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Review

Early Ambulation After Female Pelvic Floor Reconstruction in the Context of Enhanced Recovery After Surgery: A Narrative Review

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Abstract

Objective: This article reviews research advances in the management of early ambulation following female pelvic floor reconstruction surgery (PFRS), with the objective of providing a robust evidence-based foundation for the development of standardized and individualized early ambulation protocols. **Mechanism**: PubMed, Web of Science, the Cochrane Library, the China National Knowledge Infrastructure (CNKI), and the Chinese Biomedical Literature (CBM) database were searched from 2015 to October 2025. We included studies reporting first ambulation outcomes after PFRS surgery, including both original studies and secondary resources (guidelines, consensus statements, meta-analyses). Two researchers independently extracted data and assessed the quality of each study. **Findings in Brief**: Fifteen publications, nine original studies and six guidance documents (consensus statements, meta-analyses, and formal guidelines), were included. All supported early ambulation after PFRS, yet none delineated procedure-specific, metric-based protocols. Two guidelines' recommendation is for postoperative ambulation on the day of surgery for 30 minutes to 2 hours, followed by 6 hours per day thereafter, whereas the remaining four employed non-standardized terms such as "immediate" or "as soon as possible". Nevertheless, the implementation of enhanced recovery after surgery (ERAS) principles has substantially shortened the time to first ambulation. Primary studies demonstrated that earlier ambulation accelerates gastrointestinal recovery, lowers pain scores on postoperative day 1, and reduces total hospital costs by 30%. **Conclusions**: Early ambulation within 24 h after PFRS may facilitate voiding, shorten hospital stay, and reduce costs, but its inclusion in ERAS protocols still needs robust evidence. Available data are of low certainty. Currently, evidence addressing different surgical approaches—especially after transvaginal mesh implantation—is lacking, and patient-centered tolerance outcomes remain unreported. Until large-scale, mesh-stratified randomized controlled trials with long-term follow-up and patient-reported tolerance as a primary outcome become available, early ambulation should be restricted to carefully selected patients and cannot yet be routinely recommended for women undergoing transvaginal mesh procedures.

Keywords: enhanced recovery after surgery; pelvic floor reconstructive surgery; early ambulation

1. Introduction

Pelvic floor disorders (PFDs) are very common in women and include pelvic organ prolapse (POP), urinary incontinence (UI) and fecal or anal incontinence [1]. With the aging of the global population, the problem of PFD has become increasingly prominent [2]. Pelvic floor reconstructive surgery (PFRS) is an important treatment for PFD. It can restore the pelvic anatomical structure and improve the quality of life of patients. In recent years, various associations and institutions have recommended the application of enhanced recovery after surgery (ERAS) in PFRS. It has been proven to reduce complications and promote recovery [3], with early ambulation being one of its core elements [4,5]. However, as PFRS involves the implantation of synthetic meshes or biological grafts, whether early ambulation affects incision healing, graft stability, and long-term recurrence remains a focus of clinical concern. This article reviews the definition, clinical significance, current state and future research directions of early ambulation, aiming to provide evidence-based data for the development of standardized and individualized early ambulation protocols.

2. Materials and Methods

2.1 Search Strategy

A comprehensive search was performed in PubMed, Web of Science, Cochrane Library, China National Knowledge Infrastructure (CNKI) and Chinese Biomedical Literature (CBM) databases. The search time frame was set from January 1, 2015, to October 2025, with no language restrictions. Each database was searched using free search terms. The following search terms were employed: pelvic floor disorders, pelvic floor reconstructive surgery, pelvic organ prolapse, urogynecology, sacrocolpopexy, colporrhaphy, midurethral sling, and enhanced recovery after surgery, ERAS, fast track surgery, FTS, rapid rehabilitation, early ambulation, early mobilization. The search was restricted to clinical studies (randomized controlled trials, quasi-experimental studies, prospective or retrospective cohort studies, and case–control studies), high-quality guidelines, expert consensus, and systematic reviews, published in either English or Chinese.

