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REVIEW

Optimizing Early Recovery Quality in Same-Day Discharge Total Hip Arthroplasty: A Narrative Review

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Abstract: The paradigm of total hip arthroplasty (THA) is undergoing a transformative shift from prolonged inpatient care toward same-day discharge (SDD), driven by the convergence of enhanced recovery after surgery (ERAS) protocols, advances in anesthesia and analgesia, and evolving reimbursement policies. As global demand for THA continues to escalate amid population ageing, this model offers a compelling strategy to optimize healthcare resource utilization without compromising patient safety. However, the success of SDD-THA depends on a precise understanding of early postoperative recovery quality, which is a multidimensional construct encompassing pain control, functional restoration, hemodynamic stability, and patient-reported well-being. This review synthesizes contemporary evidence on early recovery trajectories and the multifactorial determinants that govern them. We analyze critical clinical strategies, including evidence-based patient selection, perioperative ERAS protocol implementation, anesthetic and multimodal analgesic optimization, blood management and complication prevention, early rehabilitation paradigms, and the influence of healthcare policy and economic frameworks on early recovery quality. By integrating these domains, we propose a patient-centered quality improvement pathway that prioritizes the velocity of functional independence as the definitive clinical endpoint. Focusing on these core perioperative optimizations ensures a sustainable, high-value SDD-THA practice.

Keywords: total Hip arthroplasty, same-day discharge, enhanced recovery after surgery, early recovery quality, perioperative optimization

Introduction

Total hip arthroplasty (THA) remains the definitive intervention for end-stage hip joint disease, providing reliable pain relief and functional restoration.[1,2] The global volume of THA procedures is projected to increase dramatically over the coming decades. Population-based forecasting studies estimate that primary THA volume in the United States will rise by 284% by 2040 relative to 2014 levels, reaching approximately 1.43 million annual procedures.[3] Similar growth trajectories are evident across Organisation for Economic Co-operation and Development (OECD) nationsand specifically within the Medicare population, where long-term projections suggest a multi-fold increase by 2060.[4,5] These projections are attributable to the convergent forces of population ageing, rising obesity prevalence, expanding surgical indications, and continuous improvements in implant design and surgical technique.[1,6] This anticipated demand poses unprecedented challenges to healthcare capacity and fiscal sustainability.[5,7]

Against this backdrop, the optimization of perioperative management pathways to maximize healthcare value has become an imperative. Same-day discharge (SDD) THA, in which patients undergo surgery and are discharged home on the day of the procedure, has emerged as a transformative care model that directly addressing growing systemic pressures on healthcare.[8,9] This shift is catalyzed by mature enhanced recovery after surgery (ERAS) principles, which minimize surgical stress and accelerate function. Consequently, hospital length of stay (LOS) has been shortened to its logical

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extreme.[10,11] In the United States, the removal of THA from the Centers for Medicare and Medicaid Services (CMS) inpatient-only list, combined with the COVID-19 pandemic's pressure on hospital resources, propelled the proportion of SDD-THA from approximately 2% in 2016 to over 54% by 2020.[9,12,13]

However, the transition to SDD-THA requires more than just faster discharge. It demands a new way to define and manage recovery quality. We must distinguish "early recovery quality" from conventional ERAS metrics. Traditional metrics primarily focus on safety-net endpoints like complication and readmission rates. Administrative markers like LOS focus on when a patient leaves the hospital. In contrast, early recovery quality focuses on the internal physiological trajectory. It prioritizes the velocity of functional restoration and hemodynamic stability. It also accounts for the absence of distressing symptoms, such as postoperative nausea and vomiting (PONV) or orthostatic intolerance (OI). Ultimately, it emphasizes the subjective patient experience during the critical transition to the home environment.[8,14] When early recovery quality is suboptimal, the consequences cascade involving failure to meet discharge criteria, unplanned hospital admission, emergency department visits, delayed rehabilitation, and increased dependence on family and community resources, negating the putative benefits of the SDD model.[8,15]

The imperative to understand early recovery quality also carries substantial public health and health-economic significance. Mobility impairment secondary to hip disease exerts profound long-term effects on older adults' health trajectories, quality of life, and socioeconomic participation.[16] Health-economic modeling demonstrates that even modest improvements in daily ambulatory function can yield meaningful reductions in functional limitation, total healthcare expenditure, and nursing home utilization over an 18-year horizon.[16] If SDD-THA can facilitate a more rapid and predictable return to independent mobility through optimized early recovery, it holds the potential to amplify these long-term health-economic dividends. Conversely, premature discharge in the absence of adequate recovery quality may increase acute care utilization, impair long-term functional trajectories, and paradoxically inflate overall healthcare costs.[8]

Despite the rapid migration toward SDD-THA, current literature remains fragmented, often focusing on isolated safety metrics or administrative discharge timing. A significant knowledge gap exists regarding how to systematically integrate multifactorial determinants into a cohesive recovery trajectory. This review addresses this gap by synthesizing contemporary evidence to propose an integrated, patient-centered quality improvement framework focused on optimal recovery as the definitive endpoint (Figure 1). The ultimate objective is to inform clinical practice, guide future research, and support the sustainable, high-quality expansion of SDD-THA in the context of an ageing global population.

Search Strategy and Selection Criteria

A comprehensive literature search was conducted across PubMed, Embase, and the Cochrane Library for English-language articles published between January 2010 and December 2025. Search terms included combinations of "total hip arthroplasty," "same-day discharge," "outpatient," "enhanced recovery after surgery," "early recovery," and "perioperative optimization." We prioritized high-level evidence, including systematic reviews, meta-analyses, and randomized controlled trials. Large-scale registry analyses and multicenter cohort studies were also included to provide real-world context. Case reports and non-peer-reviewed commentaries were generally excluded unless they offered unique insights into emerging technologies.

