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Nurses' Behaviours and Implementation Factors Towards Promoting Mobility Among Hospitalized Older Adults in China: A Mixed Method Study

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ABSTRACT

Aims: To describe the status of nurses' behaviours towards promoting mobility among hospitalized older adults in China, and to explore modifiable enablers and barriers for nurses.

Design: A sequential-explanatory mixed method design was used to collect data from nurses in three tertiary teaching hospitals in Hunan Province, China.

Methods: Quantitative data were collected using the Nurses' Behaviour Towards Promoting Mobility Scale, which covers eight dimensions: physical fitness assessment, exercise guidance, daily activities guidance, joint movement assistance, physical therapists' consultation, environment arrangement, mobilization assistance and cognition stimulation. Qualitative data were collected through in-depth individual interviews, with questions developed based on the quantitative findings. Descriptive statistics, one-way ANOVA and multiple linear regression were used to analyse the quantitative data. Interview transcripts were analysed thematically and mapped to the capability, opportunity, motivation and behaviour (COM-B) model. Quantitative and qualitative findings were integrated using a joint display approach.

Results: The overall level of nurses' mobility promotion behaviours was moderate (156.15 ± 23.94), with scoring rates varying across dimensions (50.69%–81.69%). Nurses' behaviours were significantly associated with their working positions and departments. Further, the qualitative data revealed six barriers including 'insufficient competence', 'lack of standardized protocols', 'fear of adverse events', 'unclear nurse role', 'lack of time', and 'limited environment and equipment', and four facilitators, such as 'practice-based training', 'incentive policies', 'family involvement' and 'organizational expectations'. The quantitative and qualitative findings were convergent, dissonant, complementary or silent.

Conclusion: Nurses' behaviours towards promoting mobility were suboptimal and influenced by multiple barriers and enablers related to the COM-B model. These findings need to be considered when developing targeted nurse-driven mobility promotion interventions to improve the functional abilities of hospitalized older adults.

Implications for the Profession and/or Patient Care: This study emphasizes the necessity of improving nurses' behaviours in promoting older inpatients' mobility. Adequate practice-based training is essential to enhance nurses' capability in this area.

Additionally, fostering a sense of responsibility and implementing an incentive policy could boost motivation. At the organizational level, clear protocols and standardized procedures, together with supportive ward environments, may increase opportunities for implementation. Involving family members in mobility promotion care might be an alternative way considering nurses' heavy workload and time limitations.

Reporting Method: The study adhered to the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) checklist for the quantitative component, the Consolidated Criteria for Reporting Qualitative Research (COREQ) checklist for the qualitative component, and the Good Reporting of A Mixed Methods Study (GRAMMS) guideline for the reporting of mixed methods.

Patient or Public Contribution: Nurses participated in the quantitative study and qualitative interviews that informed this study.

1 | Introduction

Hospitalization is increasingly common in older adults worldwide (Hao et al. 2024). Up to 50% of hospitalized patients in high-income countries are aged 65 or older (Dijkstra et al. 2022). Similarly, in China, the hospital admission rate increased from 6.3% among people aged 35–44 to 23.3% for those aged 65 years or older (National Health Commission 2025). The World Health Organization (WHO) defines healthy aging as the process of developing and maintaining functional ability that supports well-being in older age (Rudnicka et al. 2020). However, increasing evidence indicates that hospitalized older adults frequently experience a decline in functional ability, even after recovery from acute illness (Hao et al. 2024; Morisawa et al. 2023). This condition, known as hospitalization-associated disability, affects approximately 30%–60% of older patients and results in a higher risk of readmission, institutionalization and mortality (Gallego-González et al. 2022). As the global aging population continues to grow, the prevalence of hospital-associated functional decline is expected to increase. This trend will place a greater burden on healthcare systems through higher healthcare utilization and costs (Morisawa et al. 2023).

Among the various factors contributing to the hospitalization-associated disability in older patients, immobility is widely recognized as the most preventable and predictable cause (Hao et al. 2024). A range of personal, organizational, environmental and care-related factors can influence patients' mobility levels during hospitalization (Piper et al. 2024; van Dijk-Huisman et al. 2022). However, conventional practices such as bedrest, restrictive hospital environments, and protective nursing care are often identified as key contributors to immobility during hospitalization (Dijkstra et al. 2022; Mani et al. 2022). Immobility and prolonged bedrest are particularly common among older adults in hospitals (Piper et al. 2024). For instance, a study in the US found that approximately 50%–70% of older patients do not leave their wards throughout their stay (Dermody and Kovach 2018). Similarly, research from Denmark found that older inpatients spent the majority of their time (22.8 h per day) in sedentary behaviour, with only a very limited proportion of time (1.2 h per day) spent in upright activities (e.g., walking and standing) (Johansen et al. 2025). This persistent immobility increases the risk of frailty and functional decline, ultimately contributing to disability, morbidity and mortality (Johansen et al. 2025; Loyd et al. 2023). Given the adverse outcomes associated with immobility and its high occurrence in hospitals, it is urgent to implement effective strategies to promote mobility in hospitalized older adults (Pan et al. 2023).

Improving and maintaining inpatients' mobility involves multiple stakeholders, but nurses play a vital role due to their frequent, direct contact with patients and the unique responsibilities inherent to their profession (Pan et al. 2023; Xu et al. 2025). Evidence suggests that nurse-driven mobility intervention during hospitalization may help reduce deterioration in functional ability (Pan et al. 2023). For example, a pretest–posttest study conducted in the United States developed a nurse-led mobility program incorporating multidisciplinary teamwork, early physical assessment, frequent mobilization assistance and exercise guidance, which was shown to maintain or improve older patients' functional ability at discharge (Pan et al. 2023). Consistently, a systematic review included 15 studies that reported that nurse-led early mobility protocols significantly reduced hospital length of stay by an average of 2.6 days (Xu et al. 2025). Despite the literature documenting benefits of nurse-driven mobility intervention, it has been indicated that promoting mobility is a routinely missed nursing care activity (Imam et al. 2023). In the United Kingdom, the Royal College of Nursing reported that 59% of nurses identified mobility promotion as one of the care activities most frequently neglected (Lim, Ibrahim, et al. 2020). More recent observational evidence further suggests that, although most hospitalized patients require mobility assistance, nursing care is predominantly focused on low-intensity activities such as repositioning, with relatively limited provision of higher-level mobility activities such as walking (Simmons et al. 2025).

However, several gaps remain in the existing literature. One notable gap is that existing studies have focused on nurses' roles in occasional supervision and assisted mobilization (Lim, Ang, et al. 2020). There is limited understanding of other relevant nursing behaviours, such as communication with physical therapists, physical fitness assessment, exercise guidance and joint movement, all of which also contribute to promoting mobility (Pan et al. 2023; Simmons et al. 2025). Secondly, enhancing nurses' practical involvement in promoting mobility for older patients requires a deeper understanding of modifiable barriers and facilitators (Alexander et al. 2022). Although few studies have used qualitative designs to explore nurses' perspectives on their roles in mobility promotion among older patients (Herzog et al. 2023; Lim, Ang, et al. 2020), the findings regarding the modifiable factors influencing nurses'

behaviours remain inconsistent, and a robust theoretical framework is lacking (Herzog et al. 2023). Finally, nurses' behaviours in promoting mobility represent a complex phenomenon and are shaped by multiple factors within the workplace context (Lim, Ang, et al. 2020; Simmons et al. 2025). Further investigation is needed to explore the status and implementation factors of nurses' behaviours towards promoting mobility in the Chinese healthcare context.

Using theory to identify behavioural determinants can increase the likelihood of an intervention's effectiveness. The capability, opportunity, motivation and behaviour (COM-B) model offers a comprehensive framework for understanding the barriers and facilitators of target behaviours (Michie et al. 2011). According to this model, performing a specific behaviour requires individuals to have both the psychological and physical capability to engage in the behaviour, along with the physical and social opportunity, and motivation driven by both automatic and reflective processes (Michie et al. 2014). The COM-B model has been effectively applied to understand various nurses' behaviours, such as caring behaviours during the COVID-19 pandemic (Tong et al. 2022), continuous monitoring of vital signs (Leenen et al. 2022), and the prevention of hospital-acquired pressure ulcers (Gaspar et al. 2022). Once the relevant COM-B factors are identified, they can be systematically mapped to intervention functions and policy categories to optimize behaviour change.

