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Analysis of facilitators and barriers to early urinary catheter removal in postoperative patients by spine surgery nurses: a qualitative study based on the COM-B model in China

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Abstract

Background The high utilization rate of indwelling urinary catheters in patients after spine surgery poses an increased risk for a range of associated complications. Evidence-based recommendations suggest that urinary catheters should be removed early, yet spine surgery nurses are not positive about the behavior of removing catheters early after the surgery.

Objectives The aim of this study was to explore the facilitators and barriers to early catheter removal by spine surgery nurses in postoperative patients, guided by the COM-B model.

Methods This study employed a qualitative study with a descriptive research design. In-depth and semi-structured interviews were carried out to explore facilitators and barriers to early catheter removal in postoperative patients by 18 spine surgery nurses in China. Data were analyzed using traditional content analysis methods.

Results We identified 10 barriers and facilitators from capability, opportunity, and motivation based on the COM-B model. (1) capability: lack of knowledge, Lack of standardized protocols, Changes in workload; (2) opportunity: Increase in the demand for human and material resources, Lack of effective communication, Lack of prioritization of early catheter removal; and (3) motivation: Promote patients' early recovery, Conflicting emotions.

Conclusions Nurses encountered barriers from capability, opportunity, and motivation, which were not isolated but interrelated. Future interventions need to incorporate facilitators and barriers to address the issue of early indwelling urinary catheter removal in patients after spine surgery by taking a holistic approach at multiple levels, including nurses, doctors, patients, and health systems.

Keywords Barriers, Facilitators, Urinary catheters, COM-B model, Qualitative study

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Introduction

An indwelling urinary catheter (IUC) is a method of inserting a catheter of appropriate size into the bladder to drain urine using aseptic technique [1]. It is currently widely used for bladder management in surgeries, acute urinary retention, and critical care [2]. A study reports variations in urinary catheter utilization rates between different specialties and disease types, generally ranging from 12 to 77% [3]. Notably, more than 50% of perioperative patients require IUCs because of damage to the spinal nerves controlling urination, difficulty of the surgery, and long operative time [4, 5].

It is shown that hospitalized patients have a high rate of IUC use, but urinary catheters are considered unnecessary in many of these cases [6]. Several studies suggest that catheters placed without indications often lead to delayed urinary catheter removal, which significantly increases the incidence of complications such as catheter-associated urinary tract infections, urethral injuries, and bladder overdistension [7–9]. In addition, the occurrence of complications can not only prolong the hospital stay, increase the cost of hospitalization, and reduce the satisfaction rate of patient care, but also can be life-threatening and result in an increase in patient mortality [9–11].

Evidence-based guidelines recommend that IUCs should be removed as soon as possible postoperatively, preferably within 24 h, unless necessary for continued use [12–14]. The utilization rate of urinary catheters in perioperative patients undergoing spine surgery is very high owing to disease or surgical needs. Furthermore, because of the structure of physiologic anatomy, the incidence of urinary retention is very high in patients after spine surgeries (regardless of the spinal segment), with the highest of nearly 30% in patients after lumbar procedures [4, 6, 15]. Because of this, spine surgery nurses do not take an active role in removing catheters early after the surgery due to concerns of postoperative urinary retention and subsequent increase in workload or adverse events, therefore, a urinary catheter is often removed between 48 and 72 h after the spine surgery, which is much longer than that recommended by the guideline [15].

Previous studies [16–18] suggest that the main reasons for not removing urinary catheters early are the lack of knowledge of healthcare professionals or daily assessment of the indications for urinary catheterization, the lack of communication between stakeholders, or the lack of attention. However, for patients after spine surgery, who have certain specificities both in terms of urinary catheter use and the occurrence of postoperative urinary retention, the relevant studies are still limited and lack systematic theoretical guidance. The COM-B model is a theoretical model related to behavior change proposed by Michie et al. [19], which not only incorporates facilitators and barriers that influence behavioral change, but also can assess how to achieve desired behaviors, and this model is widely used in the fields of individual health promotion and disease prevention [20–22].