Current Landscape, Evolving Trends, and Patient Selection Strategies

Growth Trajectory and Driving Forces

The adoption of SDD-THA has accelerated markedly in recent years, with national database analyses documenting year-over-year increases in SDD rates that outpace those of same-day total knee arthroplasty (TKA).[17] This growth is propelled by a confluence of clinical, economic, and policy-level drivers. The CMS removal of THA from the inpatient-only list might represents the single most influential policy catalyst, directly enabling a greater proportion of Medicare beneficiaries to undergo THA in ambulatory settings.[9,18,19] Concurrently, commercial payers have increasingly favored outpatient designation to contain costs.[20] The COVID-19 pandemic served as an additional accelerant, compelling

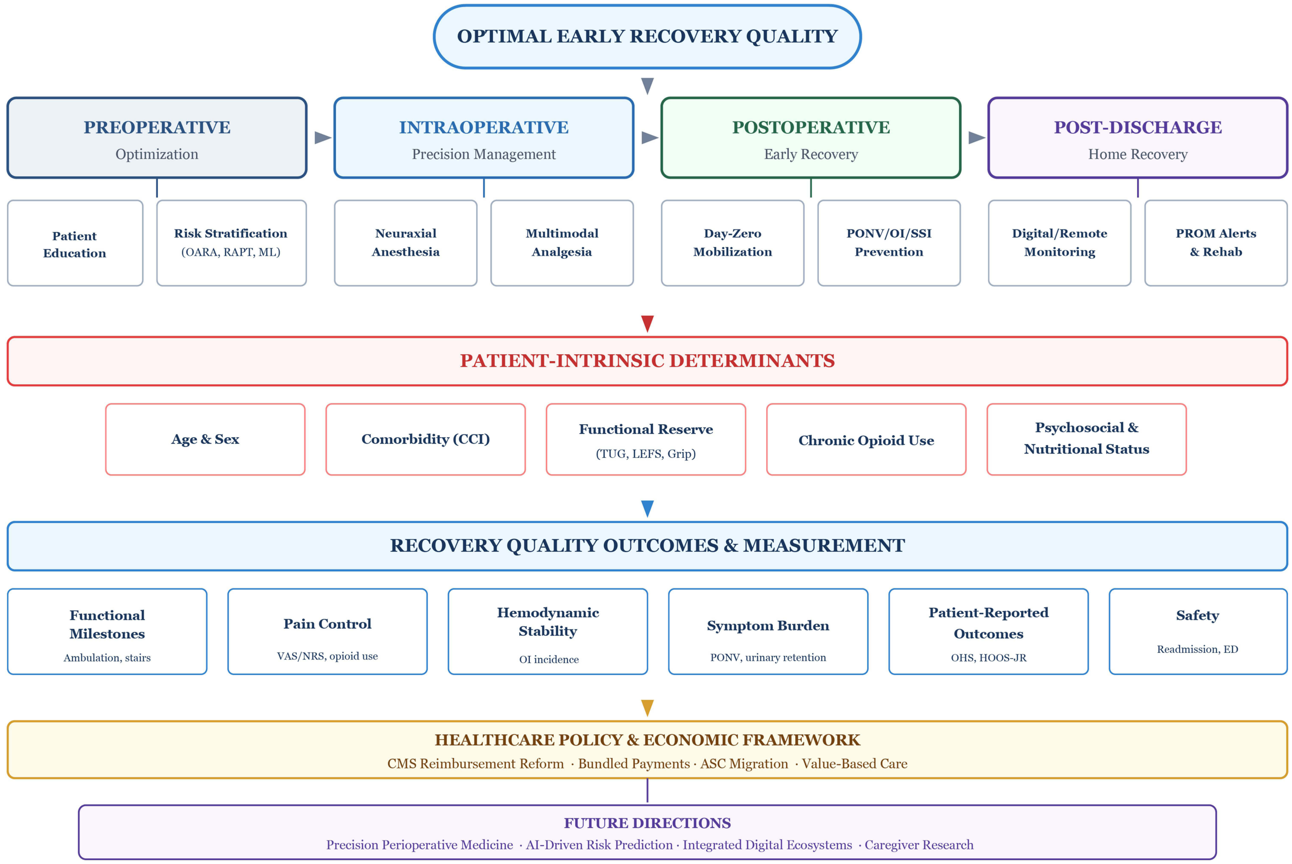

Figure 1 Integrated Conceptual Framework for Early Recovery Quality Optimization in SDD-THA.
Notes: Arrows indicate the sequential progression of steps and the decision-making flow within the algorithm.
Abbreviations: SDD, same-day discharge; THA, total hip arthroplasty; OARA, Outpatient Arthroplasty Risk Assessment; RAPT, Risk Assessment and Prediction Tool; ML, machine learning; PONV, postoperative nausea and vomiting; OI, orthostatic intolerance; SSI, surgical site infection; PROM, patient-reported outcome measure; CCI, Charlson Comorbidity Index; TUG, Timed Up and Go; LEFS, Lower Extremity Functional Scale; OHS, Oxford Hip Score; HOOS-JR, Hip Disability and Osteoarthritis Outcome Score Joint Replacement; QoR-15, Quality of Recovery-15; CMS, Centers for Medicare and Medicaid Services; ASC, ambulatory surgery center.

healthcare systems to preserve inpatient capacity by migrating eligible elective procedures to ambulatory environments.[13,21]

From a clinical perspective, the safety profile of SDD-THA has been consistently validated across high-volume centers. Comparative analyses demonstrate that 90-day complication rates, readmission rates, and emergency department visit rates in SDD cohorts are equivalent to, or lower than those observed in matched inpatient cohorts, provided standardized ERAS pathways are rigorously followed.[22–26] Patient satisfaction metrics further support the model, with SDD patients reporting higher satisfaction with pain management, nursing care, and discharge instruction quality.[27–29]

Patient Selection: A Multidimensional Decision Framework

The safety and efficacy of SDD-THA are predicated upon rigorous, evidence-based patient selection. Indiscriminate application of the SDD pathway risks increasing failure-to-launch events, which adversely impact patient experience, resource utilization, and institutional efficiency.[15,30] Contemporary patient selection has evolved from simple age and comorbidity checklists into a multidimensional framework integrating medical status, functional capacity, psychosocial resources, and surgical logistics.

Medical Comorbidity and Physiological Reserve

Lower American Society of Anesthesiologists (ASA) physical status classification consistently predicts successful SDD. Patients classified as ASA I–II demonstrate significantly higher SDD success rates compared with ASA III or higher.[31–33] Specific comorbidities conferring elevated risk for prolonged LOS include congestive heart failure, chronic obstructive

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pulmonary disease, dependent functional status, and the presence of multiple concurrent medical conditions.[18,19,34] The Charlson Comorbidity Index (CCI) provides a quantitative comorbidity burden assessment. A CCI ≥ 4 has been identified as a significant predictor of conversion from planned outpatient to inpatient status.[34] Notably, isolated primary hypertension may not constitute a contraindication to same-day surgery.[19] Preoperative chronic opioid use represents an underappreciated risk factor, as patients with established opioid dependence demonstrate inferior subjective and objective postoperative mobility recovery, lower step counts at three and six months, and greater self-reported ambulatory limitations.[35]