A mixed method design provides a deeper, broader and more balanced understanding of the results and addresses the limitations of individual methods (Östlund et al. 2011; Younas et al. 2020). The aims of this study are twofold. First, in the quantitative phase, we want to investigate the status of nurses' behaviours towards promoting the mobility of hospitalized older adults and provide a baseline understanding of individual characteristics associated with these behaviours. Second, in the qualitative phase, we deeply explore the factors that facilitate or hinder nurses' behaviours, guided by the COM-B model. The findings from this study can provide a foundation for enhancing nurses' behaviour and facilitating the development of nurse-driven mobility interventions to improve the functional abilities of older patients in China (Pan et al. 2023).

2 | Methods

2.1 | Research Design

This study used a sequential explanatory mixed method design, encompassing both quantitative and qualitative phases (Östlund et al. 2011). The initial quantitative phase was cross-sectional, while the subsequent qualitative study was descriptive. This mixed method used qualitative findings to explain and provide deeper insight into the quantitative data (Creswell and Creswell 2017). It was selected because it allowed us to explore the challenges and facilitators nurses faced when implementing mobility promotion care. The Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) Statement (von Elm et al. 2007) (see File S1) and the Consolidated criteria for reporting qualitative research (COREQ) (see File S2) (Tong et al. 2007) were used to guide the reporting of the quantitative and qualitative components, respectively. The Good Reporting of A Mixed Methods Study (GRAMMS) guideline was also followed to ensure transparent reporting of the mixed methods (see File S3) (O'Cathain et al. 2008).

2.2 | Setting and Participants

This study was conducted in three tertiary teaching hospitals in Hunan Province, China. These hospitals have specialized geriatric departments that focus on caring for older adults with comorbidity. In contrast, the non-geriatric departments provide care for all age groups with specific system-related diseases. Nurses were recruited in the study if they met the following criteria: (1) worked full-time for over a year; (2) provided direct care to older patients; (3) were able to understand and complete the survey; and (4) were willing to participate. Nurses in the intensive care unit, as well as those on maternity leave, extended sick leave or currently out of duty, were excluded from the study.

2.3 | Sampling

A convenience sampling method was used to recruit nurses for the study. For the quantitative phase, a precision-based formula for estimating the mean of a continuous outcome was used to determine the minimum sample size (Houshangi et al. 2025). In the following formula, (n) represents the minimum required sample size; $Z_{1-\alpha/2}$ is the standard normal value for a two-sided α level of 0.05, which equals 1.96. Based on a previous study (Dinling et al. 2018), the assumed mean score was 137.15 and an estimated standard deviation (SD) of 7.34 was used. d is the allowable margin of error, which was set at 1.101, equivalent to 15% of the SD (Charan and Biswas 2013). The minimum sample size was calculated to be 171.

$$n = \frac{{Z^2}_{1-\frac{\alpha}{2}} * \mathrm{SD}^2}{d^2} = \frac{1.96^2 \times 7.34^2}{(1.101)^2} = 170.74 \approx 171$$

In addition, supplementary sample size estimations were performed using the G*Power 3.1 program (Faul et al. 2009) to further assess the adequacy of the sample size for the quantitative analyses conducted in this study. For ANOVA, this calculation considered a medium effect size (Lee et al. 2025), significance level, and statistical power of 0.25%, 0.05% and 80%, respectively. The ANOVA compared four categories of participant characteristics, which required a minimum sample size of 180 participants. For multiple linear regression (Diao et al. 2024), the calculation considered a medium effect size, significance level, statistical power and eight predictors of 0.15%, 0.05% and 80%, and eight, respectively, resulting in a minimum required sample size of 109 participants. Among the three sample size estimation approaches, the largest required sample size was 180. After accounting for a 20% attrition rate (Huang et al. 2023), the final required sample size was 225. In this study a total of 307 nurses were recruited. Of these, 268 nurses returned their written consent forms and completed the questionnaires. After double-checking the data, 257 questionnaires were deemed valid for analysis. The nurses interviewed in the qualitative phase were selected from the quantitative phase, based on their willingness to participate in follow-up interviews and provision of contact

information. During this process, purposive sampling method with a maximum variation strategy was used to ensure diversity in behaviour score levels, work positions and departments.

2.4 | Instruments

The survey questionnaire comprised two parts: demographic information and the Nurses' Behaviour Towards Promoting Mobility Scale. The demographic information included age, gender, education level, department, years of nursing experience, professional title, work position and attending training activities in aged care. The Nurses' Behaviour Towards Promoting Mobility Scale was originally developed in Japanese (Yuezi and Guizi 2010) and subsequently translated and culturally adapted into Chinese (Hongyan et al. 2017) using a standard forward-backward translation procedure (An English version of the scale is provided for reference in File S4). The Chinese version has undergone independent psychometric validation in a sample of Chinese nurses. Content validity was assessed by expert consultation, with an acceptable content validity index of 0.834. Exploratory factor analysis supported the structural validity of the scale, identifying eight factors that explained 69.05% of the total variance. The scale also showed satisfactory internal consistency (Cronbach's $\alpha = 0.845$) and test–retest reliability ($r = 0.712–0.880$) (Hongyan et al. 2017). The scale includes 46 items in 8 dimensions: Physical fitness assessment (10 items), Exercise guidance (8 items), Daily activities guidance (7 items), Joint movement assistance (7 items), Physical therapists' consultation (3 items), Environment arrangement (5 items), Mobilization assistance (4 items), Cognition stimulation (2 items). Participants responded using a 5-point Likert scale to describe the frequency of behaviours (1 = never, 2 = rarely, 3 = sometimes, 4 = often and 5 = always).

The interview guideline was developed based on a thorough review of the literature and an analysis of the data obtained in the quantitative phase. Our analysis revealed that the level of nurses' mobility promotion behaviours was moderate, with scoring rates varying across dimensions, and nurses in different work positions, departments and training experiences appeared to have significantly different scores. To gain deeper insights into these results, four primary questions were generated: (1) Can you tell me in detail what you know about promoting mobility in older patients? Prompts: Do you know how to promote mobility among older patients? Are there any specific issues or challenges you've encountered with knowledge and skills? Why do you find some dimensions harder to perform and others relatively easier? (2) How do you feel about the previous training activities you attended? What skills might help you promote mobility for older patients? (3) How do you feel the difficulty or ease of promoting mobility in your work position? (4) How does your department (non-geriatric/geriatric) influence your behaviour? How would your department need to change to facilitate your behaviour? A pilot interview was conducted to test the suitability and clarity of the questions. The researchers adjusted the interview guides for responsiveness and ethical standards. The detailed guides and the relationship with quantitative analysis results, see File S5.

2.5 | Data Collection

During the quantitative phase (July to early December 2020), researchers personally visited the three hospitals to inform the eligible participants about the study and obtain written consent. Paper-and-pencil questionnaires were distributed to all eligible participants with instructions to complete questionnaires in a secure collection box. The principal researcher collected the boxes to ensure confidentiality and data security.

During the qualitative phase (December 2020 to May 2021), semi-structured face-to-face interviews were conducted by two female nursing researchers (SW and JHN), both with academic backgrounds in geriatric nursing. SW, the primary interviewer, was a Ph.D. candidate, while JHN held a master's degree. Both had 3–6 years of research experience in mobility promotion among older adults and were trained in qualitative research methods. Prior to data collection, no established personal or professional relationships existed between the interviewers and the participants. The interviewers were not affiliated with the participants' working hospital, which helped reduce potential social desirability bias. Before each interview, researchers explained the study to participants and gave time for them to ask any questions. The interviews, which lasted 30–40 min each, were conducted at convenient locations for the participants, such as faculty offices in clinical departments. Field notes were taken during interviews to document participants' responses, expressions and gestures, maintaining an objective and fair attitude throughout. Participants were given ample opportunity to comment on relevant points or topics. To ensure data saturation, data collection and analysis were conducted concurrently. After the 12th participant completed the interview, the research team jointly concluded that no new information emerged. This judgement was supported by a code frequency approach, in which the number of newly identified codes was tracked across interviews (Hennink and Kaiser 2022). As data collection progressed, the frequency of new codes diminished, and no new themes were identified. Therefore, data collection was ceased. A saturation tracking table is provided in File S6. None of the selected participants refused to participate or dropped out.

It should be noted that data collection took place between July 2020 and May 2021, during the COVID-19 pandemic. During this period, the pandemic was generally under control in China, and clinical services had largely returned to routine practice. However, infection prevention and control measures remained in place, including pre-examination and triage procedures, enhanced infection control practices and restrictions on patient visitation and family caregiving (e.g., a 'one patient-one caregiver' policy). In addition, some training activities were reduced or postponed, with only essential sessions conducted in online formats. These contextual factors may have influenced the clinical workflow and care environment.