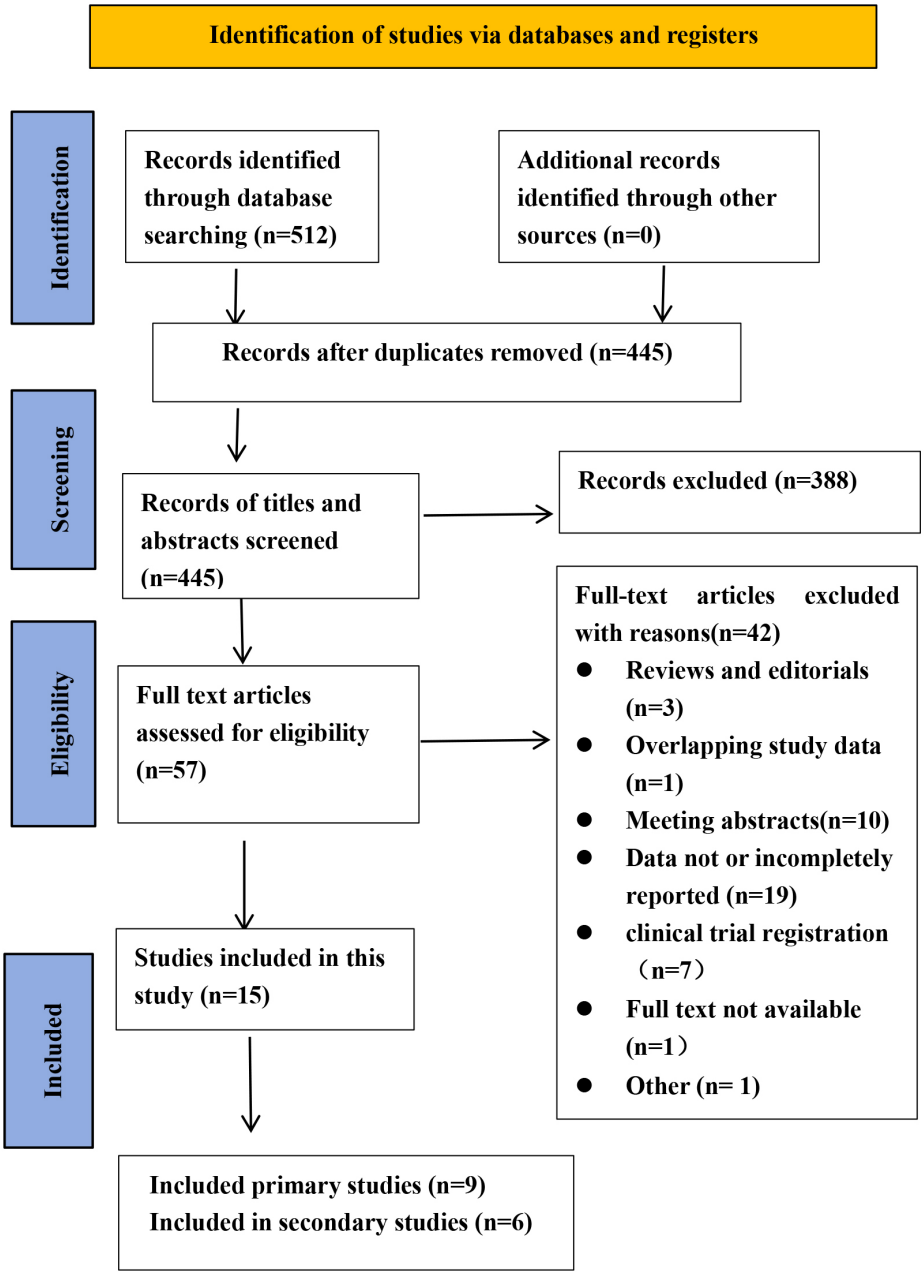

Fig. 1. PRISMA flow diagram. PRISMA, Preferred Reporting Items for Systematic Reviews and Meta-Analyses.

2.2 Selection Criteria

Inclusion criteria were determined using the Population (P), Intervention (I), Comparator (C), Outcome (O), and Study Design (S) framework, as recommended.

2.3 Studies Were Included if They Met the Following Criteria

(P): Adult patients with PFD undergoing PFRS, including but not limited to: sacrocolpopexy (with or without hysterectomy), midurethral sling placement, colpopexy, and uterosacral ligament suspension.

(I): Early ambulation after surgery or ERAS strategies.

(O): Primary outcomes included time to first ambulation, defined as the first assisted walking or the first movement out of bed.

(S): Randomized controlled trials (RCTs), cohort studies, systematic review and meta-analysis, expert consensus, and guidelines.

2.4 Studies Were Excluded if They Were the Following

(i) Were conference abstracts, guideline interpretations, research protocols, or outdated clinical guidelines that had been superseded by newer versions; (ii) Contained incomplete data (e.g., inability to extract key outcomes), had inaccessible full texts; (iii) Included duplicate patient cohorts or reused data from previously published studies; (iv) Included pregnant patients.

2.5 Data Extraction

Article screening and data extraction were completed by two independent researchers in accordance with the study objective and inclusion criteria, including cross-verification to ensure consistency. Any discrepancies arising during the process were resolved by consulting a third reviewer.