Age and Sex

Advancing age is an independent predictor of SDD failure, with patients over 70 years, particularly those aged 76–80 and above, exhibiting significantly elevated 30-day readmission risk.[30,36,37] However, age alone should not serve as an absolute exclusion criterion. Carefully selected, highly motivated Medicare-aged patients with limited comorbidity burden can achieve outcomes comparable to younger cohorts.[18,38] For patients older than 70 years, expectations regarding SDD feasibility should be appropriately calibrated, especially for female patients and those requiring preoperative assistive devices.[39] Female sex has been consistently associated with higher failure-to-launch rates and greater susceptibility to postoperative OI.[15,30,40,41]

Functional Status and Body Composition

Preoperative functional capacity is among the most potent predictors of early recovery trajectory. The Timed Up and Go (TUG) test, with cutoffs such as < 9.7 seconds, has demonstrated significant association with shorter LOS.[42] The Lower Extremity Functional Scale (LEFS) score at baseline predicts postoperative outcomes including LOS, SDD rate, independent ambulation at discharge, and home discharge probability.[43] Grip strength, as a readily measurable surrogate of global muscle strength and nutritional status, independently predicts postoperative complications, unplanned readmission, discharge disposition, and functional recovery following THA.[44,45] Preoperative serum albumin levels below 3.5 g/dL have been linked to low grip strength and increased complication risk, reinforcing the importance of nutritional screening.[44]

Psychosocial and Environmental Factors

Adequate home caregiver support and a safe domestic environment are non-negotiable prerequisites for SDD.[46,47] The role of informal caregivers assumes heightened importance when patients return home within hours of a major surgical procedure. Caregiver burden following joint arthroplasty is significant and correlates with female caregiver sex, greater daily time investment, and inadequate preoperative preparation.[48] A scoping review has highlighted the paucity of data regarding the impact of outpatient THA on informal caregivers, underscoring a critical evidence gap.[49] Married patients demonstrate lower rates of conversion from outpatient to inpatient status.[34] Psychological resilience may also influence recovery, with emerging evidence suggesting that higher resilience predicts better patient-reported physical and mental health outcomes and may attenuate early postoperative opioid consumption[50] (Table 1).

Risk Stratification Tools and Predictive Models

The development of validated risk stratification instruments has advanced the precision of patient selection. The Outpatient Arthroplasty Risk Assessment (OARA) score, which integrates age, body mass index (BMI), comorbidity burden, and medication use, was designed specifically to identify candidates suitable for SDD.[32] Multicenter validation studies confirm that lower OARA scores (<80) predict higher SDD success rates with lower complication and readmission risk, outperforming ASA classification alone.[32,54] The OARA has also demonstrated predictive utility in revision THA settings.[55] The Risk Assessment and Prediction Tool (RAPT), which synthesizes age, sex, comorbidity, preoperative mobility, and social support, effectively discriminates between patients appropriate for outpatient versus inpatient pathways.[56,57] Machine learning models integrating demographic, comorbidity, and functional variables are increasingly being applied to predict LOS and discharge status with high accuracy, providing data-driven decision support[58,59] (Figure 2). Furthermore, natural language processing pipelines capable of automatically extracting and analyzing relevant

Table 1 Multidimensional Patient Selection Framework for SDD-THA: Risk Factors, Clinical Significance, and Supporting Evidence

Category	Factor	Clinical Significance	Risk Direction	References
Medical Comorbidity	ASA Classification	ASA I–II favorable; ASA ≥III associated with higher failure-to-launch and prolonged LOS	↑ Risk with higher ASA	[31–33]
	CCI	CCI ≥ 4 significantly predicts conversion from outpatient to inpatient status	↑ Risk with CCI ≥ 4	[34]
	Specific comorbidities (CHF, COPD)	CHF, COPD, dependent functional status, and multi-morbidity are strong predictors of prolonged hospitalization	↑ Risk	[18,19,34]
	Chronic opioid use	Preoperative opioid dependence associated with inferior postoperative mobility recovery and lower step counts at 3–6 months	↑ Risk	[35]
	Isolated primary hypertension	May not constitute a contraindication to same-day surgery	Neutral	[19]
Demographic Factors	Age > 70 years	Independent predictor of SDD failure and 30-day readmission; age ≥ 65 predicts conversion to inpatient	↑ Risk	[30,36,37]
	Female sex	Higher failure-to-launch rates; greater susceptibility to postoperative orthostatic intolerance	↑ Risk	[15,30,40,41]
	Race/ethnicity	Non-white race associated with higher outpatient-to-inpatient conversion rates	↑ Risk	[34]
Functional Status	Timed Up and Go test	TUG < 9.7 s significantly associated with shorter LOS	↓ Risk with better TUG	[42]
	Lower Extremity Functional Scale	Higher preoperative LEFS predicts shorter LOS, higher SDD rate, and greater independence at discharge	↓ Risk with higher LEFS	[43]
	Grip strength	Low grip strength predicts complications, readmission, reduced home discharge, and inferior functional recovery	↑ Risk with low GS	[44,45]
	ADL dependency	Severe preoperative ADL dependency significantly associated with 30-day readmission	↑ Risk	[51]
Psychosocial & Environmental	Caregiver availability	Adequate home support is a non-negotiable prerequisite; caregiver burden is significant post-TJA	↑ Risk if absent	[46–49]
	Marital status	Married patients demonstrate lower conversion to inpatient status	↓ Risk if married	[34]
	Psychological resilience	Higher resilience may predict better PROs and reduce early opioid consumption	↓ Risk with higher resilience	[50]
Surgical & Logistic	Surgical start time	Late start (eg., after 11:00 AM) is an independent predictor of failure to launch	↑ Risk with late start	[15,30,52]
	Anesthesia type	Neuraxial anesthesia associated with higher SDD success vs. general anesthesia	↓ Risk with neuraxial	[30,53]
	Operative time / blood loss	Prolonged surgery and greater estimated blood loss predict unplanned admission	↑ Risk	[30,36]

Notes: In the "Risk Direction" column, ↑ indicates an increase in risk, and ↓ indicates a decrease in risk.
Abbreviations: SDD, same-day discharge; THA, total hip arthroplasty; ADL, activities of daily living; ASA, American Society of Anesthesiologists; CCI, Charlson Comorbidity Index; CHF, congestive heart failure; COPD, chronic obstructive pulmonary disease; TUG, Timed Up and Go; GS, grip strength; LOS, length of stay; LEFS, Lower Extremity Functional Scale; TJA, total joint arthroplasty; PROs, patient-reported outcomes.

clinical information from electronic health records represent a promising avenue for efficient, large-scale risk assessment.[60]