2.6 | Data Analysis

This study used the joint display to integrate and report findings from the quantitative and qualitative phases (Östlund et al. 2011; Younas et al. 2020). Joint display is a visual integration strategy that facilitates the comparison and synthesis of findings across

different phases, enhancing transparency and interpretability in mixed methods research. In this study, quantitative and qualitative data were first analysed and reported separately. Subsequently, the research team integrated the findings by applying the COM-B model and the four integration principles: convergence (results align across phases), complementarity (one phase enriches the other), dissonance (findings conflict between phases) and silence (themes emerge only in one phase) (Younas et al. 2020). Finally, consensus was reached through team discussions, and the integration process and results were presented using a joint display table.

In the quantitative phase, IBM SPSS Statistics 25.0 was used for data analysis. Invalid questionnaires (e.g., missing responses $\geq 20\%$ or unreliable responses like filling in the same response number for all items or selecting more than one answer for one item) were excluded. Descriptive analyses were used to describe the nurses' characteristics and scores of nurses' behaviours towards promoting mobility. Categorical variables (participants' demographic characteristics) were described by frequency and percentages, while behaviours' scores were described using mean and standard deviation. The scoring rate was calculated as (actual score/total score)$\times 100\%$. For descriptive purposes, the scoring rate was categorized using Bloom's cut-off points: 80%–100% (good), 60%–79% (moderate) and $<60\%$ (poor). This approach has been adopted in previous studies assessing behavioural or clinical practice outcomes (Liao et al. 2023; Seruwagi et al. 2021). One-way ANOVA and independent *t*-tests were used to examine differences in scores of nurses' behaviours towards promoting mobility according to the nurses' categorical characteristics (gender, age, education level, years of nursing, professional title, work position, department and training experience). When a significant difference was found from ANOVA, the Bonferroni post hoc tests were conducted to identify specific group differences. Multiple linear regression analysis was performed to examine predictors of nurses' behaviours towards promoting mobility. All relevant variables, including gender, age, education level, years of nursing, professional title, work position, department and training experience, were entered simultaneously into the model. The selection of variables was informed by prior literature and expert knowledge (Doherty-King and Bowers 2013; Lim, Ang, et al. 2020). Categorical variables were converted into dummy variables. Prior to analysis, the assumptions for *t*-tests, ANOVA and multiple linear regression were assessed. Normality was evaluated using the Shapiro–Wilk test, homogeneity of variance using Levene's test, multicollinearity using variance inflation factors (VIF), and independence of residuals using the Durbin-Watson statistic. The results indicated that the data were approximately normally distributed ($p > 0.05$), homogeneity of variance was met (all $p > 0.05$), VIF values were below 5 (1.01–2.86), and the Durbin-Watson statistic was 1.97, indicating no substantial autocorrelation. In all results, $p < 0.05$ was considered statistically significant.

In the qualitative phase, Nvivo 11 was used to assist with coding and theme development. A hybrid inductive-deductive thematic analysis approach was applied (Braun and Clarke 2014; Fereday and Muir-Cochrane 2006). Audio recordings and field notes were transcribed verbatim into Chinese and returned to participants for validation. Two researchers (SW, JHN) independently read each transcript to gain familiarity with the data and generated initial codes inductively. These codes were subsequently grouped into meaningful themes based on patterns emerging from the data. Following this inductive analysis, the identified themes were first categorized as barriers or facilitators. Subsequently, a deductive approach was applied to map these themes onto the COM-B model components (Physical or Psychological Capability, Physical or Social Opportunity, and Reflective or Automatic Motivation) and the Theoretical domains framework (TDF), which comprises 14 domains explaining behavioural determinants (see Figure 1) (Atkins et al. 2017). During this process, the research team considered the potential influence of the theoretical framework. Theme classification was refined through iterative team discussions to avoid forcing themes into predefined categories and to reach consensus. This analysis process is illustrated in

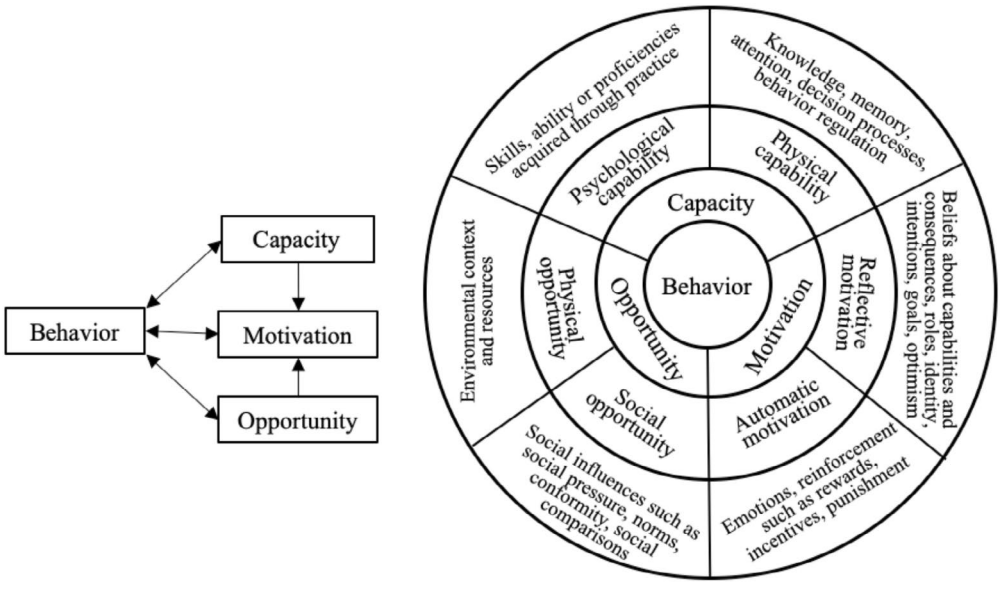

FIGURE 1 | The COM-B model and TDF framework. COM-B, capability, opportunity, motivation, and behaviour; TDF, Theoretical domains framework.

File S7. After data analysis, themes and selected quotations were translated from Chinese to English by a bilingual researcher. A second bilingual researcher then back-translated the content into Chinese. Any discrepancies between the original and the back-translation versions were discussed by the research team until an agreement on meaning was reached (Chen and Boore 2010).

To avoid being governed by researchers' own pre-structured understanding during data interpretation, a reflexive approach was adopted throughout the study (Tong et al. 2007). Researchers maintained a reflexive stance, critically examining potential biases and actively considering alternative interpretations to ensure that the findings were grounded in the data. Regular group meetings were conducted for peer debriefing and reflection during data collection and analysis. The themes were cross-validated and discussed until consensus was reached.

2.7 | Ethical Consideration

Ethics approval for this study was obtained from the Ethics Committee of Central South University (Approval no. E202063). Before the study, all participants were informed that their participation was entirely voluntary and that declining participation would not affect their work status. Written informed consent was obtained from all participants. To maintain confidentiality, only the interviewers had access to the participants' identities, while other researchers worked with anonymous data transcripts.

3 | Results

3.1 | Quantitative Results

3.1.1 | General Characteristics of Participants

The majority of participants were aged 26–35 years (61.5%) with only 4.7% aged over 46 years. Most participants held a bachelor's degree ($n = 195$, 75.9%). Nearly 41% had 6–10 years of work experience. In terms of professional titles, 38.1% were senior nurses and 51.0% were nurses in charge. Regarding work positions, the majority were general nurses (77.4%), with 17.5% working as clinical teaching nurses and 5.1% as head nurses. Geriatric wards were work departments for 50.6% of the participants ($n = 130$). Additionally, nearly half (50.2%) had attended training activities in aged care. The detailed characteristics of the participants are presented in Table 1.

TABLE 1 | Demographic characteristics of included participants ($n = 257$).

Characteristics	Categories	*n*	%
Gender	Female	251	97.7
	Male	6	2.3
Age	≤25	31	12.1
	26–35	158	61.5
	36–45	56	21.8
	≥46	12	4.7
Educational level	Diploma[a]	2	0.8
	Associate degree[b]	16	6.2
	Bachelor's degree	195	75.9
	Master's degree	44	17.1
Years of nursing experience	≤5	48	18.7
	6–10	104	40.5
	11–15	53	20.6
	≥16	52	20.2
Professional title	Newly registered nurse[c]	21	8.2
	Senior nurse[d]	98	38.1
	Nurse in charge[e]	131	51.0
	Director nurse[f]	7	2.7
Work positions	Head nurse[g]	13	5.1
	Clinical teaching nurse[h]	45	17.5
	General nurse[i]	199	77.4
Departments	Geriatric wards	130	50.6
	Non-geriatric wards	127	49.4
Attending training activities in aged care	Yes[j]	129	50.2
	No	128	49.8

Abbreviations: %, percentage of participants; *n*, number of participants.
[a]Non-degree vocational qualification.
[b]2-year associate degree, usually a step towards bachelor's degree.
[c]Within three years of experience.
[d]Nurses with junior-level professional titles.
[e]Nurses with mid-level professional titles.
[f]Nurses with senior-level professional titles.
[g]Nurses managing a specific ward or unit.
[h]Nurses who mentor students or staff.
[i]Nurses without any specific duties.
[j]Attended aged care workshops or seminars.