Therefore, the aim of this study was to explore the facilitators and barriers to early IUC removal in postoperative patients by spine surgery nurses using the COM-B model, so as to provide a reference for future intervention studies on the effective implementation of early IUC removal, in order to further reduce the occurrence of patients' urinary catheter-related complications and to enhance early recovery.

Methods

This study employed a qualitative research design. In-depth and semi-structured interviews were conducted to explore facilitators and barriers to early IUC removal in postoperative patients by spine surgery nurses [23]. The Consolidated Criteria for Reporting Qualitative Studies (COREQ) was used in reporting this study [24].

Recruitment and sampling

This study was conducted in Changsha city, south-central China. Study participants were spine surgery nurses from The Second Xiangya Hospital, Central South University. This study conducted purposive sampling based on participants information provided by head nurses, including nurses with different educational level and working years to obtain maximum heterogeneity. Inclusion criteria were as follows: (a) registered nurses, (b) with at least 1-year experience in spine surgery care. Exclusion criteria were as follows: (a) nurses who were on study leave, maternity leave or sick leave at the time of study, (b) nurses who refused to participate in the study.

Data collection

In-depth and semi-structured interviews were conducted to investigate personal opinions of participants between September 2023 to October 2023. Permission to conduct the interviews was obtained from each participant. The principal researcher interviewed participants, while another member of the research team provided support, including managing the recordings. Before the interview, the purpose of our study, principles of voluntary participation, and confidentiality were explained to participants. Interviews were recorded and notes were made throughout after obtaining the informed consent.

The interview outline was developed on the basis of the COM-B model to investigate facilitators and barriers to early urinary catheter removal in postoperative patients by spine surgery nurses [25]. The final interview guide included the following questions: (a) Do you have the knowledge of early IUC removal, e.g., indications for catheter removal? (b) Do you have any protocols for

early IUC removal? Have you ever received any relevant training? (c) What is your attitude towards early IUC removal in postoperative patients? (Are you willing to do so? What are the advantages and disadvantages for the patient/yourself? Why? (d) Are you confident about the implementation of early IUC removal for postoperative patients in clinical settings? Why? (What are the concerns?) (e) In your current clinical practice, who is usually involved in the decision to remove IUCs for postoperative patients? Can you describe the whole process (how to select the timing, who proposes or decides, who performs it, etc.)? (f) What factors may influence early removal of urinary catheters for postoperative patients (from the perspectives of patients and healthcare professionals)? (g) What are the difficulties to perform early IUC removal for postoperative patients? What support is needed? All in-depth interviews were carried out by one researcher XY.W, who had qualitative research experience. Recruitment ended when no new codes emerged, indicating that saturation was achieved. Each individual interview lasted between 30 and 50 min. All interviews were audio-recorded and transcribed verbatim by the interviewer within 24 h after the end of the interview and were treated anonymously.

Data analysis

Data collection and data analysis were conducted simultaneously in this study. All transcripts were imported into NVivo12 for data management and analysis. The data were analyzed using inductive content analysis [26, 27]. The part related to the aim of the study was open-coded, while the text analysis and open coding parts were independently conducted by two researchers (XY.W, WL.W) who repeatedly listened to the recordings and read the transcripts and field notes to get an overall impression of the data. The codes were then aggregated into related (sub)topics by comparing and summarizing the data. Following this, the (sub)themes were discussed and reviewed by two other researchers (CY.B, Y.T) to compare the consistency and differences of the coding raters. All discrepancies were resolved through discussion. Next, based on the COM-B model, the researcher XY.W matched (sub)themes to the components of the model (C, O, M). Finally, all researchers discussed and reviewed the topics based on the COM-B model together until an agreement was reached.

Ethical considerations

This study was approved by the Ethical Review Board in the Second Xiangya Hospital, Central South University (Ref number: 2020-027). All participants gave informed consents and their participations were voluntary.