Failure to Launch: Causes and Modifiable Risk Factors

Despite rigorous screening, a proportion of patients planned for SDD fail to achieve SDD. Understanding the causes of this "failure to launch" is essential for pathway refinement. The most prevalent reasons include failure to achieve physical therapy milestones (eg., independent ambulation, stair negotiation), postoperative hypotension or dizziness, PONV, inadequate pain control, and urinary retention.[15,30,36,37,61] Patient preference changes after surgery also contribute to SDD failure.[62] Critically, several failure-to-launch risk factors are modifiable: active smoking, excessive peak post-operative pain scores, and late surgical start times (eg., afternoon scheduling) have been consistently identified as

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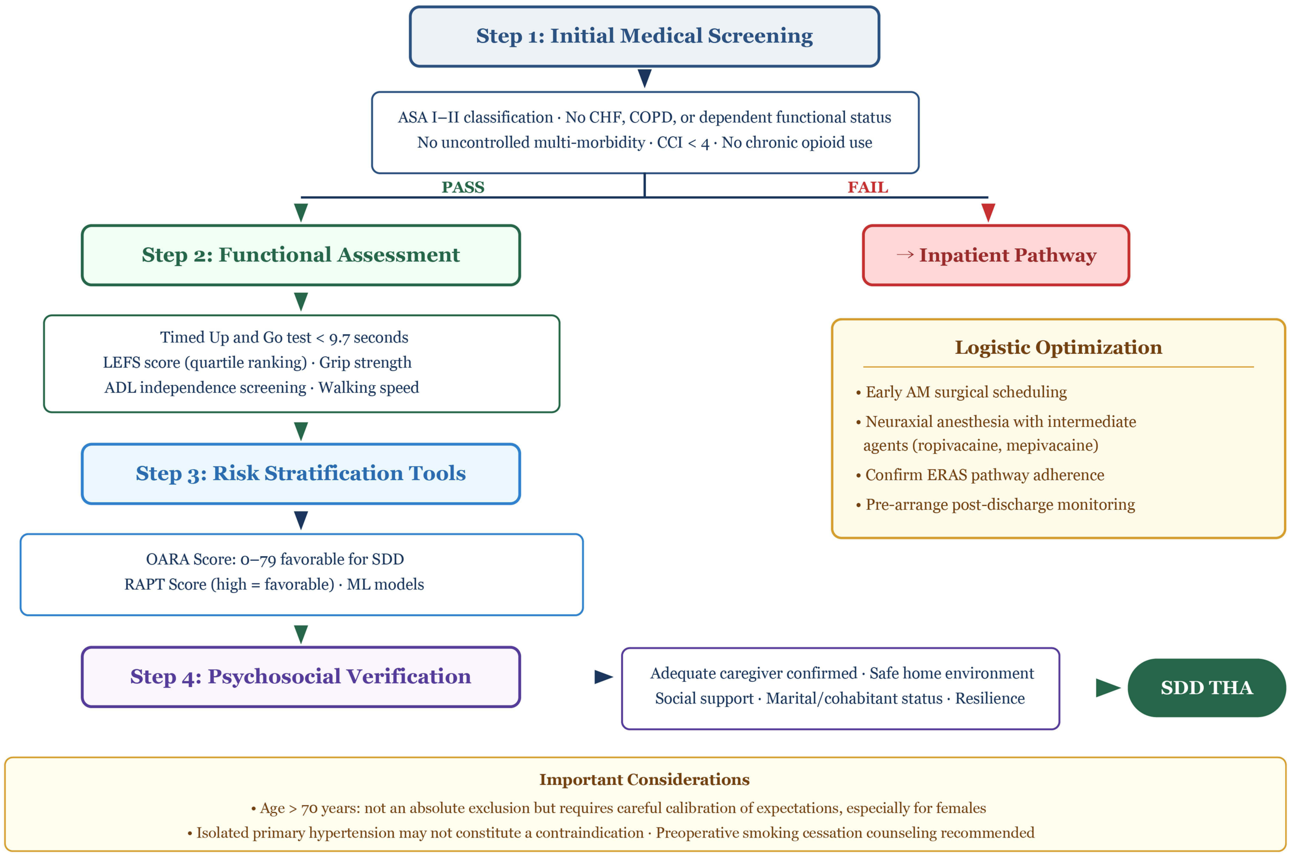

Figure 2 Stepwise Patient Selection and Risk Stratification Algorithm for SDD-THA.
Notes: Arrows indicate the sequential progression of steps and the decision-making flow within the algorithm.
Abbreviations: SDD, same-day discharge; THA, total hip arthroplasty; ASA, American Society of Anesthesiologists; CHF, congestive heart failure; COPD, chronic obstructive pulmonary disease; CCI, Charlson Comorbidity Index; ERAS, enhanced recovery after surgery; LEFS, Lower Extremity Functional Scale; ADL, activities of daily living; OARA, Outpatient Arthroplasty Risk Assessment; RAPT, Risk Assessment and Prediction Tool.

independent predictors.[15,30,52] These findings support targeted interventions including preoperative smoking cessation counseling, optimization of multimodal analgesia, expectation management, and scheduling of SDD candidates in early operative sequence.

Perioperative ERAS Protocols: Key Elements and Implementation

The ERAS Framework: Rationale and Evidence for Protocol Adherence

The ERAS framework constitutes the clinical backbone of SDD-THA, providing a systematic, evidence-based approach to attenuating surgical stress, maintaining physiological homeostasis, and expediting functional restoration.[10,63] ERAS is not a static checklist but a dynamic, individualized clinical pathway spanning the preoperative, intraoperative, and postoperative continuum. Its effectiveness derives not from any single intervention, but from the synergistic interaction of multiple concurrent modalities and the degree of institutional adherence to the protocol as an integrated whole. The landmark POWER2 prospective cohort study demonstrated a clear dose-response relationship between ERAS protocol compliance and patient outcomes that patients in the highest compliance quartile experienced significantly fewer overall and moderate-to-severe complications and shorter LOS compared with those in the lowest quartile.[64] This underscores the imperative to implement ERAS as a comprehensive package rather than selectively adopting individual components[10,28] (Table 2).