3.1.2 | Nurses' Behaviours Towards Promoting Mobility

The overall mean score of nurses' behaviours towards promoting mobility was 156.15 ± 23.94 out of 230 points, and the overall level of behaviours was rated moderate, with a scoring rate of 67.82%. Nurses had relatively higher scoring rates in 'mobilization assistance' (81.69%), 'environment arrangement' (79.02%) and 'daily activities guidance' (70.64%). However, lower scoring rates were observed in 'physical therapists' consultation' (50.69%), 'joint movement assistance' (63.02%), 'exercise guidance' (64.15%), 'physical fitness assessment' (66.58%) and 'cognition stimulation' (67.32%). Overall, 66.15% of the nurses demonstrated moderate behaviours, while only 13.62% had good behaviours. Notably, more than half of nurses (57.59%) had poor behaviours in the 'physical therapists' consultation' dimension. Conversely, more than half of nurses had good behaviours in 'mobilization assistance' (71.95%) and 'environment arrangement' (58.37%). Detailed information is provided in Tables 2 and 3.

3.1.3 | Differences in Nurses' Behaviours Towards Promoting Mobility According to Nurses' Characteristics

The total scores of nurses' behaviours towards promoting mobility showed statistically significant differences according to age groups ($F = 2.89$, $p = 0.036$, partial $\eta^2 = 0.03$, 95% CI [0.00, 0.08]) and work positions ($F = 4.04$, $p = 0.019$, partial $\eta^2 = 0.03$, 95% CI [0.00, 0.08]). Bonferroni post hoc tests revealed that nurses aged 36–45 years had significantly higher scores than those aged 26–35 years ($p = 0.047$). Clinical teaching nurses had higher scores than general nurses ($p = 0.017$). Independent *t*-tests indicated that nurses working in geriatric wards had higher scores than those working in non-geriatric wards ($t = 9.27$, $p < 0.001$, Cohen's $d = 1.16$, 95% CI [0.89, 1.42]). Nurses who attended training activities in aged care had higher scores than those who had not ($t = 6.36$, $p < 0.001$, Cohen's $d = 0.79$, 95% CI [0.54, 1.05]). These results suggest that the differences by age group and work position had small effect sizes, whereas the differences by department and training experience showed larger effect sizes. No statistically significant differences were found in behaviour scores according to gender, educational level, years of nursing experience and professional title ($p > 0.05$) (Table 4 and File S8).

TABLE 2 | Score of nurses' behaviours towards promoting mobility ($n = 257$).

Dimension	Range	Mean ± SD	Scoring rate (%)[a]
Total dimension	46–230	156.15 ± 23.94	67.82
Physical fitness assessment	10–50	33.29 ± 6.03	66.58
Exercise guidance	8–40	25.65 ± 5.45	64.12
Daily activities guidance	7–35	24.72 ± 4.25	70.64
Joint movement assistance	7–35	22.06 ± 5.28	63.02
Physical therapists' consultation	3–15	7.60 ± 2.43	50.69
Environment arrangement	5–25	19.75 ± 3.44	79.02
Mobilization assistance	4–20	16.34 ± 3.08	81.69
Cognition stimulation	2–10	6.73 ± 1.68	67.32

Abbreviations: %, percentage of participants; *n*, number of participants; SD, standard deviation.
[a]Scoring rate was computed as (actual score/total score) × 100%.

3.1.4 | Associations Between Nurses' Characteristics and Nurses' Behaviours Towards Promoting Mobility

Multiple linear regression analysis identified several factors significantly associated with nurses' behaviours towards promoting mobility. Clinical teaching nurses were more likely to engage in mobility promotion behaviours compared with general nurses ($\beta = 0.12$, $p = 0.035$). In addition, nurses working in geriatric wards demonstrated significantly higher levels of mobility promotion behaviours than those working in non-geriatric wards ($\beta = 0.49$, $p < 0.001$). These factors accounted for 25% of variance in nursing behaviours ($F = 6.06$, $_{adj}R^2 = 0.25$, $p < 0.001$) (Table 5).

3.2 | Qualitative Results

3.2.1 | General Characteristics of Participants

The mean age of the 12 nurses was 35.8 (8.8) years, most were female (91.7%) and held a bachelor's degree (66.7%). Most nurses (75%) worked as general nurses and 58.3% of nurses worked in non-geriatric wards. Additionally, half of the nurses reported that they attended training activities in aged care. The mean score of nurses' behaviours towards promoting mobility was

TABLE 3 | Grade of nurses' behaviours towards promoting mobility for each dimension ($n = 257$).

Dimension	Poor[a] (*n*, %)	Moderate[b] (*n*, %)	Good[c] (*n*, %)
Total dimension	52 (20.23)	170 (66.15)	35 (13.62)
Physical fitness assessment	62 (24.12)	158 (61.48)	37 (14.40)
Exercise guidance	69 (26.85)	155 (60.31)	33 (12.84)
Daily activities guidance	35 (13.62)	151 (58.75)	71 (27.63)
Joint movement assistance	90 (35.02)	111 (43.19)	56 (21.79)
Physical therapists' consultation	148 (57.59)	86 (33.46)	23 (8.95)
Environment arrangement	12 (4.67)	95 (36.96)	150 (58.37)
Mobilization assistance	13 (5.06)	59 (22.96)	185 (71.95)
Cognition stimulation	51 (19.84)	111 (43.19)	95 (36.96)

Abbreviations: %, percentage of participants; *n*, number of participants.
[a]Poor, scoring rate (actual score/total score) × 100% = 0%–59.0%.
[b]Moderate, scoring rate = 60.0%–79.0%.
[c]Good, scoring rate = 80%–100.0%.

TABLE 4 | Nurses' behaviours towards promoting mobility based on nurses' characteristics ($n = 257$).

Characteristics	Categories	Mean ± SD	*t* or *F*	Cohen's *d* or partial η^2 (95% CI)	*p*	Post hoc test
Gender	Female	156.35 ± 23.86	0.83	0.34[a] (−0.47, 1.15)	0.409	
	Male	148.17 ± 28.07				
Age	①≤ 25	151.32 ± 21.15	2.89	0.03[b] (0.00, 0.08)	0.036*	②<③*
	②26–35	154.30 ± 25.06				
	③36–45	164.16 ± 20.80				
	④≥ 46	155.67 ± 23.37				
Educational level	Diploma	168.50 ± 3.54	0.63	0.01[b] (0.00, 0.03)	0.597	
	Associate degree	150.19 ± 27.34				
	Bachelor's degree	156.87 ± 23.85				
	Master's degree	154.57 ± 23.63				
Years of nursing experience	≤ 5	157.96 ± 25.32	2.44	0.03[b] (0.00, 0.07)	0.052	
	6–10	152.45 ± 25.37				
	11–15	154.68 ± 20.80				
	≥ 16	163.38 ± 21.39				
Professional title	Newly registered nurse	147.67 ± 17.12	1.05	0.01[b] (0.00, 0.04)	0.371	
	Senior nurse	155.98 ± 27.56				
	Nurse in charge	157.49 ± 22.27				
	Director nurse	159.00 ± 11.87				
Work positions	①Head nurse	159.85 ± 18.17	4.04	0.03[b] (0.00, 0.08)	0.019*	③<②*
	②Clinical teaching nurse	164.82 ± 25.39				
	③General nurse	153.95 ± 23.55				
Departments	Geriatric ward	168.01 ± 20.66	9.27	1.16[a] (0.89, 1.42)	<0.001***	
	Non-geriatric ward	144.02 ± 20.82				
Attending training activities in aged care	Yes	165.02 ± 22.94	6.36	0.79[a] (0.54, 1.05)	<0.001***	
	No	147.35 ± 21.61				

Note: Cohen's *d* was reported for independent-samples *t*-test comparisons, and partial eta squared (partial η^2) was reported for ANOVA comparisons. Values in parentheses indicate 95% confidence intervals for the corresponding effect sizes. Bonferroni post hoc tests were conducted for multiple comparisons where appropriate, and only statistically significant pairwise comparisons are shown. Bonferroni post hoc tests were conducted for multiple comparisons where appropriate, and only statistically significant pairwise comparisons are shown. *$p < 0.05$; ***$p < 0.001$.

Abbreviations: CI, confidence intervals; *F*, analysis of variance; *n*, number of participants; SD, standard deviation; *t*, independent *t*-test.