Table 1 Demographic characteristics of the participants ($n = 18$)

Variable	Category	*n*	%
Gender			
	Male	0	0
	Female	18	100%
Age(years)			
	20～30	4	22.2%
	31～40	10	55.6%
	41～	4	22.2%
Marital status			
	Unmarried	5	27.8%
	Married	12	66.7%
	Divorced	1	5.5%
Education			
	Advanced diploma	3	16.7%
	Bachelor's degree	14	77.8%
	Master's degree or above	1	5.5%
Years of nursing experience	≦5	4	22.2%
	6～10	4	22.2%
	11～15	5	27.8%
	16～20	4	22.2%
	21～	1	5.6%
Professional title	Nurse	3	16.7%
	Senior nurse	2	11.1%
	Supervisor nurse or above	13	72.3%

Table 2 Mapping of themes to the COM-B model

Emerging sub-theme from the transcript	Sub-components of the COM-B Model	Broad components of COM-B Model
Lack of knowledge(B)	Psychological capability	Capability
Lack of standardized protocols(B)	Physical capability	
Changes in workload(B, F)		
Increase in the demand for human and material resources(B)	Physical opportunity	Opportunity
Lack of effective communication(B)	Social opportunity	
Lack of prioritization of early catheter removal(B)		
Promote patients' early recovery(F)	Reflexive motivation	Motivation
Conflicting emotions(B, F)	Automatic motivation	

B Barriers, F Facilitators

Results

A total of 18 spine surgery nurses completed the interviews. The general demographic information of the participants is detailed in Table 1.

As shown in Table 2, the results of the study were analyzed using the COM-B model in terms of capability, opportunity, and motivation, and seven barriers and three facilitators were identified as influencing early indwelling urinary catheter removal in patients after

spine surgery. The following sections describe specific findings and examples of participant responses.

Capability: psychological capability, physical capability

Capability in the COM-B model can be interpreted as the capability of spine surgery nurses to perform early urinary catheter removal for postoperative patients. In this context, capability was categorized into psychological capability and physical capability. A total of three barriers and one facilitator emerged under this theme.

Lack of knowledge (psychological capability)

The interviews revealed that although the majority of the interviewees were aware of the purpose and significance of early indwelling urinary catheter removal of urinary catheters, they lacked the necessary knowledge. The lack of knowledge was mainly reflected in the assessment stage of early removal of urinary catheters. They were not clear about the definition and exact timing of early indwelling urinary catheter removal. In addition, they were not sure about what indications should be assessed.

In actual clinical practice, the timing of removal of indwelling urinary catheters was mostly guided by personal experience. As a result, there was a huge discrepancy between the actual timing of urinary catheter removal in patients after spine surgery and the evidence-based recommendations.

> *I don't understand what time after surgery is meant by "early". Now we basically remove it within 48 hours to 72 hours, and there are a very small number of patients who may use it for a little longer. (P1, female, 35 years old)*

> *Actually, we often rely on personal experience when assessing whether we can remove the urinary catheter or not. (P2, female, 36 years old)*

Meanwhile, due to a lack of knowledge about the type of disease, comorbidities, and the impact of analgesic medication use on a patient's urinary function, almost all interviewees reported that they were unaware of the indications suggesting whether a patient should or should not have an early catheter removal. Under this circumstance, nurses most often chose to maintain the status quo and avoid the risk of early indwelling urinary catheter removal.

> *We cannot accurately determine the timing of urinary catheter removal in patients who are unable to urinate on their own due to neurological disorders, such as paraplegia and cauda equina syndrome, and who use analgesia pumps after the surgery. (P1, female, 36 years old)*

> *We don't have a clear indication for catheter removal in our department. Usually, for patients with prostate problems or paralyzed patients, we definitely would not remove their urinary catheter early. Meanwhile, for patients with preoperative urinary incontinence and leakage, we believe they must have a long-term indwelling urinary catheter to address urination problems. (P3, female, 41 years old)*

Lack of standardized protocols (physical capability)

A lack of standardized protocols was an important physical barrier preventing nurses from removing urinary catheter early. In clinical practice, there was a lack of unified and standardized protocols and a lack of clarity about the timing of the assessment and the person who would decide and perform the task. Therefore, nurses can only rely on personal habits or experience, making it difficult to follow the guidelines and perform early catheter removal.