Table 2 Key Elements of the Integrated ERAS-SDD Protocol for THA Across the Perioperative Continuum

Phase	Element	Recommendation / Evidence Summary	Evidence Type	References
Preoperative	Patient education	Structured web-based or in-person education to set realistic expectations, reduce anxiety, and improve protocol adherence	RCT; cohort	[65,66]
	Modifiable risk factor optimization	Systematic screening and intervention for anemia, hyperglycemia, smoking, malnutrition, and chronic opioid use	CPG; cohort	[67–69]
	Nutritional assessment	NRS-2002 or albumin screening; albumin < 35 g/L associated with increased complications and mortality	Retrospective	[44,70]
	Carbohydrate loading	Clear carbohydrate drink 2–3 h preoperatively; principal benefit in reducing PONV and intraoperative hyperglycemia	RCTs	[71–73]
	Risk stratification	Validated tools (OARA, RAPT) to identify SDD-appropriate candidates and predict discharge outcomes	Multi-center	[32,54,56,57]
Intraoperative	Neuraxial anesthesia preference	Spinal anesthesia with intermediate-acting agents (ropivacaine, mepivacaine) for rapid motor recovery; chloroprocaine as ultra-short option	RCTs; consensus	[53,74–79]
	Multimodal analgesia	Acetaminophen + COX-2/NSAIDs + IV dexamethasone (8–10 mg); opioids as rescue only; avoid routine gabapentinoids	SR; CPG	[80–82]
	Motor-sparing nerve blocks	PENG block, continuous ESP block, or QLB preferred over femoral nerve block; LIA as adjunct	RCTs; cohort	[83–89]
	Blood conservation	Routine TXA (IV, oral, or topical); single 1 g dose non-inferior to double dose	NMA; SR	[90–93]
	Thermoregulation	Active warming to maintain normothermia; hypothermia increases blood loss and transfusion risk	Retrospective	[94,95]
	Wound closure	Absorbable subcuticular suture + skin adhesive reduces exudate, shortens time to dry wound	RCT	[96,97]
Postoperative	Day-zero mobilization	Ambulation within hours of surgery; removal of catheters, drains, and epidural to facilitate	RCT feasibility; cohort	[98–101]
	Opioid-sparing analgesia	Continue non-opioid multimodal regimen; ERAS-outpatient patients use significantly less opioid with similar pain control	Comparative	[28,102]
	PONV prophylaxis	Risk-stratified multimodal antiemetic protocol; transdermal scopolamine as adjunct	SR; cohort	[103–106]
	OI management	Optimize fluid status; consider midodrine (10 mg) for refractory orthostatic intolerance	Pilot	[41,107]
	Urinary retention prevention	Avoid routine catheterization; US-guided bladder monitoring; intermittent catheterization if needed	SR	[108]
	SSI prevention bundle	No razor shaving; smoking cessation ≥ 4 wk; antibiotics ≤ 24 h; blood glucose < 137 mg/dL on POD1	Cochrane; cohort	[109–113]
Post-Discharge	Remote vital signs monitoring	Wearable-to-virtual-response-center data transmission; real-time surveillance reduces readmissions	Cohort	[114]
	Digital PROM monitoring	Regular online PROM submission with automated alerts for recovery deviation; reduces healthcare utilization	RCT	[115,116]
	Smartphone rehabilitation platform	Equivalent functional outcomes to conventional rehab with reduced outpatient PT utilization (55% to 34%)	RCT	[117]
	Individualized rehabilitation	Commence within 1 week; 2×/week for month 1; frequency adjusted by recovery trajectory; telerehab for most	Delphi consensus	[118,119]

Abbreviations: SDD, same-day discharge; THA, total hip arthroplasty; RCT, randomized controlled trial; PONV, postoperative nausea and vomiting; OARA, Outpatient Arthroplasty Risk Assessment; RAPT, Risk Assessment and Prediction Tool; COX-2, cyclooxygenase-2; NSAIDs, non-steroidal anti-inflammatory drugs; SR, systematic review; CPG, clinical practice guideline; PENG, pericapsular nerve group; ESP, erector spinae plane; QLB, quadratus lumborum block; LIA, local infiltration analgesia; TXA, tranexamic acid; NMA, network meta-analysis; OI, orthostatic intolerance; US, ultrasound; SSI, surgical site infection; POD, postoperative day; PROM, patient-reported outcome measure; PT, physical therapy.

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Preoperative Optimization and Patient Education

The preoperative phase serves as the foundation of the ERAS pathway, centering on patient education and physiological optimization. Comprehensive preoperative education whether delivered via web-based digital platforms or in-person sessions, effectively manages expectations, alleviates anxiety, enhances adherence to rehabilitation protocols, and has been associated with shorter LOS.[65,66] Clinical practice guidelines recommend systematic preoperative optimization of modifiable risk factors including anemia, hyperglycemia, and smoking.[67] Diabetic patients, even within ERAS pathways, exhibit higher complication rates, prolonged LOS, and lower long-term joint-forgotten scores, highlighting the critical importance of stringent glycemic control.[68] This evidence supports a paradigm shift from the traditional concept of "preoperative clearance" to proactive "preoperative optimization," systematically screening for and intervening upon modifiable risk factors such as obesity, malnutrition, anemia, uncontrolled blood glucose, smoking, and chronic opioid use.[69] Preoperative nutritional assessment should be incorporated as standard practice, as malnutrition (albumin < 35 g/L) is an independent risk factor for postoperative complications and mortality following THA.[44,70]

Preoperative carbohydrate loading, a traditional ERAS component, has been re-evaluated in recent evidence. Its principal benefits in non-diabetic patients may reside in attenuation of intraoperative hyperglycemia and reduction of PONV rather than direct reduction of infectious complications.[71–73] For SDD patients, the mitigation of PONV and improvement of early comfort are themselves clinically meaningful objectives supporting timely discharge.

Intraoperative Management: Precision and Homeostasis

Intraoperative management within the ERAS framework encompasses anesthesia optimization, surgical technique refinement, blood conservation, and thermoregulation. Multimodal analgesia integrating local anesthetic infiltration or regional nerve block with non-opioid systemic agents constitutes the analgesic cornerstone.[103,120,121] The POWER2 sub-study identified local anesthesia as an independent predictor of earlier postoperative mobilization.[98] Regarding surgical technique, while ERAS consensus statements note insufficient evidence to designate any single surgical approach as superior for achieving discharge criteria,[121] robot-assisted THA has attracted attention for its enhanced precision in component positioning and limb-length equalization.[122] Within ERAS-managed cohorts, robot-assisted THA does not adversely affect blood loss, pain, functional recovery, or complication rates, supporting its safe integration into ERAS-outpatient pathways.[123] Comparative data on surgical approach suggest that direct anterior, direct superior, and posterior approaches yield similar early recovery outcomes when performed within standardized perioperative protocols, indicating that surgeon proficiency and pathway standardization may outweigh the intrinsic advantages of any particular surgical approach.[124,125] The lack of high-level RCT evidence favoring one technique over others remains a limitation in the current landscape.