[a]Cohen's *d*.

[b]Partial η^2.

156.7 (49.4). Detailed characteristics of the participants are presented in Table 6.

3.2.2 | Facilitators or Barriers of Nurses' Behaviours Towards Promoting Mobility

Using thematic analysis to derive factors that nurses perceive to facilitate or hinder nurses' behaviours towards promoting mobility, six barriers and four facilitators were identified. The barriers were 'insufficient competence', 'lack of standardized protocols', 'fear of adverse events', 'unclear nurse role', 'lack of time' and 'limited environment and equipment'. The facilitators were: 'practice-based training', 'incentive policies', 'family involvement' and 'organizational expectations'.

These themes were mapped to six COM-B constructs: Psychological Capability, Physical Capability, Reflective Motivation, Automatic Motivation, Social Opportunity and Physical Opportunity, and seven TDF domains: Knowledge, Skill, Reinforcement, Beliefs about consequences, Social/Professional role and identity, Environmental context and resources and

TABLE 5 | Multiple linear regression analysis of factors associated with nurses' behaviours towards promoting mobility ($N = 257$).

Variables	B	SE	β	t	95% CI		p	VIF
Gender (ref. male)								1.01
Female	−1.60	8.70	−0.01	−0.18	−18.74	15.54	0.854	
Age (ref. ≤25)								2.75
26–35	6.34	5.99	0.13	1.06	−5.46	18.13	0.291	
36–45	7.84	8.50	0.15	0.92	−8.90	24.59	0.357	
≥46	2.61	10.96	0.02	0.24	−18.98	24.20	0.812	
Education level (ref. bachelor's degree)								1.24
Diploma	−6.90	15.92	−0.03	−0.43	−38.26	24.46	0.665	
Associate degree	−0.42	6.06	−0.00	−0.07	−12.36	11.52	0.944	
Master's degree	−5.12	4.09	−0.08	−1.25	−8.90	24.59	0.212	
Years of nursing (ref. ≤5)								2.86
6–10	−8.80	4.59	−0.18	−1.92	−17.84	0.23	0.056	
11–15	−0.79	5.60	−0.01	−0.14	−11.82	10.25	0.888	
≥16	−5.27	8.49	−0.09	−0.62	−21.99	11.45	0.535	
Professional title (ref. newly registered nurse)								2.32
Senior nurse	9.33	6.30	0.19	1.48	−3.08	21.75	0.140	
Nurse in charge	3.13	7.19	0.06	0.44	−11.03	17.29	0.663	
Director nurse	10.43	12.62	0.07	0.83	−14.43	35.29	0.409	
Work positions (ref. general nurse)								1.19
Head nurse	2.82	7.59	0.03	0.37	−12.12	17.77	0.710	
Clinical teaching nurse	7.81	3.70	0.12	2.11	0.53	15.09	0.035*	
Departments (ref. non-geriatric ward)								1.87
Geriatric ward	23.24	3.66	0.49	6.35	16.03	30.45	<0.001***	
Attending training activities in aged care (ref. no)								1.94
Yes	1.26	3.64	0.03	0.34	−5.91	8.43	0.729	

Note: $F = 6.056$ ($p < 0.001$); $R^2 = 0.301$; $_{adj}R^2 = 0.251$; Durbin-Watson = 1.97. *$p < 0.05$; ***$p < 0.001$.
Abbreviations: CI, confidence intervals; *n*, number of participants; SE, standard error; VIF, variance inflation factor.

Social influences. These themes and their mapping to the COM-B constructs and TDF domains are summarized in File S9.

3.2.3 | Barriers of Nurses' Behaviours Towards Promoting Mobility

Insufficient competence (COM-B: Psychological Capability, Physical Capability; TDF: Knowledge, Skill) Most of the nurses indicated that they did not know the exact content of nurses' behaviours towards promoting mobility before this study. These concerns were partly due to the limited information they reported receiving from previous training.

> I did not know how to promote older patients' mobility decline systematically before... I did not know how to do and what is it. The aging care training activity I attended before only had little knowledge related to this topic.
>
> (N3)

> I didn't receive systematic training before and may not know how to do it. Until this study, I only have a general understanding. To guide patients effectively, I need a clear idea of how to do it which may require more knowledge and skills.
>
> (N6)

They complained about not having sufficient knowledge and practical skills to guide or assist older patients' joint movement and exercise.

TABLE 6 | Demographic characteristics of interview participants ($n = 12$).

Characteristics	Mean (SD) or *n* (%)
	Mean (SD)
Age (years)	35.8 (8.8)
Score of nurses' behaviours[a]	156.7 (49.4)
	***n* (%)**
Gender	
Male	1 (8.3)
Female	11 (91.7)
Education level	
Associate degree[b]	1 (8.3)
Bachelor's degree	8 (66.7)
Master's degree	3 (25.0)
Work positions	
Head nurse[c]	2 (16.7)
Clinical teaching nurse[d]	1 (8.3)
General nurse[e]	9 (75.0)
Departments	
Geriatric wards	5 (41.7)
Non-geriatric wards	7 (58.3)
Years of nursing experience	
≤ 5	1 (8.3)
6–10	5 (41.7)
11–15	1 (8.3)
≥ 16	5 (41.7)
Attending training activities in aged care	
Yes[f]	6 (50)
No	6 (50)

Abbreviations: %, percentage of participants; *n*, number of participants; SD, standard deviation.
[a]Score of nurses' behaviours towards promoting mobility from quantitative phase.
[b]2-year associate degree, usually a step towards bachelor's degree.
[c]Nurses managing a specific ward or unit.
[d]Nurses who mentor students or staff.
[e]Nurses without any specific duties.
[f]Attended aged care workshops or seminars.

> I did not have the confidence to do it. Although I learned some related knowledge in the training activity before, I still feel that the practice is not enough.
>
> (N1)

> But in some areas like assisting with joint movement and exercise guidance, I think (I) may not be very professional, because we have not received professional training.
>
> (N8)

Lack of standardized protocols (COM-B: Physical Opportunity; TDF: Environmental context and resources) Some nurses mentioned that the absence of standardized institutional protocols and practical guidelines for mobility promotion made implementation difficult, particularly in relation to exercise guidance and physical fitness assessment. This theme was mapped into Physical Opportunity because it reflected a lack of formal procedures, written standards and operational resources that could enable nurses to perform mobility promotion behaviours. In contrast, daily activity guidance and environmental arrangements were easier to implement because these activities had already been incorporated into existing routine nursing care protocols.

> It needs to be standardized. How to assess physical ability in the 'physical fitness assessment' domain? How can we manage their muscle strength and guide exercise according to the evaluation results?
>
> (N12)

> We need a standard protocol, the reason why I could do the daily activity guidance and environment arrangement is because this content is written on our daily care protocols. But my purpose is to prevent falls not to improve their mobility.
>
> (N1)

Fear of adverse events (COM-B: Reflective Motivation; TDF: Belief about consequences) Nurses expressed concerns that mobilization might lead to accidents, such as falls or bleeding in older patients. They emphasized that patient safety was their top priority. To avoid potential risks, some nurses chose to limit or prevent mobilization efforts, prioritizing caution over promoting mobility.

> There may still be some potential safety hazards at times. Patients are frail... if they do some overload movement, it may cause such as bleeding, or falls.
>
> (N1)

> The risk is that if it is a frail patient, or you rashly conduct exercise guidance without some professional evaluation... The longer you work for this job, the more consideration, and the more risks you imagine.
>
> (N3)

> ...We mainly focus on avoiding risks, rather than meeting specific requirements or enhancing their mobilization... (As a result), we might not encourage exercise....
>
> (N10)

Unclear nurse role (COM-B: Reflective Motivation; TDF: Social/professional role and identity): Some nurses, patients and doctors believed that the responsibilities of nurses did not include mobility promotion, attributing the responsibility to the physical therapists. This perception diminished nurses' motivation to engage in mobility-related care, as they identified themselves as non-experts in this area. The lack of clearly defined responsibilities further left nurses uncertain about their role in mobility promotion.

> The responsibilities of each profession are different, my responsibilities are not much related to promoting mobility, which is mainly done by physical therapy.
>
> (N9)

> We believe these care activities are more related to rehabilitation and typically handled by physical therapists... Honestly, I acknowledged that it is important for geriatric nurses to master this knowledge as well, but we are unable to perform standardized maneuvers. In the rehabilitation department, physical therapists and their technicians conduct mobilization activities more professionally and effectively.
>
> (N2)

Nurses reported that patients and doctors lacked trust in their ability to promote mobility. This scepticism raised concerns that their involvement in mobility activities might be perceived as interfering with the patient's recovery process or worsening their condition. As a result, nurses felt discouraged from engaging in mobility promotion.