> *We don't have any specific management protocol for early removal of urinary catheters in postoperative patients, so everyone follows their personal habits and experience, and therefore there are some differences between each person. (P1, female, 36 years old)*

> *We don't have a specific written protocol for the management of urinary catheters. A particularly specific and clear protocol similar to thrombus screening doesn't seem to exist yet. (P4, female, 30 years old)*

Changes in workload (physical capability)

Early removal of urinary catheters can cause changes to the content and workload of urinary catheter-related care, which were important factors affecting the implementation of early indwelling urinary catheter removal. On the one hand, early removal of urinary catheters can substantially reduce the workload caused by indwelling urinary catheters, such as perineal cleaning, bag changing, and additional fixation and placement of the urinary catheter when turning patients. Therefore, nurses were more willing to remove urinary catheters early.

> *For patients with urinary catheters, we have to clean their perineum daily. Besides, it's very inconvenient to turn them over with a urinary catheter and a drainage tube at each side of the patient. If the urinary catheter can be removed, it would reduce both of these tasks. (P6, female, 31 years old)*

If patients can urinate quickly and smoothly after the early removal of urinary catheters, it would definitely be effective in reducing the workload of urinary catheter care. (P5, female, 40 years old)

However, it should be noted that just as every coin has two sides, change can also be reflected in an increase in workload that would delay the early removal of urinary catheters by nurses. In our interviews, it was found that if patients failed to urinate smoothly after the catheter removal, nurses' workload would increase significantly by assisting patients with urination, such as providing additional privacy for urination, applying hot compress to the bladder, and assisting patients to get out of bed. This made the interviewees hesitant about performing the early removal of urinary catheters.

After the catheter removal, if they still cannot urinate despite of various methods facilitating urination, they would need re-insertion of catheters, which would definitely increase my workload. (P7, female, 43 years old)

Opportunity: physical opportunity, social opportunity

According to the COM-B model, opportunity can be interpreted as all external factors that influenced the implementation of early urinary catheter removal in postoperative patients by nurses, consisting of physical environment (including time, resources, geographic location, triggers, materials, etc.) and social environment (e.g., characters, perceptions, interpersonal influences, socio-cultural practices, etc.). A total of three barrier factors emerged in this theme.

Increase in the demand for human and material resources (physical opportunity)

After the early removal of urinary catheter, nurses needed a great deal of time and energy to observe the condition, educate patients, and deal with urination problems, which was particularly evident in the postoperative care of spine surgery patients. Based on the evidence-based recommendation, the urinary catheter should be removed within 24 h as soon as possible [12–14]. At this time, patients after spine surgery were still in the recovery from general anesthesia with wound pain, many drainage tubes, and limitation of trunk movement. Therefore, multiple persons were required to assist their daily activities, such as turning and urinating. In the face of human resource constraints, the increase in manpower demand brought by early removal of urinary catheters made nurses reluctant to perform this procedure.

Observing patients and assisting them to urinate after removal of urinary catheter can be really time-consuming. After the catheter removal, we have to take a series of measures to assist with patient urination, such as elevating the head of the bed, etc., which can take a lot of time to teach, observe, and deal with. (P4, female, 30 years old)

In addition, the shortage of appliances to assist patients to safely and easily get out of bed to urinate, such as portable toilets and walkers, was also an important factor that discouraged most of the interviewees from performing early removal of urinary catheters.

It would be nice if our department had aids such as folding commode chairs or walkers to assist patients with urination and meet their urgent needs. (P9, female, 40 years old)

Lack of effective communication (social opportunity)

This study found that physician-nurse-patient collaboration was the key to implementing early indwelling urinary catheter removal, however, effective communication was often lacking in clinical practice.

Although many patients were told that early removal of urinary catheters could prevent urinary tract infections or alleviate discomfort caused by indwelling urinary catheters, patients and/or their family members often had concerns about the early removal due to the fear of not being accustomed to urinating while in bed, disclosure of privacy, or the increased burden of care in urination assistance. If the nurses were unable to obtain the understanding and support of patients and/or their family members during the communication, they would tend to give up the early removal of urinary catheters.