Intraoperative thermoregulation is essential that hypothermia (core temperature < 36°C) independently increases intraoperative blood loss and perioperative transfusion rates.[94] Active warming measures should therefore be routinely implemented.[95] Wound closure technique may also influence discharge timing that absorbable subcuticular suture with skin adhesive significantly reduces wound exudate, shortens time to dry incision, and decreases LOS compared with metallic staples, offering practical advantages for SDD pathways that include "dry wound" as a discharge criterion.[96,97]

Postoperative Management: Analgesia, Symptom Control, and Early Mobilization

Postoperative management directly governs early recovery quality and discharge readiness. ERAS pathways emphasize non-opioid-based analgesic regimens that provide adequate pain control while minimizing opioid-related adverse effects including nausea, vomiting, ileus, sedation, which are common barriers to timely mobilization and discharge.[28,120] Patients managed on ERAS-outpatient pathways demonstrate significantly lower early postoperative opioid consumption with comparable pain perception compared with traditional inpatient counterparts, achieving a superior analgesic benefit-risk ratio.[28] In addition, prophylactic antiemetic administration should also be protocolized.[103]

Early mobilization, ideally within hours of surgery is the cornerstone postoperative objective. Mobilization within 24 hours postoperatively is associated with shorter LOS and superior functional recovery.[98–100] Randomized feasibility data confirm that day-zero walking is safe and effective, significantly shortening the time to achieve functional milestones including transfer, ambulation, and stair negotiation.[101] Achievement of all unnecessary physiological barriers to mobilization such as routine urinary catheterization, surgical drains, and epidural analgesia, should be avoided.[98] Patients undergoing ERAS-outpatient THA demonstrate significantly earlier return to walking, stair climbing, showering, daily activities, and exercise compared with contralateral limbs managed via traditional inpatient pathways.[28]

Anesthesia and Multimodal Analgesia Optimization

Anesthetic Technique Selection

Anesthetic management for SDD-THA has evolved from a singular focus on intraoperative conditions to a comprehensive strategy targeting the entire perioperative recovery trajectory. The choice between neuraxial and general anesthesia remains a topic of active investigation. While the ICAROS group recommends neuraxial anesthesia based on its association with lower overall mortality and complication rates,[126] the recent REGAIN multicenter RCT demonstrated no significant difference in 60-day mortality or walking independence between the two techniques.[53] This highlights a critical area of uncertainty, suggesting that the benefits of spinal anesthesia may be more pronounced in specific subsets of patients rather than as a universal mandate for all SDD candidates. However, spinal anesthesia remains the preferred technique in many high-volume SDD centers in practice, due to its favorable hemodynamic profile, reduced general anesthetic exposure, and potential for earlier cognitive recovery.[127]

Within the domain of spinal anesthesia, the choice of local anesthetic agent profoundly influences early mobilization kinetics, which is a critical determinant of SDD feasibility. Traditional long-acting agents such as bupivacaine produce prolonged motor blockade that delays ambulation. Contemporary evidence strongly supports the use of intermediate- or short-acting agents. Ropivacaine-based spinal anesthesia enables significantly earlier lower-limb motor recovery, with studies demonstrating that warmed ropivacaine achieves grade 4 or higher motor strength within 3.5 hours postoperatively.[74,75] Mepivacaine spinal anesthesia yields more predictable motor recovery compared with bupivacaine, with a double-blinded randomized trial demonstrating that 70% of mepivacaine recipients achieved independent ambulation within 3–3.5 hours versus substantially fewer bupivacaine recipients, translating to higher SDD rates.[76–78] Chloroprocaine, an ultra-short-acting agent, has also demonstrated the ability to facilitate more rapid discharge without increasing complications.[79] These pharmacokinetic considerations are central to optimizing the anesthetic prescription for SDD-targeted THA.

Multimodal Pharmacological Analgesia

The optimization of multimodal analgesia is paramount for SDD-THA. The 2021 PROSPECT guideline for THA recommends a foundational regimen comprising acetaminophen, COX-2-selective inhibitors or non-selective NSAIDs (administered preoperatively or intraoperatively and continued postoperatively), with opioids reserved strictly as rescue analgesics.[80] Intravenous dexamethasone (8–10 mg) is recommended for its synergistic analgesic and anti-inflammatory properties.[80] A systematic review and meta-analysis confirmed that perioperative systemic dexamethasone reduces LOS in total joint arthroplasty.[81] Notably, the PROSPECT guideline explicitly recommends against routine gabapentinoid use, as the analgesic benefit fails to achieve the minimal clinically important difference while increasing the risk of dizziness and visual disturbance.[80,82] Regarding acetaminophen delivery, preoperative oral administration provides equivalent postoperative analgesia to intravenous formulation at lower cost, aligning with the efficiency principles of SDD.[128]

Awareness of potential drug interactions is warranted. Dual NSAID therapy (eg., aspirin for thromboprophylaxis plus ibuprofen for analgesia) carries a small but clinically relevant risk of acute kidney injury (approximately 2.9%), although most cases are self-resolving.[129] Opioid-sparing strategies, including opioid-free anesthesia protocols, have demonstrated feasibility in ambulatory THA, offering the potential for further reduction in opioid-related adverse events that impede early recovery.[102]

Regional Anesthesia Techniques for Hip-Targeted Analgesia

Regional anesthesia techniques constitute a critical pillar of multimodal analgesia, directly influencing early mobilization capacity. Traditional femoral nerve blockade, while providing effective analgesia, is unsuitable for SDD-targeted THA

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due to quadriceps motor weakness that impedes ambulation.[80,83] Contemporary practice has therefore shifted toward hip-selective blocks that preserve motor function while providing targeted sensory analgesia.

The pericapsular nerve group (PENG) block has emerged as a promising technique, demonstrating superior short-term analgesia compared with femoral nerve block following hip surgery while better preserving quadriceps strength.[83,84] Continuous erector spinae plane (ESP) block has been shown to significantly increase total walking distance on postoperative days one and two compared with continuous fascia iliaca block, with equivalent pain scores and opioid consumption, suggesting a kinematic advantage for early mobilization.[85] The quadratus lumborum block (QLB) has demonstrated superiority over femoral nerve and fascia iliaca blocks in hip arthroscopy, with shorter post-anesthesia care unit stays,[86] and anterior QLB specifically has shown promise in improving postoperative recovery quality following THA.[87] The fascia iliaca block remains a valid option, with prospective randomized data confirming its efficacy in reducing postoperative opioid consumption.[88] Additionally, combined lateral femoral cutaneous nerve and ilioinguinal/ iliohypogastric nerve blocks have demonstrated analgesic efficacy in direct anterior approach THA.[89] Collectively, these data support the preferential use of motor-sparing, hip-targeted regional techniques in SDD-THA protocols (Table 3).