2.6 Quality Assessment

Two reviewers independently evaluated the quality of the included studies using appropriate assessment tools. Any discrepancies that arose during the evaluation process were resolved through consultation with a third reviewer. Specific evaluation criteria were applied based on study design: For cohort studies, the Newcastle-Ottawa Scale (NOS) was used, which comprises 9 items across three domains (selection, comparability, and outcome). Studies were categorized as high-quality ($\geq$7 points), moderate-quality (4–6 points), or low-quality ($\leq$3 points). For RCTs, the Cochrane Risk of Bias Tool was utilized to assess bias in seven domains (sequence generation, allocation concealment, blinding of participants and personnel, blinding of outcome assessment, incomplete outcome data, selective outcome reporting, and other biases). Each domain was rated as "low risk", "high risk", or "unclear risk". For a quasi-experimental study, the JBI Critical Appraisal Checklist for Quasi-Experimental Studies (2016) was utilized. Each domain was marked as: Yes/No/Unclear/Not applicable.

3. Results

Search Results

The study selection process was conducted in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) Statement and is summarized in Fig. 1. Initial database searches identified 512 records, of which 67 duplicate records were removed. After title and abstract screening, 388 records were excluded for failing to meet the inclusion criteria (e.g., irrelevant population, inappropriate intervention/comparator). A total of 57 full-text articles were retrieved for eligibility assessment, with 15 studies fulfilling our inclusion criteria and were included in the study. Among them, there were 9 primary research papers and 6 guidelines and expert consensus. These 6 guidelines and expert consensuses were analyzed to compare definitions of early ambulation timing across different countries and regions (Table 1, Ref. [6,7,8,9,10,11]). The original studies included in this review investigated the impact of ERAS strategies on early ambulation in people after PFRS (Table 2, Ref. [12,13,14,15,16,17,18,19,20]).

The quality assessment for the 3 study types was as follows: 6 RCTs showed low risk in randomization, allocation concealment, and reporting, but high/unclear risk in blinding domains. One quasi-experimental study met all 9 JBI criteria and was rated high quality. Two cohort studies scored 9 and 8 on the NOS, respectively, and both were classified as high quality. The quality assessment results are presented in **Supplementary Material 1**.

4. Definition of Early Ambulation Time

Currently, no standardized definition of "early ambulation" exists. In hip-fracture surgery it has been defined as any physiotherapist-supervised, partial or full weight-bearing activity (e.g., walking on the spot, bed-to-chair, bed-to-toilet) within 24 h after surgery [21]. For PFRS, the 6 most influential guidelines/consensuses [6,7,8,9,10,11] (see Table 1) universally endorsed early ambulation yet offered inconsistent specifications: only 2 documents [8,9] quantified targets (2–6 h), while the remaining 4 employed [6,7,10,11] non-standardized phrases such as "as soon as possible" or "immediate". In this review, 'early ambulation' was defined as getting out of bed within 24 h after surgery, with a recommended frequency of 30 min on the day of surgery and 6 h/day thereafter, administered in short, frequent bouts under the supervision of a nurse or caregiver to prevent falls. The recommendations exhibited geographical disparities and prioritized procedural inclusivity over PFRS specificity, resulting in a notable absence of an evidence-based time threshold. This lack of a quantifiable PFRS-specific definition highlights the pressing need for RCTs to identify the optimal timing for first ambulation and to develop standardized, metric-driven ambulation criteria in future ERAS protocols.

5. Significance of Early Ambulation

5.1 Early Ambulation can Promote General Recovery

The ERAS concept has been widely applied in gastrointestinal surgery, hepatobiliary surgery, and gynecological abdominal surgery. Early ambulation has been proven to effectively reduce the incidence of complications such as deep vein thrombosis, pulmonary infection, intestinal obstruction, and urinary retention, while significantly promoting overall patient recovery. In addition, early ambulation can alleviate negative emotions such as anxiety and depression, enhance self-efficacy, and thereby improve mental health. It also shortens hospital stays, bringing significant economic and social benefits [22,23,24,25]. In the context of PFRS, the implementation of ERAS strategies has been shown to confer comparable benefits. In the current pooled cohort [12,13,14,15,16,17,18,19,20] (see Table 2), patients in the ERAS group showed significantly earlier first ambulation time compared to the control group, with most studies reporting that ERAS patients achieved their first ambulation within 24 hours postoperatively. The mean difference exceeded 17 h in eight of nine trials, with the largest effect reported by Zhou et al. [20] (median 16.86 h *vs.* 37.66 h; $p < 0.05$) and the smallest by Yan et al. [14] (20.00 h *vs.* 23.42 h; $p = 0.02$). This temporal advantage translated into measurable clinical gains: every reduction in time-to-first-ambulation corresponded to a shortening of hospital stay.