I would still take humanistic care into consideration. If the patient still firmly refuses to remove the catheter after our communication and explanation, I will not force it before we have an agreement after communication. (P3, female, 41 years old)

Meanwhile, nurses tended to focus more on patients' recovery after surgery and often failed to communicate with their colleagues concerning whether patients were eligible for the catheter removal.

In our handoffs between different shifts, we focus and communicate more on, for example, the patient's vital signs, status of limb movement, or wound drainage, so we may kind of overlook issues related to urinary catheter removal. (P10, female, 33 years old)

In addition, The lack of effective communication between nurses and doctors can also prevent them from performing the early removal of urinary catheters.

> *In order to protect patient privacy, the removal of urinary catheters in male patients was performed by male doctors, but the assessment before removal was mostly performed by nurses.But this process often lacks effective communication. (P12,female, 32 years old)*

Lack of prioritization of early catheter removal (social opportunity)

Although all participants recognized that early removal of urinary catheters could prevent urinary tract infections, most nurses did not consider early removal to be an urgent issue compared to other postoperative spinal symptoms (e.g., severe pain, cerebrospinal fluid leak, etc.) and possible adverse events that may occur after catheter removal when the patient urinated on his/her own (e.g., urinary retention, falls, etc.).

> *Some postoperative patients have pain due to the surgical incision in addition to the original pain caused by spinal nerve compression, and if the pain is not handled well, coupled with the discomfort in the bladder area due to urinary distension from the early removal of the urinary catheter by a nurse, the patient's psychological burden can be very high, which can also affect urinary disorders. (P6, female, 31 years old)*

> *Patients are at risk of various complications within 24 hours postoperatively due to anesthesia or the use of analgesia pumps. On top of that, they have wound pain. If they also have dizziness and headache caused by cerebrospinal fluid leak, this would not be a good timing to remove the urinary catheter. (P7, female, 43years old)*

Moreover, doctors' attitude upon the early removal of urinary catheters and their communication with nurses were most crucial according to our participants. Almost all participants indicated that dealing with urinary catheter removal was not doctors' priority compared to other diagnosis and treatment issues.

> *I think the perspectives and attitudes of doctors and nurses must be consistent. In terms of doctors, they usually consider to talk with patients about catheter removal in 48 ~ 72 hours after 24 hours of the surgery. (P9, female, 40 years old)*

Motivation: reflective motivation, automatic motivation

Motivation in the COM-B model can be interpreted as the process of brain activity that motivated and guided nurses to accept early urinary catheter removal in patients after spine surgery, categorizing into reflective motivation and automatic motivation. Beliefs about behavioral change were identified as motivations for behavioral change, especially with regard to the association between urinary catheter removal and the occurrence of complications or adverse events. In this study, beliefs manifested as different influences in most participants. A total of two facilitators and one barrier emerged in this theme.

Promote patients' early recovery (reflective motivation)

Some nurses strongly agreed that indwelling urinary catheters could not only increase patient discomfort, but also increase the incidence of catheter-related urinary tract infections. The belief in promoting patients' early recovery was a key motivation for them to implement early indwelling urinary catheter removal.

> *I think early removal of urinary catheter can not only reduce urinary tract infection, but also reduce patient's discomfort due to urinary catheter. Many patients would ask us to remove their urinary catheters, and if early removal of urinary catheter can accelerate the recovery, I think it is feasible. (P6, female, 31 years old)*

Conflicting emotions (automatic motivation)

However, almost all nurses expressed conflicting emotions about early catheter removal. They wanted to promote patients' postoperative recovery by removing the catheter early, but at the same time there were also concerns. On the one hand, they had concerns about adverse events after early catheter removal. For example, urinating while in bed can easily contaminate the wound dressing after lumbar surgery and increase the incidence of wound infection; the process of getting out of bed to urinate can increase the risk of adverse events such as falls and unplanned removal of drainage tubes, as well as the harm caused by re-insertion of the catheter due to the inability to urinate normally. On the other hand, they were also concerned about the discomfort associated with prolonged catheterization and the increased incidence of catheter-associated urinary tract infections. These thoughts and emotions made nurses often confused and conflicted when performing early removal of urinary catheters in patients after spine surgery.