Local Infiltration Analgesia and Adjuvant Agents

Local infiltration analgesia (LIA) represents an additional component of multimodal perioperative analgesia. The PROSPECT guideline recommends single-shot LIA particularly for patients with contraindications to foundational

Table 3 Comparative Overview of Regional Anesthesia Techniques for Hip-Targeted Analgesia in SDD-THA

Technique	Target Structures	Motor Impact	Advantages	Limitations	References
Pericapsular nerve group (PENG) block	Articular branches of femoral, obturator, and accessory obturator nerves at anterior hip capsule	Minimal	Superior short-term analgesia vs. FNB; preserves motor function for early ambulation	Primarily sensory; may require supplemental posterior coverage	[83,84]
Continuous erector spinae plane (ESP) block	Ventral and dorsal rami via paravertebral spread	Minimal	Significantly greater total walking distance on POD 1–2 vs. continuous FIB; equivalent pain scores	Catheter management; variable spread; requires US guidance	[85]
Quadratus lumborum block (QLB)	Thoracolumbar fascia; paravertebral space spread	Minimal	Anterior QLB improves QoR-40 scores in THA; shorter PACU stay vs. FNB/FIB in hip arthroscopy	Technique-dependent spread variability; limited THA-specific RCT data	[86,87]
Fascia iliaca block (FIB)	Femoral, lateral femoral cutaneous, and obturator nerves beneath fascia iliaca	Moderate	Reduces opioid consumption; technically straightforward; well-established evidence base	Less hip-selective than PENG; potential quadriceps weakness limiting early mobilization	[88]
LFCN + IH/II nerve block	Lateral femoral cutaneous nerve; iliohypogastric/ ilioinguinal nerves	Minimal	Effective for DAA-THA incisional pain; purely sensory block preserving all motor function	Limited to anterior approach; does not cover deep joint pain	[89]
Local infiltration analgesia (LIA)	Periarticular tissues (capsule, muscle, subcutaneous)	None	Recommended by PROSPECT for THA; simple, surgeon-administered; effective adjunct to systemic analgesia	Duration limited (single shot); liposomal bupivacaine shows uncertain clinical advantage	[80,130]
Femoral nerve block (FNB)*	Femoral nerve (anterior thigh, knee)	Significant	Well-established analgesic efficacy	Not recommended for SDD-THA due to significant motor impairment delaying ambulation; PROSPECT advises against	[80,83]

Notes: *The FNB row is listed for comparison but is not recommended for SDD-THA pathways due to significant motor impairment. Techniques are listed in order of current evidence-based preference for SDD-THA.

Abbreviations: SDD, same-day discharge; THA, total hip arthroplasty; PENG, pericapsular nerve group; FNB, femoral nerve block; ESP, erector spinae plane; POD, postoperative day; US, ultrasound; FIB, fascia iliaca block; QLB, quadratus lumborum block; QoR-40, Quality of Recovery-40; PACU, post-anesthesia care unit; RCT, randomized controlled trial; LFCN, lateral femoral cutaneous nerve; IH/II, iliohypogastric/ilioinguinal; DAA, direct anterior approach; LIA, local infiltration analgesia.

systemic analgesics or those anticipated to experience severe postoperative pain.[80] Regarding the choice of local anesthetic, liposomal bupivacaine has attracted attention for its prolonged theoretical duration of action. However, a meta-analysis concluded that while it may offer statistically significant advantages in pain scores over conventional LIA, the clinical significance of this improvement is uncertain and no clear benefit in opioid reduction has been demonstrated.[130] Therefore, routine use requires careful cost-effectiveness evaluation.

Among adjuvant agents, dexmedetomidine as a highly selective α2-adrenergic agonist, prolongs sensory blockade duration when used for sedation during combined spinal-epidural anesthesia compared with midazolam,[131] attenuates tourniquet-induced metabolic and coagulation disturbances,[132] and reduces postoperative opioid requirements. However, intravenous dexmedetomidine use in the spinal anesthesia setting warrants caution due to the potential for elevated postoperative hypotension rates.[133] Transdermal scopolamine has been demonstrated to effectively reduce PONV incidence following total joint arthroplasty and may indirectly promote early functional activity through improved comfort.[104]

Perioperative Blood Management and Complication Prevention

Tranexamic Acid and Blood Conservation Strategies

Meticulous perioperative blood management is fundamental to ensuring hemodynamic stability, facilitating early mobilization, and achieving safe SDD. Tranexamic acid (TXA) has become the cornerstone of blood conservation in THA. Network meta-analysis and randomized controlled trials confirm that intravenous, oral, and intra-articular topical TXA administration all effectively reduce total blood loss and transfusion rates, with no significant differences in efficacy among routes.[90–92] Critically, the safety profile of TXA extends to high-risk patients with histories of venous thromboembolism, myocardial infarction, stroke, renal disease, and atrial fibrillation, with no observed increase in thromboembolic complications.[93] Single-dose (1 g) intravenous TXA achieves comparable efficacy to double-dose regimens, supporting protocol simplification.[91]

Complementary blood conservation measures include active prevention of intraoperative hypothermia, which independently increases blood loss and transfusion requirements,[94] and avoidance of routine closed-suction drain placement, which has not demonstrated benefit in reducing total blood loss or infection risk and may paradoxically increase transfusion needs and delay straight-leg raising recovery.[134] Bipolar sealing devices have similarly failed to demonstrate superiority over standard electrocautery for blood loss or functional outcomes in arthroplasty.[135] Preoperative hemoglobin optimization is critical: when hemoglobin falls below 135 g/L, transfusion risk increases significantly and progressively; moreover, hemoglobin values deviating from the 137–141 g/L range (in either direction) are associated with increased 30-day emergency visits and readmissions.[136]

Prevention of OI, PONV, and Urinary Retention

OI is a frequently underrecognized barrier to early mobilization following THA, with an overall incidence of approximately 25%, significantly exceeding that following TKA.[41] Risk factors include female sex, THA (versus TKA), and bupivacaine-based spinal anesthesia.[41,137] Preliminary investigation of the vasopressor midodrine (10 mg) has demonstrated a significant pressor response and potential reduction in adverse mobility events, offering a potential pharmacological strategy for refractory OI.[107]

PONV risk factors in the arthroplasty population include female sex, history of motion sickness, migraine history, and lower BMI.[105,106] Risk-stratified, multimodal antiemetic prophylaxis is essential within SDD protocols. Urinary retention risk factors encompass advanced age, male sex, benign prostatic hyperplasia, opioid use, and patient-controlled analgesia.[108] Routine indwelling catheterization should be avoided or removed within 48 hours, with ultrasound-guided bladder volume monitoring and intermittent catheterization as the preferred management strategy.[108]