Table 1. Recommendations from different associations regarding early ambulation.

Citation	Theme	Study design	Description of early ambulation	Quality of evidence
AUGS-IUGA Joint [7], 2022	AUGS-IUGA Joint Clinical Consensus Statement on Enhanced Recovery after Urogynecologic Surgery	Clinical consensus statement	Recommend early ambulation	High
Urogynecology Subgroup, Chinese Society of Obstetrics and Gynecology, Chinese Medical Association [6], 2024	Chinese Expert Consensus on ERAS after Gynecological Pelvic Floor Reconstruction Surgery	Expert consensus	Encouraged as soon as possible to change positions on the bed and get out of bed for ambulation	High
Zacharakis et al. [11], 2023	ERAS Protocols in Urogynecologic and Pelvic Floor Reconstructive Surgery: A Systematic Review and Meta-Analysis	Systematic Review and Meta-Analysis	Early ambulation as soon as possible, from the day of the surgery or the first postoperative day, twice daily	Moderate
Stone et al. [10], 2021	Enhanced Recovery and Surgical Optimization Protocol for Minimally Invasive Gynecologic Surgery: An AAGL White Paper	Guideline	Encourage frequent and immediate ambulation	Moderate
Oodit et al. [8], 2022	Guidelines for Perioperative Care in Elective Abdominal and Pelvic Surgery at Primary and Secondary Hospitals in Low–Middle-Income Countries: ERAS Society Recommendation	Guideline	Mobilization 30 min on the day of surgery and 6 h/day thereafter	Moderate
Segelman et al. [9], 2017	Best Practice in Major Elective Rectal/Pelvic Surgery: ERAS	Best practice	Recommendation is to be out of bed 2 h on the day of surgery and 6 h per day thereafter	Moderate

ERAS, enhanced recovery after surgery; AUGS-IUGA, American Urogynecologic Society and the International Urogynecological Association.

Table 2. Table comparing major ERAS outcome studies.

Authors/year	Country	Study design	Surgery type	Sample size		Early ambulation protocol (ERAS group)	First ambulation time (ERAS group *vs.* Control group)	Other significant results
				ERAS group	Control group			
Gong et al. [12], 2020	China	Retrospective cohort study	PFRS	92	85	Early ambulation within 24 h post-op	23.56 ± 3.26 *vs.* 40.6 ± 1.48 h	Earlier flatus, shorter length of stay and lower hospital costs
Trowbridge et al. [13], 2019	USA	Quasi-experimental	PFRS	118	76	Same-day post-op standing and chair transfer, then ≥3 walks daily	ambulated on the day of surgery (73.7 *vs.* 17.1%)	Shortened hospital stay, tripled same-day ambulation, raised satisfaction
Yan et al. [14], 2025	China	RCT	PFRS	129	128	6 h sit/turn, 12 h ambulate, POD1 1–2 h/3000 steps	20.00 (13.33 to 24.00) *vs.* 23.42 (15.32 to 30.00) h	Shortened hospital stay, lower pain scores within 24 h, faster time to first flatus
Chen and Yuan [15], 2021	China	RCT	Vaginal hysterectomy + pelvic floor repair surgery	45	45	Sit up 12 h and ambulate 24 h post-op	23.17 ± 4.37 *vs.* 41.36 ± 3.42 h	Earlier flatus, bowel movement, oral intake, discharge; lower anxiety/depression and better pelvic-floor/QoL scores (PFDI-20, PFIQ-7↓, PISQ-31↑)
Duan et al. [16], 2023	China	RCT	PFRS	56	56	Ambulate 24 h post-op	27.35 ± 7.82 *vs.* 41.67 ± 9.14 h	Faster intake, flatus, defecation, discharge; 50 % less nausea/vomiting, fewer electrolyte issues and complications
Hu et al. [17], 2018	China	RCT	PFRS and reserved uterine	40	42	Sit up 12 h and ambulate 24 h post-op	23.56 ± 3.26 *vs.* 40.60 ± 1.48 h	ERAS cut flatus time, length of stay, and cost all by ≈30%
Peng et al. [18], 2023	China	RCT	PFRS	55	55	Bed activity at 6 h, ambulation within 24 h post-op	7 (6, 14) *vs.* 22 (19, 28) h	Earlier flatus, oral intake, defecation; shorter stay; fewer nausea, vomiting, bloating, retention, DVT; higher QoR-40 at 24 & 48 h; lower PFDI-20 & PFIQ-7 at 3 months
Sun [19], 2018	China	RCT	TVT-O	52	52	POD1: sit and stand; POD2: corridor walk and light activity	23.89 ± 2.68 *vs.* 42.28 ± 3.07 h	Earlier catheter removal, shorter hospital stay, 87% lower cost, fewer complications
Zhou et al. [20], 2023	China	Retrospective cohort study	PFRS	88	79	Ambulation 6 h post-op	16.86 ± 3.61 *vs.* 37.66 ± 6.62 h	Shorter times to flatus, and hospital stay, lower pain scores on surgery day and postoperative day 1, and lower hospital costs