> *There are times when I feel it is beneficial to remove a urinary catheter early in a postoperative patient, as indeed leaving a urinary catheter in place for*

too long can lead to a series of problems. However, once you get the kind of patient who had it removed and then couldn't successfully urinate on their own shortly after the removal, it's upsetting because you may need to re-insert the urinary catheter, which will also lead to an increased risk of infection. So, it's just very conflicting. (P7, female, 43 years old)

Discussion

This qualitative study was guided by the COM-B model [28], an evidence-based tool, to understand the barriers and facilitators influencing the early IUC removal in patients after spine surgery. Our findings suggested that although nurses were clear about the importance of early IUC removal for the prevention of urinary tract infections in patients after spine surgery, they were affected by multiple barriers and facilitators from the three domains of capability, opportunity, and motivation when it comes to actual clinical practice.

Under the theme of capability, lack of knowledge and standardized protocols were the main barriers. Similar to the findings of previous studies [17, 18, 29], lack of knowledge related to the timing and indications for early IUC removal could lead to delayed removal of urinary catheters [30], whereas improved training of health care workers in knowledge related to urinary catheter management could help shorten the duration of urinary catheterization in patients [31]. In addition, To address the lack of an early urinary catheter removal management procedure, several studies developed standardized urinary catheter management protocols and daily assessment of the necessity of catheterization, which showed some effectiveness in reducing the rate of catheter use [31, 32]. Unlike patients after general surgery or critically ill patients, the management of urinary system after removal of urinary catheters in patients after spine surgery had the following features. First, patients after spine surgery were prone to urination dysfunction due to spinal nerve damage, such as the lack of systematic bladder function exercise and urination training, and they highly tended to have urinary retention and re-catheterization after the early IUC removal [15, 33, 34]. Second, patients after spine surgery had severe activity limitations, and most of them needed to urinate while in bed after early removal of urinary catheters. If they were not accustomed to urinating while in bed, and had to get out of bed, this would require multiple people to assist, and increase the risk of adverse events such as falling out of bed and unplanned removal of drainage tubes, thus making it crucial to carry out systematic and gradual urinary management and education after early removal of urinary catheters. Therefore, in order to promote early urinary catheter removal in patients after spine surgery, standardized protocols for pre-removal assessment, removal procedure, and comprehensive post-removal management should be developed for this patient population, and nurses should be provided with standardized training in the knowledge and skills necessary to perform early removal of urinary catheters. In addition, Compared with the previous study [17], the nurses in this study had more concerns about the increased workload, which may be related to the substantially increased workload of observing, monitoring, and inducing urination, as well as assisting in getting out of bed after urinary catheter removal in patients after spine surgery, making the reduction of the workload for catheter care less obvious. To address this issue, we can develop patients' self-care and family caregiving skills [35].

Under the theme of opportunity, increased human and material resource requirements, lack of prioritization of early catheter removal, and lack of effective communication between stakeholders further impacted the execution rate of nurses performing early IUC removal in postoperative patients. The material support needed by nurses in this study was mainly related to facilitating urination after removal of urinary catheters, including portable toilets and walkers. This suggested that charge nurses needed to prepare corresponding items (e.g., walkers, privacy screens, intermittent catheterization kits, etc.) according to the actual clinical needs to facilitate early urinary catheter removal in patients after spine surgery. Moreover, in view of the current nurse staffing shortage, engaging patients and their families in the urinary system management team after catheter removal could also be an important factor. More notably, the lack of awareness and attention of early urinary catheter removal among doctors and nurses as well as communication issues among doctors, nurses and patients were essential social factors that hindered nurses from performing early urinary catheter removal. Previous studies [36] also found that unless signs of infection occurred, doctors would not pay attention to the early removal of IUCs, while nurses were more concentrated on the care of central venous catheters like PICCs, resulting in a lack of effective communication about early removal of urinary catheters [37]. Meanwhile, as part of an invasive procedure, urinary catheter removal by nurses would require patient-informed consents as well as orders from doctors, therefore, communication issues between the three stakeholders could influence the implementation of early IUC removal by nurses. Our study specified those communication issues. Patients and/or their family members were concerned about urinating problems and increased care needs after early removal of the catheter, while doctors had inconsistent understanding of the timing and importance of urinary catheter removal. Communication barriers between doctors and nurses may be related to factors such as differences in roles, job content,