> They did not trust us (patients and doctors). When we want to help patients move, the doctor said that: 'you can't do anything for this patient. I am afraid you will make him catch a cold'.
>
> (N7)

However, few clinical teaching nurses explained that their role involves mentoring students and staff in clinical settings, which motivated them to enhance their competence and keep up to date with new clinical practices.

> You know, I need to teach nurse students about how to prevent the function decline in the hospital, and I also need to be a role model for other staff in the ward. I hold myself to a high standard-not just giving injections and administering medications, but also focusing on the patient's functional recovery.
>
> (N4)

Lack of time (COM-B: Physical Opportunity; TDF: Environmental Context and Resources): Almost all nurses stated they were consistently occupied with a heavy workload, leaving them with little additional time to perform the behaviours towards promoting mobility. Additionally, patients were often engaged in long-term treatments that required them to remain in bed, which limited their opportunities to participate in mobility promoting activities.

> The work of each nurse is trivial... because we have too much work to do at ordinary times... if we need to consume a lot of energy and time to do it, it may not be really carried out. We have limited time and it may be difficult to implement well.
>
> (N3)

> For example, some patients with heart failure, they may be infused for a longer time, perhaps for 24 h, and he has less chance of getting out of bed.
>
> (N5)

Limited environment and equipment (COM-B: Physical Opportunity; TDF: Environmental context and resources): Nurses argued that the limited resources in the non-geriatric wards, including outdated facilities and a lack of assistive devices and exercise equipment, are restrictions that hindered their opportunity to promote mobility.

> Our non-geriatric department is very old. The toilet in the ward is not convenient for the older adults. Anyway, the environment is very poor for them to walk. In addition, if you want to guide the exercise, the necessary tools, such as exercise equipment, are not available.
>
> (N7)

> We need to think about whether the current equipment system is complete. For example, if I want to implement this kind of nursing, the tools such as mobility aids, exercise equipment are currently not available.
>
> (N2)

3.2.4 | Facilitators of Nurses' Behaviours Towards Promoting Mobility

Practice-based training (COM-B: Psychological Capability, Physical Capability; TDF: Knowledge, Skill): Nurses who had received relevant training recognized the importance of promoting mobility and were more willing to implement behaviours towards promoting mobility.

> I participated in the training of a respiratory therapist in our hospital last year and I also engaged in rehabilitation courses last year. After attending these training courses, I learned about the importance of early rehabilitation and activities and paid more attention to promoting mobility.
>
> (N2)

Several nurses highlighted the need for systematic and practice-based training to effectively translate theoretical knowledge into clinical practice. They emphasized that sufficient knowledge and skills were essential for building their confidence in performing these behaviours.

> We need a specific and targeted training. First, we need to understand the knowledge, for example, the content of care for mobility promotion. Then, how to translate the knowledge into practice. Last, we need clinical case analysis and practical training. It may be more practical for us to promote mobility for older patients in different environments.
>
> (N6)

Incentive policies (COM-B: Automatic Motivation; TDF: Reinforcement): Establishing appropriate reimbursement mechanisms for mobility-related nursing care and providing incentives for nurses could enhance their motivation to engage in these activities.

> It must be charged. You may be willing to do this thing with a certain economic reward. If we don't have any payment at all, we will lose enthusiasm.
>
> (N4)

> The motivation (to engage in this activity) might decrease if there are no rewards provided. Since this task requires a certain level of expertise, it may warrant financial compensation. Patients might also be willing to pay if they see the benefits.
>
> (N9)

Family involvement (COM: Social Opportunity; TDF: Social influences): Empowering family members to participate in mobility promotion care may be beneficial. Involving them in appropriate aspects of mobility support could help reduce nurses' workload while also minimizing potential disputes related to care costs.

> If we want to do this work without enough staff, family can play a role in helping patients manage movement.
>
> (N8)

> It may be better if the family members participate. If we make a video and then the family members help patients do it, it will be better. It is a replacement for nurses. We don't need to charge for this if we hand it over to the family.
>
> (N11)

Organizational expectations (COM: Social Opportunity; TDF: Social influence), Wald-level expectations in geriatric wards and leadership support were essential for encouraging nurses to engage in mobility promotion. When wards prioritize mobility promotion and clearly delegate related responsibilities, nurses are more likely to participate in these activities and perceive mobility promotion as part of their professional duties.

> The head nurse of our geriatric ward encourages us to do it and want to see older patients' good outcomes. If the head nurse attaches great importance to this area, there will be a certain nurse take responsibility for this work... I think leaders are very important.
>
> (N10)

> If a majority of nurses implement it, the whole atmosphere will persuade you to implement this work. If everyone does this you will be more willing to do it. If no one does it, you are doing it alone. You will consider it is not your job, and it is not your workload, right?
>
> (N6)

3.3 | Integration of Quantitative and Qualitative Findings

The main quantitative and qualitative results were integrated and presented in a joint display table (Table 7). Overall, the integration revealed that nurses' behaviours towards promoting mobility were suboptimal and influenced by interacting factors across the domains of capability, motivation and opportunity. In terms of capability, insufficient knowledge and skills, along with a lack of standardized training, limited nurses' ability to implement mobility promotion behaviours. Motivational influences were primarily related to professional role identity. Role ambiguity reduced engagement, while clearer role identity enhanced behaviour, particularly among clinical teaching nurses. Regarding opportunity, environmental resources and organizational support were associated with higher behaviour levels, whereas limited resources, time constraints and the absence of standardized protocols hindered mobility promotion behaviours. Family involvement was also identified as a potential facilitator that could extend care support. Integration patterns of convergence, complementarity, dissonance and silence were identified, demonstrating the added value of integrating quantitative and qualitative findings.

4 | Discussion

This study used mixed methods to evaluate the status of nurses' behaviours towards promoting mobility among hospitalized older adults and identify the barriers and facilitators. The integrated findings suggest that the suboptimal implementation of mobility promotion behaviours is likely driven by the dynamic interaction of capability, motivation and opportunity-related factors within complex clinical contexts.

4.1 | Practice-Based Training to Improve Capability

The integrated findings highlighted capability as a key determinant of mobility promotion behaviours. Lower performance

TABLE 7 | Joint display of key quantitative and qualitative findings.

COM-B domains	Main quantitative results	Main qualitative results	Integration results
Behaviour	The overall mean score of nurses' behaviours towards promoting mobility was 156.15 ± 23.94 out of 230 points. A total of 66.15% of the nurses demonstrated moderate behaviours, while only 13.62% demonstrated good behaviours	Nurses' behaviours were influenced by factors across the domains of capability, motivation and opportunity, comprising 10 factors in total, including four facilitators and six barriers	**Complementarity:** Nurses' behaviours towards promoting mobility were suboptimal and were jointly influenced by multiple barriers and facilitators, indicating the need for systematic interventions in future practice
Capability	Lower scoring rates were observed in 'joint movement assistance' (63.02%) and 'exercise guidance' (64.15%)	**Insufficient competence:** Nurses complained about not having sufficient knowledge and practical skills to guide or assist older patients' joint movement and exercise: *I did not know how to do and what is it. (N3); But in some areas like assisting with joint movement and exercise guidance, I think (I) may not be very professional, because we have not received professional training. (N8)*	**Complementarity:** Lower performance in joint movement assistance and exercise guidance may be explained by insufficient competence, particularly the lack of knowledge, practical skills and professional training, which limits effective implementation
	Training was associated with higher scores in univariate analysis ($t = 6.36$, $p < 0.001$) but not significant in multivariate analysis ($\beta = 0.03$, $p = 0.729$)	**Practice-based training:** Nurses emphasized the importance of systematic and practice-based training to improve knowledge, skills, and confidence: *...I learned about the importance of early rehabilitation and activities and paid more attention to promoting mobility. (N2); We need a specific and targeted training. First, we need to understand the knowledge, for example, the content of care for mobility promotion. Then, how to translate the knowledge into practice. Last, we need clinical case analysis and practical training.... (N6)*	**Dissonance:** While training was not a significant predictor in the multivariate analysis, qualitative findings highlighted the importance of practice-based training. This inconsistency suggests that current training programs may lack practical and context-specific components, limiting their effectiveness in influencing behaviour

(Continues)

TABLE 7 | (Continued)