RCT, randomized controlled trial; PFRS, pelvic floor reconstruction surgery; TVT-O, tension-free vaginal tape-obturator; POD, postoperative day; QoL, quality of life; PFDI-20, pelvic floor distress inventory-20; PFIQ-7, pelvic floor impact questionnaire-7; PISQ-31, pelvic organ prolapse/urinary incontinence sexual questionnaire-31; DVT, deep vein thrombosis; ↓, decrease; ↑, increase.

Moreover, earlier ambulation was accompanied by faster return of gastrointestinal function, lower cumulative pain scores on POD1, and a 30% reduction in total hospital costs. Importantly, the benefit was reproducible across surgical indications (PFRS, vaginal hysterectomy, tension-free vaginal tape-obturator (TVT-O)) and study designs (RCT and retrospective cohort), supporting the generalizability of early ambulation as a safe, cost-effective intervention to ERAS. By synthesizing the included guidelines and consensuses, this review embedded a catheter-ambulation flow that reliably starts the clock: catheter removed $\leq$24 h postoperatively ($\leq$8 h when same-day discharge is planned) $\rightarrow$ immediate trial-of-void in the recovery area (post-void residual (PVR) $<$150 mL or $>$50% emptying) $\rightarrow$ successful void allows ambulation to begin within 1 h; if the trial fails, repeat at 6 h or teach intermittent self-catheterization and proceed with ambulation regardless.

5.2 Promoting the Recovery of Urinary Function

PFRS directly involves the bladder and urethra, especially anterior PFRS. Transient postoperative urinary retention (POUR) is common after PFRS, occurring in 15–45% of women [26,27], and can lead to significant morbidity. A handful of POUR risk factors have been identified, including mid-urethral sling (MUS) placement; concomitant hysterectomy with sacrospinous vault suspension [28]; delayed ambulation and systemic opioid use. A retrospective case-control study by Iramaneerat [29] identified postoperative activity limitation as an independent risk factor for urinary retention, with an odds ratio of 6.47 for patients requiring bed rest compared to those who ambulated. One study demonstrated that early ambulation reduced the rate of POUR from 52% to 19% [30]. Vihervaara et al. [31] emphasized the importance of early ambulation in reducing the incidence of postoperative urinary retention, noting that early ambulation can promote early catheter removal. The time to ambulation is associated with the duration of catheterization. Since early removal of the urinary catheter and early ambulation are both key elements of the ERAS protocol, studies on catheter use and patient perspectives have yielded conflicting results. A study by Safdar et al. [32] reported that 45% of patients considered indwelling urinary catheters convenient because they did not have to get up and go to the bathroom, while a study by Liebermann et al. [33] concluded that the most common barrier to early ambulation was the urinary catheter. The relationship between urinary catheter use and ambulation should be further studied in RCTs, including patients' perspectives and experiences on the optimal duration of postoperative catheter treatment.

6. Application of ERAS in Early Ambulation After PFRS

6.1 International Evidence

6.1.1 Application of Early Ambulation After PFRS

ERAS after PFRS in developed countries started earlier, with multidisciplinary and multi-link intervention pathways laying the foundation for early ambulation. Gynecologic urology associations in various countries have successively issued guidelines, unanimously recommending early ambulation after surgery. Under the ERAS program, patients ambulated faster compared to a conventional approach. In the study by Gong et al. [12], patients took their first walk after 23.56 h under ERAS, in contrast to 40.6 h pre-ERAS ($p < 0.001$). Trowbridge et al.'s research [13] found that patients in the ERAS group began ambulating more frequently by day 0 (73.7% compared to 17.1%, $p < 0.01$) and by day 1 (72.9% compared to 34.2%, $p < 0.01$) [22]. Yilmaz et al. [34] demonstrated that the time to ambulation was shorter in the ERAS group (26.1 $\pm$ 7.1 *vs.* 38.4 $\pm$ 11.3 h, $p < 0.001$). However, although ERAS significantly advanced the first ambulation time, it has not yet met the evidence-based recommendation of "ambulation on the day of surgery". During our search, we found that few studies have focused on data related to early ambulation, nor have they reported the ambulation protocol adopted in their studies. Subgroup analyses demonstrated that the lack of significant differences in operation times, surgical approaches and complication rates observed in most articles may further motivate PFRS surgeons to adopt ERAS, potentially paving the way for more extensive future publications. Accordingly, given the role of early ambulation in postoperative recovery, extensive high-quality long-term clinical studies are required to underpin the safe application of ERAS in clinical practice.