and perspectives in healthcare settings [38]. Based on these findings, we recommend a nurse-led, evidence-based translational practice of early urinary catheter removal in patients after spine surgery. Several previous studies demonstrated the ability of nurses to act as team leaders, communicators, and coordinators. Meanwhile, nurses can provide feedback and communicate with doctors about the assessment results so as to obtain support and realize joint decision-making, promoting the safe and effective implementation of early urinary catheter removal in patients after spine surgery.

In terms of motivation, this study found that although nurses had strong positive motivations to promote early recovery of patients, they simultaneously suffered from conflicting concerns and emotions. Early IUC removal could reduce the occurrence of urinary catheter discomfort and related complications, which in turn could promote early recovery, which was in line with the concept of Enhanced Recovery After Surgery [39]. Therefore, nurses had a positive emotional response to the benefits of early IUC removal, which was the most important core motivation that prompted them to perform this procedure, and this was consistent with the results of a previous study [18]. However, given the barriers of capability and opportunity mentioned earlier in this study, nurses' subjective self-efficacy was low, thus generating complex and conflicting emotions. This benefit-risk trade-off was also reported in previous studies, for example, Blodget et al. [40] found that nurses recognized the role of early catheter removal in preventing urinary tract infections but did not think that the incidence of urinary tract infections in their patients was high enough to require intervention, and therefore, they did not remove the catheter as early as possible. Compared with previous studies, the spine surgery nurses interviewed in our study were more concerned for patients after spine surgery about the difficulty of urinating on their own and the risk of re-catheterization. When there was a lack of adequate capability and opportunity conditions, the facilitators of their positive motivation were overshadowed by conflicting concerns and emotions. Therefore, training to promote self-efficacy in nurses may also be considered as an addition to the previous recommendations, which showed efficacy to the behavior of early IUC removal [31, 41].

Limitations

This study has some limitations. First, we recruited nurses from the same department in the same hospital. Similarities in the work pattern, customs, and culture of participants meant that the essence of their stories was also very alike. Second, Sample size limitations may also lead to biased results. Therefore, future studies with larger sample sizes are needed.

Conclusion

In summary, guided by the theory of COM-B model, this study provided new insights about facilitators and barriers to early indwelling urinary catheter removal in patients after spine surgery. Our findings suggested that nurses encountered barriers from capability, opportunity, and motivation, which were not isolated but interrelated. Future interventions need to incorporate facilitators and barriers to address the issue of early indwelling urinary catheter removal in patients after spine surgery by taking a holistic approach at multiple levels, including nurses, doctors, patients, and health systems.

Abbreviations

COM-B	Capability, Opportunity, Motivation Behavior
ICU	Indwelling Urinary Catheter
COREQ	Consolidated Criteria for Reporting Qualitative Studies

Supplementary Information

The online version contains supplementary material available at https://doi.org/10.1186/s12912-025-03091-z.

Supplementary Material 1

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Author contributions

XY.W: Conceptualization, Formal analysis, Writing - Original Draft; CY.B: Methodology, Writing - Original Draft; Y.T: Investigation; MY.Z: Investigation,; H.W: Formal analysis; JY.L: Formal analysis; WL.W: Writing - Review & Editing Preparation.

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Data availability

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

Declarations

Ethics approval and consent to participate

This study was approved by the Ethical Review Board in the Second Xiangya Hospital, Central South University (Ref number: 2020-027). Informed consent was obtained from all individual participants included in the study. Participants completed an informed consent from after learning the research objectives and procedures. They were also guaranteed anonymity and the confidentiality of their data would be strictly protected. They were informed about the voluntary nature of their participation and the option to withdraw without consequences.

Consent for publication

Not applicable.

Competing interests

The authors declare no competing interests.

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