription; and patients were reluctant to talk about sexual function with non-family members, even with professional medical staff. Despite focusing on improvement of surgical techniques, quality of life and patient outcomes were the core elements. The promising finding after three-year implementation of PROSTATE care model was a faster time to removal the urinary catheter and pelvic drainage tube. Research [31, 32] show that the discomfort after radical prostatectomy was from different tubes, and our trail made the earlier removal possible and safe. Tube-related (urinary tract infection and urinary retention) and wound complications dropped with self-engagement due to high-quality education before discharge and specialty support after discharge [33, 34]. Patient-centered PROSTATE care pathway ensures the safety after the surgery and reduces short-term complications.

Favorable results regarding the perioperative rehabilitation backed the implementation of this model. First is about the mobilization. Although there is no difference in first water intake, however, number of patients who got off the bed on the first day after the surgery raised significantly. Early ambulation might relate to no increase in venous thromboembolism, which was the same from other studies [5, 35, 36]. Second, two group of patients showed no difference in urinary leakage after urinary catheter removal, however, one month later, patient-reported ICIQ score was much better than patients before the PROSTATE care model. Moreover, 3-month pad test confirmed better continence with improved quality of life. As reported, the prevalence of post-prostatectomy incontinence could be as high as 70-80% [37, 38]. Incontinence was regarded as the bothersome cause after the surgery [39, 40]. Pelvic floor muscle exercise was the first line recommendation for post-prostatectomy incontinence [41], but reports about efficacy varied depending on patient compliance [40, 42]. We focused on the pelvic muscle training and made full utilization of facilities to promote fast recovery. After comprehensive assessment and physical

exams, patients were first taught to use the appropriate urinary collectors and contract the right muscle with or without biofeedback. If patients suffered bothersome PPI consistently, the rehabilitation nurse would refer to other physicians for further treatment.

The successful implementation of this PROSTATE care model depended on several factors. For patients, they were strictly enrolled and undergone the radical prostatectomy by surgeons with at least ten-year experience in prostate cancer to exclude the influence of the surgical techniques. Secondly, team members were strictly trained. Every patient in the PROSTATE group received the same quality of care from the PROSTATE team. For example, in order to collect the accurate data after the surgery and improve patient compliance [43, 44], we reimbursed the participants for test fees, traffic fees, and other related medical supplies. For some missing information, trained team members and the physician assistant contacted patients and arranged the follow-ups. Lastly, one-month feedback from team members, healthcare providers and patients was important. Voices from all involved members including patients were heard. Suggestion from other professions could be discussed and promote the quality of care. This was the chance for communication and quality improvement for the safety of patients.

Our study had several limitations. First, this was a retrospective research in a single urological center. Further research was needed to evaluate long-term effects of PROSTATE care model in multi-center and whether types of surgeries affected postoperative parameters and rehabilitation. Second, cost effectiveness should be more specific analyzed including medical costs and staff costs. We believe this study is unique in its framework and contents, and has potential for further implementation in a larger scale.

5 Conclusion

The current study demonstrates that the implementation of PROSTATE care model benefits patients and improves quality of care. This model provides a safe convenient, and an effective option for patients who need radical prostatectomy. It gathers medical resources from different departments to meet patients' expectations and promote interdisciplinary communication. This innovative care model shortened the LOS without compromising the quality of care or increasing the incidence of complications. The results of the study add value to the current literature and support extended employment in other institutions.

Declarations

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Conflict of Interest

The authors have no conflicts of interest to declare.

Ethics approval

This study protocol was reviewed and approved by Institutional Review Board of Renji Hospital, School of Medicine, Shanghai Jiao Tong University (Ethical number: KY2018-212). Participants in the study understood the details of the research and have given the written informed consent.

Consent to participate

Patients involved in this research agreed to participate in this research and signed the consent form.

Consent for publication

If the paper was accepted by the journal, all authors agreed for publication.

Authors' Contributions

Xiuqun Yuan: Formal analysis; writing the original draft

Xiaorong Wu: revision of the draft

Xia Yuan: Supervision and conception of the model

Xiaohong Meng: WOC nurse, data collection

Sijie You: specialty nurse in prostate care, data collection

Jiahua Pan & Yinjie Zhu: urological surgeons in prostate, resources

Baijun Dong: methodology

Availability of data and materials

All data generated or analysed during this study can be accessed through the supporting information. Further enquiries can be directed to the corresponding author.

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