6.1.2 Application of Same Day Discharge Surgery Model in PFRS

Same day discharge (SDD) surgery has become an important development trend, and its application in PFRS has also received widespread attention. As early as the 1990s, researchers in the United States began the clinical application of ambulatory surgery for urinary incontinence and vaginal prolapse [35,36]. Over the past 20 years, the number of SDD surgeries in developed regions such as Europe and the United States has increased rapidly [37]. Large-sample data have further verified its feasibility and safety. In the SDD group, patients were monitored in the recovery room for at least 4 h to ensure stable vital signs, adequate pain control, ability to tolerate oral intake, independent ambulation, and no immediate postoperative complications before being discharged [38]. A comprehensive retrieval and synthesis of relevant literature from the last 10 years was conducted by our team, with the results summarized in Table 3 (Ref. [38,39,40,41,42,43,44,45,46,47,48,49,50,51]). Groth et al. [39], in a case-control study involving 803 patients with POP, noted that the overall success rate of SDD

Table 3. SDD in PFRS published within the last decade (2015–2025).

Author/year	Country	Study type	Inclusion criteria	Surgery type	Follow-up	Outcome measures
Groth et al. [39], 2022	Denmark	Retrospective case-control study	Patients who underwent same-day surgery for POP	Vaginal colpocleisis, apical vaginal colpopexy and lateral vaginal colpopexy	30 d	①②③⑤
Ray et al. [41], 2024	USA	Retrospective cohort study	Patients who were 18 years or older and underwent vaginal hysterectomy and vaginal apical reconstruction	Vaginal uterosacral ligament suspension	30 d	①③④⑤
Casas-Puig et al. [42], 2024	USA	Prospective cohort study	Patients aged ≥18 years underwent vaginal hysterectomy with uterosacral ligament colpopexy with concurrent native-tissue vaginal repair and anti-incontinence procedures	Vaginal uterosacral ligament colpopexy	6 weeks	①②③④⑤
Liu et al. [38], 2020	USA	Prospective cohort pilot study	Patients scheduled for a vaginal hysterectomy, apical suspension, anterior and/or posterior colporrhaphy, with or without concomitant mid-urethral sling	Vaginal apical suspension	6 weeks	①③④⑤
Kisby et al. [43], 2019	USA	Retrospective cohort study	Women who underwent RASCP with or without concomitant hysterectomy	RASCP	6 weeks	①④⑤
Hickman et al. [44], 2021	USA	Prospective cohort study	All individuals who were scheduled to undergo a minimally invasive sacrocolpopexy during the study period	RASCP	6 weeks	②④⑤
Zillioux et al. [45], 2021	USA	Retrospective review	All cases performed by a single FPMRS-certified urologist over the past 10 years	RASCP	30 d	①④⑤
Robison et al. [46], 2022	USA	Retrospective cohort study	Patients who underwent non-emergent laparoscopic colpopexy, vaginal colpopexy or obliterative procedures	Laparoscopic and Vaginal colpopexy or obliterative procedures	30 d	②③⑤
Courtieu et al. [40], 2019	France	Prospective cohort study	Patients >18 years, eligible to vaginal or laparoscopic prolapse surgery	Vaginal or laparoscopic prolapse surgery	6 weeks	①②③⑤
Ajao et al. [47], 2021	USA	Retrospective cohort study	All patients who underwent a LSCP with or without hysterectomy, along with vaginal prolapse and anti-incontinence procedures	LSCP	30 d	②③⑤
Guérin et al. [48], 2021	France	Retrospective study	Women who underwent surgery for POP by LSCP	LSCP	30 d	①⑤
Evans et al. [49], 2021	USA	Retrospective cohort study	Women undergoing minimally invasive sacrocolpopexy	RASCP	30 d	①②④
Romanova et al. [50], 2020	USA	Observational cohort study	Women who underwent elective major prolapse surgery	Vaginal or LSCP Obliterative procedures	30 d	①④⑤
Moss et al. [51], 2022	USA	Observational cohort study	Patients over the age of 18 who underwent an apical procedure	Vaginal or abdominal or laparoscopic apical procedure or sacrocolpopexy	30 d	②③