COM-B domains	Main quantitative results	Main qualitative results	Integration results
Motivation	More than half of nurses (57.59%) demonstrated poor behaviours in the physical therapists' consultation dimension. Clinical teaching nurses had significantly higher scores than general nurses ($p = 0.017$) and were more likely to engage in mobility promotion behaviours ($\beta = 0.12$, $p = 0.035$)	**Unclear nurse role:** Nurses reported unclear professional roles, while clinical teaching nurses demonstrated stronger role identity and motivation: *...my responsibilities are not much related to promoting mobility, which is mainly done by physical therapy. (N9); I need to teach nurse students about how to prevent the function decline in the hospital, and I also need to be a role model for other staff in the ward.... (N4)*	**Complementarity:** Lower performance in consultation-related behaviours and higher scores among clinical teaching nurses may be explained by role-related differences in motivation, where role ambiguity reduces engagement and clearer role identity enhances behaviour implementation
	No quantitative findings	**Fear of adverse events:** Nurses reported concerns about risks (e.g., falls, bleeding), leading them to avoid promoting mobility: *...we mainly focus on avoiding risks, rather than meeting specific requirements or enhancing their mobilization... (As a result), we might not encourage exercise.... (N10)*	**Silence:** Fear of adverse events, not reflected in the quantitative findings, may act as a key motivational barrier, leading nurses to prioritize risk avoidance over mobility promotion
	No quantitative findings	**Incentive policies:** Nurses reported that financial compensation and rewards, could enhance their motivation to engage in mobility promotion behaviours: *Since this task requires a certain level of expertise, it may warrant financial compensation.... (N9)*	**Silence:** Incentive policies, not reflected in the quantitative findings, may serve as important motivational drivers by reinforcing nurses' engagement in mobility promotion behaviours

(Continues)

TABLE 7 | (Continued)

COM-B domains	Main quantitative results	Main qualitative results	Integration results
Opportunity	Nurses working in geriatric wards demonstrated significantly higher levels of mobility promotion behaviours than those in non-geriatric wards ($t = 9.27$, $p < 0.001$; $\beta = 0.49$, $p < 0.001$)	**Limited environment and equipment:** Nurses reported that limited resources and equipment in non-geriatric wards, including outdated facilities and lack of assistive devices, restricted implementation: *Our non-geriatric department is very old... the necessary tools... are not available. (N7)* **Organizational expectations:** In contrast, stronger organizational expectations and leadership support in geriatric wards encouraged engagement: *The head nurse... encourages us... I think leaders are very important. (N10)*	**Convergence:** Higher behaviour levels in geriatric wards align with qualitative findings indicating both better environmental resources and stronger organizational expectations, suggesting that supportive physical and social contexts jointly facilitate mobility promotion behaviours.
	Relatively higher proportions of nurses demonstrated good behaviours in 'mobilization assistance' (71.95%) and 'environment arrangement' (58.37%)	**Lack of standardized protocols:** Nurses reported that existing care protocols facilitate implementation, whereas the absence of standardized guidelines in other areas creates difficulties: *We need a standard protocol... the reason why I could do daily activity guidance and environment arrangement is because this content is written in our care protocols.... (N1)*	**Complementarity:** Higher performance in mobilization assistance and environment arrangement may be explained by the presence of established protocols, which facilitate implementation, whereas lack of standardized protocols hinders other mobility-related practices
	No quantitative findings	**Lack of time:** Nurses reported that heavy workload constrained their ability to implement mobility promotion behaviours: *We have limited time and it may be difficult to implement well. (N3)* **Family involvement:** Nurses perceived that engaging family members could facilitate mobility promotion by extending care support *family can play a role in helping patients manage movement.... (N8)*	**Silence:** These factors, which were not reflected in the quantitative findings, may both constrain and facilitate mobility promotion behaviours, with time constraints limiting implementation and family involvement extending care capacity

in dimensions such as 'joint movement assistance' (63.02%), 'exercise guidance' (64.15%) and 'physical fitness assessment' (66.58%) were explained by insufficient knowledge, skills and lack of standardized training, as complemented by emergent themes in qualitative data. In line with findings from a previous study, nurses reported more difficulties in mobilizing hospitalized patients compared to rehabilitation therapists, primarily due to a lack of specialized knowledge and skills (Crooks et al. 2024). Rehabilitation therapists received specialized training in patients' mobilization, which is a core component of their daily clinical practice (Crooks et al. 2024; Lewis et al. 2023).

Notably, a dissonance was observed regarding training: although training was associated with higher scores in univariate analysis, it was not significant in multivariate analysis. Qualitative findings, however, emphasized the importance of practice-based training. This finding may suggest that the previous aged care training that nurses receive lacks systematic, practice-based content focused on promoting mobility, leading to limited real-world impact on their behaviours. Therefore, providing nurses with sufficient practice-based training targeting the specific content is essential to prepare them for promoting mobility in clinical settings (Herzog et al. 2023). However, there is still heterogeneity in ways of defining and measuring nurses' behaviours towards promoting mobility. For instance, Simmons et al. (2025) defined nurses' behaviours towards promoting mobility as three types of mobility events (e.g., repositioning in bed, bed-to-chair transfer and walking assistance). In contrast, Pan et al. (2023) categorized four types of mobility events (e.g., a multidisciplinary care team, early assessment, timely and frequent ambulation assistance and constant encouragement). In our study, we assessed nurses' behaviours towards promoting mobility as 46 items in 8 dimensions, offering a more comprehensive framework. Therefore, achieving consistency in the definition and measurement of nurses' mobility promotion behaviour is essential. Clear, standardized instruments would facilitate comparisons across study comparisons and support the development of more effective training programs for nurses.

4.2 | Enhancing Nurses' Role Cognition and Implementing Incentive Policy to Boost Motivation

Motivational factors were closely linked to professional role identity. Complementary findings showed that lower performance in consultation-related behaviours and higher engagement among clinical teaching nurses could be explained by differences in role perception. Role ambiguity reduced nurses' willingness to engage in mobility promotion, whereas clearer professional identity enhanced behavioural engagement. A common finding shared among studies (Johansen et al. 2025; Lewis et al. 2023). However, physical therapists are only with the patient for approximately 30 min per day; the time is 8–12 h for nurses (Lewis et al. 2023; Lim, Ang, et al. 2020). If the work of assisting patients with early mobility is the responsibility of the physical therapist, it may delay mobility in older patients. Conversely, shifting the responsibility for assisting patient mobility into the nurse's work may increase patient activity and improve patient outcomes (Xu et al. 2025). Future interventions should enhance nurses' role cognition and sense of responsibility, thus promoting the initiative of nurses' behaviours towards promoting mobility.

In addition, several motivation-related factors emerged exclusively from qualitative findings (silence), including fear of adverse events and the influence of incentive policies. Nurses tended to prioritize patient safety and avoid potential risks, which may reduce their willingness to promote mobility. This aligns with previous research indicating that fear of falls and safety concerns can inhibit mobility promotion behaviours (Lim, Ang, et al. 2020; Mani et al. 2022). Since patient falls are a nursing-sensitive quality indicator, the responsibility for patient falls is often directly placed on the nurse (Herzog et al. 2023). To prevent falls and protect hospitalized older patients, nurses may resort to physical restraints and restrict patients' mobility. Future education programs should focus on correcting nurses' misconceptions (e.g., that promoting mobility increases the risk of adverse events) and reinforcing accurate perspectives (e.g., that mobility promotion helps prevent function decline). Training should additionally provide clear guidance on risk assessment and indications for safety mobility promotion enhancing nurses' self-confidence in these behaviours (Herzog et al. 2023; Pan et al. 2023). Furthermore, timely and appropriate rewards can improve clinical performance, shift priorities, and enhance the efficiency and effectiveness of nursing care (Kohnen et al. 2023). Strengthening these aspects will fundamentally boost nurses' motivation to promote patients' mobility.

4.3 | Creating Older Patients-Friendly Environment and Promoting Family Involvement to Increase Opportunities

Opportunity-related factors were identified as critical in shaping nurses' behaviours. Convergent findings demonstrated that nurses working in geriatric wards had higher levels of mobility promotion behaviours, which aligned with qualitative evidence of better environmental resources and stronger organizational support in these settings. This suggests that both physical and social environments jointly facilitate behaviour implementation. In order to adapt to the increase in the number of older inpatients and the coexistence of multiple diseases in older patients, many class A tertiary hospitals in China have established geriatrics departments (Dong et al. 2018; Long et al. 2024). Compared with non-geriatric departments, geriatric departments may receive geriatric care-related training, so there are fewer barriers in knowledge (Long et al. 2024). Evidence suggests that older inpatient-friendly environments including safe walking areas, sufficient lighting and floor, sufficient equipment, and functional furniture are the promotion factors (Herzog et al. 2023; Piper et al. 2024). Several models of geriatric practice have addressed the problem of functional decline in hospitalized older patients which included environmental modifications as an important component (Herzog et al. 2023; Mani et al. 2022).