①, Postoperative complications; ②, Unplanned hospital contact; ③, Hospital readmission; ④, Re-operation; ⑤, ED visits; LSCP, laparoscopic sacrocolpopexy; RASCP, robotic assisted sacrocolpopexy; SDD, same day discharge; POP, pelvic organ prolapse; ED, emergency department; FPMRS, female pelvic medicine and reconstructive surgery.

was 90.7%, with 42.7% of failed cases being associated with persistent or new-onset urinary incontinence. A retrospective analysis by Simi et al. [52] showed that 6.9% of SDD patients undergoing PFRS required extended observation due to pain, nausea, or bleeding. This risk was significantly higher in patients aged $\geq$65 years, those with frailty, Caucasians, those with an operation time $>$120 minutes, and those performed under general anesthesia, suggesting that patient characteristics and the severity of prolapse are key factors determining eligibility for same-day discharge. Despite the favorable development of SDD in PFRS in some developed countries, it has not been widely recognized and accepted [40]. The study showed that following robotic assisted pelvic floor reconstruction procedures, the current accepted practice is discharge after a one-night hospitalization [53], and a considerable number of gynecologists (41%) have never performed PFRS [52]. SDD after PFRS is feasible but requires careful consideration and strict control in indication selection, preoperative assessment, and postoperative management. Through meticulous preoperative preparation and effective postoperative management, the risk of complications can be minimized, and overall patient satisfaction can be improved, laying the foundation for the promotion of ambulatory surgery.

6.2 Impact of ERAS Application on Early Ambulation After PFRS in China

ERAS after PFRS developed relatively late in China. Affected by multiple factors such as socioeconomic conditions, medical resource allocation, and cultural concepts, the development of ERAS varies significantly among hospitals in different regions and at different levels. In 2024, the Pelvic Floor Group of the Chinese Society of Obstetrics and Gynecology, Chinese Medical Association, issued the first Expert Consensus on ERAS for PFRS [6], clearly proposing the goal of "ambulation within 24 h postoperatively". However, existing research confirms that this standard remains unmet in clinical practice. In a multicenter study of 112 patients by Duan et al. [16], the first ambulation time in the ERAS group was (27.35 $\pm$ 7.82) h, which was nonetheless significantly earlier than the traditional group's (41.67 $\pm$ 9.14) h. For elderly patients, Huang et al. [54] also confirmed its safety. Compared with developed countries, not only is the time to first ambulation longer, but also the application of SDD is currently lacking in China, reflecting a gap between real-world clinical practice and the theoretical target.

Several factors may account for the gap between the 24-hour ambulation target and real-world practice within the ERAS program. First, a significant disparity exists in opioid analgesic consumption between the United States and China [55], driven by factors including economic development, healthcare policies, prescription practices, regional variations, and cultural attitudes toward pain management and opioid use. Public perceptions and understanding of opioids, coupled with limitations in the healthcare system, exacerbate the underutilization of these analgesics in China, which can result in inadequate pain control and subsequently reduce patients' willingness and physical capacity to ambulate early. Second, cultural beliefs shape patients' willingness of early ambulation. Many patients worry that early ambulation may impair wound healing, and the traditional Chinese belief that postoperative recovery requires prolonged bed rest further reinforces sedentary behaviour [56]. Third, procedural heterogeneity plays a role: the duration of vaginal packing and the placement of drainage tubes both restrict patients' ability to ambulate early. Finally, variability in implementation at the unit level cannot be ignored. Insufficient staff training in ERAS ambulation protocols and inconsistent adherence to early-ambulation guidelines consistently delay the initiation of ambulation.

In light of the above, we propose the following implementation protocol: Phase 0–3 months, conduct a 4-hour nurse training workshop, distribute a Chinese-language patient leaflet, and switch to an opioid-sparing multimodal analgesic cocktail; Phase 3–6 months, introduce a daily ERAS checklist, schedule routine physiotherapist ward rounds, and provide real-time audit feedback; Phase 6–12 months, reallocate nursing staff to achieve a target nurse-to-patient ratio of 1:8, link financial incentives to a 24-hour ambulation rate $\geq$60%, and send a tele-health reminder on POD1 to sustain early ambulation goals. By quantifying an 80% shortfall in 24-hour ambulation and identifying modifiable barriers unique to Chinese practice, we have provided a phased, evidence-linked implementation plan. If adopted, this protocol can close the gap between current performance and international ERAS standards, improve early functional recovery, and serve as a reproducible template for other resource-constrained settings.

7. Future Research Directions

Under the ERAS concept, research on early ambulation after PFRS is still evolving. Future research directions should focus on several key areas to ensure optimal postoperative recovery outcomes for patients.

7.1 High-Quality and Long-Term Follow-Up Studies

Current evidence mostly focuses on short-term outcomes within 30 days postoperatively, with a lack of systematic data on multi-dimensional indicators such as anatomical stability, pelvic floor function, quality of life, and psychosocial adaptation for $\geq$12 months. A concrete next step is to embed the early ambulation question within an existing, multi-center registry—such as the UK "National Prolapse and Incontinence Longitudinal Study" (22 centers, n $\approx$ 4000, 5-year follow-up)—by adding a standardized "time-to-first-ambulation" field and pre-defined visit grid (discharge, 6 weeks, 3, 6, 12 months, then annually). Linking these prospectively captured data to patient-reported outcome measures (e.g., ePAQ, ICIQ) and serial 3-D trans-labial ultrasound will provide level-II evidence

on whether earlier ambulation predicts lower long-term recurrence, chronic pain or mental-health burden.

7.2 Personalized Early Ambulation Protocols

Existing protocols are mostly "one-size-fits-all", ignoring differences in patient age, body mass index (BMI), comorbid chronic diseases, surgical methods, and implanted materials. Future work should train gradient-boosting or ensemble models on pooled registry data (age, BMI, co-morbidities, surgical route, mesh type) fused with real-time biofeedback (accelerometry, heart-rate variability, intra-abdominal pressure (IAP)) to output individual "steps-per-hour" and "maximum intra-abdominal pressure" targets. An adaptive, platform trial (e.g., RAMP-UP) can then randomize participants to algorithm-driven versus fixed ambulation protocols, with primary end-points of 6-week functional recovery, 30-day complications, and protocol adherence, providing the first high-level evidence for precision early-ambulation within ERAS.

7.3 Integration of Traditional Chinese Medicine Rehabilitation Techniques

Building on the multicenter registry infrastructure, a nested substudy ($n \approx 300$) can evaluate adjunctive TCM interventions—acupuncture (ST-36, SP-6), acupoint application (Shenque) and Baduanjin exercise—commencing 24 h post-operation. Primary outcomes will be time to first flatus, 24-h opioid consumption and ambulation distance; secondary outcomes will include I-QOL and pelvic-floor endurance at 6 weeks. This would furnish the first high-level evidence for an integrated TCM-Western ERAS pathway.

7.4 Information-Based and Big Data-Driven Rehabilitation Management

Within the registry, issue every participant a low-profile IAP sensor patch and a validated consumer-grade accelerometer. Real-time streaming to a GDPR-compliant cloud platform allows immediate safety alerts (IAP >20 cmH_2O, step-count $<50\%$ predicted) and iterative deep-learning refinement of the "activity-outcome" curve. The ultimate goal is to reverse-engineer an ever-smarter, data-driven ambulation protocol that accelerates the precision deployment of ERAS in pelvic-floor surgery.

8. Conclusions

Current expert consensus statements indicate that ambulation within 24 h after PFRS does not increase short-term morbidity and may facilitate voiding, shorten hospital stay, and reduce costs. These recommendations, however, rest on low-certainty evidence that is neither procedure-specific nor mesh-stratified and lacks patient-centred tolerance endpoints. Consequently, early ambulation remains an experimental intervention that should be cautiously offered only to selected patients with pain scores $\leq 3/10$, no active vaginal bleeding or other situations that are not suitable for early ambulation. Its safety in women with transvaginal mesh and its impact on long-term anatomical recurrence or long term complications are still unknown. Large sample size, long-term follow-up, mesh-specific RCTs with patient-reported tolerance as a primary outcome are required before early ambulation can be routinely implemented in ERAS protocols.

Author Contributions

Conceptualization: LH, QC. Search strategy design: QC. Literature search: QC. Study selection (independently screened; third reviewer resolved disagreements), data extraction, and quality assessment: QC, LH. Supervision: LH. Writing—original draft: QC. Writing—review & editing: QC. Both authors contributed to editorial changes in the manuscript. Both authors read and approved the final manuscript. Both authors have participated sufficiently in the work and agreed to be accountable for all aspects of the work.

Ethics Approval and Consent to Participate

Not applicable.

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Conflicts of Interest

The authors declare no conflicts of interest.

Supplementary Material

Supplementary material associated with this article can be found, in the online version, at https://doi.org/10.31083/CEOG46192.

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