In addition, complementary findings indicated that higher performance in certain domains including mobilization assistance (81.69%) and environment arrangement (79.02%) was associated with the presence of established care protocols. These findings may be explained by the fact that nurses' content of routine work protocols including these better performance dimensions,

for instance assessing the fall risk of older inpatients, guiding their daily activity and keeping the environment safe inwards to avoid falls (Vechter and Drach-Zahavy 2021). At the same time, nurses educated patients and families to move and transport patients to avoid immobility complications (Simmons et al. 2025). Furthermore, Herzog et al. (2023) suggested professional standards and protocols related to mobility while mapping each collaborator's (i.e., patients and staff member's) role and contribution is crucial in the process of mobility improvement. Researchers also suggested that setting standards and pathways of care for mobility promotion would assist nursing teams in taking an active and goal-directed role in promoting mobility (Pan et al. 2023; Xu et al. 2025). Therefore, we recommend wards give specific goals, protocols, pathways, written and spoken rules, and procedures related to mobility promotion care.

In contrast, qualitative findings revealed additional opportunity-related barriers and facilitators that were not captured in the quantitative data (silence). Heavy workload and time constraints limited nurses' ability to prioritize mobility promotion. Similar conclusions have been reported in other studies from Switzerland (Herzog et al. 2023) and Denmark (Piper et al. 2024), which found that mobility promotion tasks became less of a priority for nurses when they faced low staff ratios and high workloads. Conversely, family involvement was identified as a potential facilitator, as engaging family members could extend care capacity and support patient mobility. Due to the shortage of nurses, it is not possible for the nursing staff of the ward to fulfil the needs of the patients (Pan et al. 2023). Previous studies widely recommend that involving family members in hospital settings could cover a considerable number of care activities and promote functional recovery in older inpatients (Hao et al. 2024; Pan et al. 2023). Therefore, in the practical context, family members might be an alternative resource to conduct mobility promotion if they have been trained, supervised or supported to perform care activities accurately (Piper et al. 2024).

To date, several nurse-driven mobility promotion programs from the US (Pan et al. 2023), Canada (Liu et al. 2018) and Switzerland (Liechti et al. 2024) have shown benefits, including reduced length of stay, increased time spent out of bed and improved functional outcomes under study conditions. However, these studies primarily employed discrete behaviour change techniques such as education, skill practice and mobility resources, which did not result in broad-scale changes in clinical practice. To implement durable and effective changes, interventions should address barriers and facilitators that can be realistically modified in practice. The COM-B model and TDF used in this study offer a detailed understanding of the factors that facilitate or hinder nurses' behaviours towards promoting mobility among hospitalized older adults, which is essential for developing theoretically informed interventions (Michie et al. 2014). Specifically, the explicit links between the COM-B model and TDF to the Behavioural Change Wheel (BCW) guide a systematic process to identify the relevant intervention function and supportive policies that could promote nurses' behaviours (Gaspar et al. 2022; Michie et al. 2011). Furthermore, linking the identified intervention function to the Behavioural Change Taxonomy provides suggestions as to possible behavioural change techniques for consideration in complex intervention development (Michie et al. 2014; Samdal et al. 2023). This theoretical approach can also prevent the development of less effective interventions which focus solely on nurses' factors while neglecting the complex hospital context (Tong et al. 2022). Therefore, this study provides a solid foundation for the development of context-based and theoretically informed interventions to enhance nurse-driven mobility promotion (Michie et al. 2014; Pan et al. 2023).

It is also important to consider the context in which the data were collected. During the COVID-19 pandemic, changes in the working environment may have influenced nurses' mobility promotion behaviours. Previous studies have reported that altered nurse-to-patient ratios, changes in work arrangements, exposure to unprecedented health risks, and reduced training opportunities posed significant challenges for nurses (Alquwez 2025). Restrictions on patient visitation and family caregiving may have reduced family involvement in mobility-related care, thereby increasing reliance on nurses (Johansen et al. 2025). Meanwhile, infection control procedures and additional clinical demands may have further increased workload. Evidence suggests that high workload and limited resources can shift attention towards urgent tasks, reducing the priority given to preventive nursing activities (Herzog et al. 2023). In this context, mobility promotion may have been less prioritized. In addition, reduced training opportunities may have limited access to practice-based learning, potentially affecting nurses' ability to implement mobility-related interventions (Piper et al. 2024). These factors may help explain the moderate level of mobility promotion behaviours observed in this study.

4.3.1 | Strengths and Limitations

This study used an explanatory sequential mixed method approach with appropriate integration of quantitative and qualitative components, which was a sound, justifiable and feasible approach. However, several limitations must be considered. First, this study only involved three class A tertiary hospitals, and all had established geriatric departments. Therefore, the findings may have limited generalizability to other healthcare settings, particularly small and medium-sized hospitals. Future research should include a broader range of institutions. Second, selecting qualitative participants from the quantitative sample enabled deeper exploration of survey findings. However, participants were recruited on a voluntary basis, which may introduce self-selection bias and lead to overrepresentation of nurses who are more interested or engaged in mobility promotion. In addition, due to the sequential nature of the explanatory design, participants' responses in the qualitative phase may have been influenced by their prior exposure to the questionnaire, potentially introducing a carryover effect. To minimize this risk, open-ended questions were used during interviews, and terminology consistent with the questionnaire was deliberately avoided to encourage independent and authentic expression (O'Cathain et al. 2008). Third, this study used self-reported measures in the quantitative phase. Self-reported questionnaire may not provide an accurate representation of the real situation for nursing activities (Burke et al. 2000). Fourth, the categorization of scoring rates using Bloom's cut-off points may enhance the interpretability of behaviour scores; however, these thresholds have not been specifically validated for this scale. Therefore, the

classification of behaviour levels may be sensitive to the selected cut-off values, particularly for scores near the category boundaries (Seruwagi et al. 2021). Finally, reporting bias should also be considered. Although a secure box was used, participants may have provided socially expected answers instead of conveying their authentic opinions.

4.3.2 | Implications

This study highlights the need to enhance nurses' behaviours towards promoting mobility among hospitalized older adults. Initially, ward standards and protocols need to be developed to provide specific goals, rules and procedures. Additionally, education and practice-based training should focus on addressing skill and knowledge gaps and clarify their roles in mobility promotion. Although reducing nurses' heavy workload and time constraints may not be immediately achievable, involving family members in care can help alleviate some of the burden. Furthermore, nursing administrators and managers are encouraged to create an elderly-friendly environment in wards and ensure the availability of sufficient assistive resources to support mobility promotion in the clinical setting.

5 | Conclusions

The findings of this study showed that Chinese nurses' behaviours towards promoting mobility among hospitalized older adults are at a moderate level and need further improvement. Informed by the COM-B model, we identified barriers and facilitators affecting nurses' implementation of mobility promotion behaviours. The integration between the quantitative and qualitative findings emphasizes the importance of using a mixed method design to comprehensively understand the status and influential factors of nurses' behaviours. These findings are essential for hospital and nurse managers to develop targeted intervention programs. Further research aimed at improving nurses' behaviours towards promoting mobility should focus on enhancing their abilities and motivation at the individual level and providing supportive environments and resources at the organizational level.

Author Contributions

The first author S.W. conceived and designed the study. The corresponding author H.F. designed and supervised the study. S.W., H.L., J.N., C.B., H.N. and H.P. had roles in research design, recruitment, data collection. S.W., Q.Z. and M.H. analysed the results. M.V. made significant changes for the methodology, methods and manuscript revision. All authors reviewed and revised the manuscript and approved the final version. The corresponding author attests that all listed authors meet authorship criteria and that no others meeting the criteria have been omitted. The authors have checked to make sure that our submission conforms as applicable to the Journal's statistical guidelines described here. M.H. is a statistician on the author team.

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Ethics Statement

Ethics approval for this study was obtained from the Ethics Committee of Central South University with approval number E202063.

Conflicts of Interest

The authors declare no conflicts of interest. All co-authors have seen and agree with the contents of the manuscript, and there is no financial interest to report.

Data Availability Statement

The quantitative and qualitative data used to support the findings of this study are available from the corresponding author upon request.

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Supporting Information

Additional supporting information can be found online in the Supporting Information section. **File S1:** Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) statement. **File S2:** Consolidated criteria for reporting qualitative studies (COREQ) checklist for qualitative studies. **File S3:** Good Reporting of A Mixed Methods Study (GRAMMS) checklist. **File S4:** The Chinese nurses' behaviours towards promoting mobility scale in English. **File S5:** Interview guide. **File S6:** Saturation tracking table. **File S7:** Thematic analysis process applied to the study. **File S8:** Differences in nurses' behaviours towards promoting mobility according to nurses' characteristics ($N = 257$). **File S9:** Mapping of themes to the TDF domains and COM-B constructs.