Surgical Site Infection Prevention

Surgical site infection (SSI) prevention requires attention to multiple perioperative details. Razor shaving significantly increases SSI risk relative to no hair removal, clippers or depilatory agents should be used while necessary.[109]

Preoperative smoking cessation of at least four weeks also significantly reduces wound infection rates.[110] Current evidence supports perioperative antibiotic prophylaxis for THA but does not support continuation beyond 24 hours.[111] Postoperative glycemic control is critical: in non-diabetic patients, first-postoperative-morning blood glucose ≥ 137 mg/dL is linearly associated with increasing periprosthetic joint infection risk.[112] Allogenic blood transfusion independently increases both superficial and deep wound infection risk, further reinforcing the importance of comprehensive blood conservation strategies.[113]

Regarding venous thromboembolism screening, a noteworthy temporal trend has been documented that as LOS has shortened, the rate of inpatient lower-extremity ultrasonography has declined dramatically (from 7.0% in 2010 to 0.3% in 2020), yet the two-week postoperative DVT diagnosis rate has remained stable.[138] This suggests that reduced LOS has not increased DVT miss rates and may have curtailed unnecessary screening.

Functional Status and Sarcopenia as Outcome Predictors

Patient functional reserve and muscle strength represent powerful predictors of early recovery quality and complication risk, with particular relevance to the ageing THA population. Severe preoperative dependence in activities of daily living (ADL) is significantly associated with 30-day readmission following THA.[51] Poor ADL recovery during post-discharge home care or rehabilitation independently elevates rehospitalization risk.[139–141] Grip strength, as a simple and reliable surrogate marker of systemic muscle status, predicts a constellation of adverse outcomes including pressure injury, transfusion, urinary tract infection, prolonged LOS, unplanned readmission, reduced home discharge probability, and inferior hip function and quality-of-life recovery.[44,45] Preoperative walking speed has also been identified as an independent predictor of six-month functional recovery and quality of life following hip fracture surgery.[142] These findings collectively support the incorporation of functional assessments such as ADL dependency screening, grip strength measurement, TUG testing, and LEFS scoring, into the preoperative evaluation algorithm for SDD THA candidates, enabling targeted prehabilitation or pathway modification for high-risk individuals.

Early Rehabilitation Strategies and Functional Recovery Trajectories

Early Mobilization as the ERAS Cornerstone

Early postoperative mobilization is the main objective of the ERAS pathway and the critical gateway to successful SDD. A large prospective cohort study across 131 Spanish hospitals demonstrated that 69.3% of THA/TKA patients achieved mobilization within 24 hours, with multivariable analysis identifying local anesthesia use, higher preoperative hemoglobin, and avoidance of urinary catheters, surgical drains, and epidural analgesia as significant independent facilitators.[98] Surgical start time is an additional modifiable determinant. Earlier start times (before 9:00 AM) significantly increase the probability of same-day discharge.[143] A randomized controlled feasibility study confirmed that day-zero mobilization (within hours of surgery) is safe and effective, accelerating functional milestone achievement and promoting earlier discharge.[101] Importantly, achievement of walking-level rehabilitation has been identified as a strong independent predictor of ambulatory capacity at discharge.[142]

Objective Measurement of Recovery Trajectories Using Digital Health Technology

The objective characterization of postoperative recovery trajectories has been revolutionized by wearable sensor technology and smartphone-based platforms. A systematic review and meta-analysis confirmed the efficacy of lower-limb wearable devices in assessing recovery following THA and TKA, with capacity to monitor step count, gait velocity, standing duration, gait stability, and estimated six-minute walk test performance.[144] A prospective study utilizing wearable accelerometry to track daily ambulatory function over one year following THA revealed a non-linear recovery trajectory: mean daily step count demonstrated significant improvement from six weeks postoperatively onward, with continued gains at six and twelve months; gait velocity showed a transient decline at six weeks due to surgical trauma and protective behavior, before significant improvement at six and twelve months; stability metrics improved notably at twelve months.[145] These objective data delineate the characteristic multiphasic recovery pattern: an initial period focused

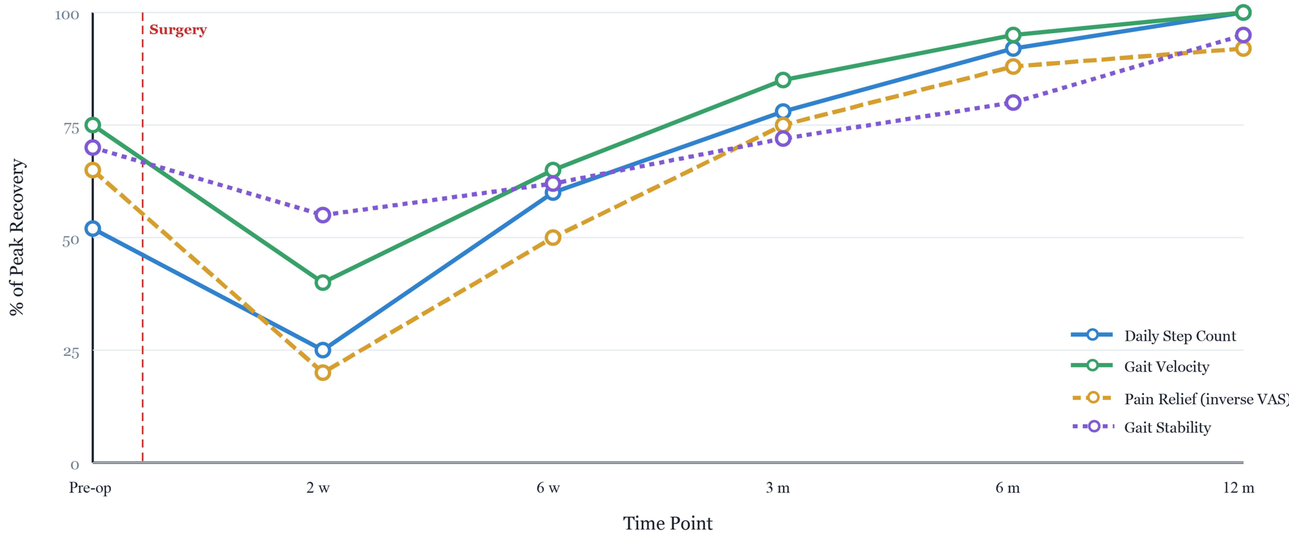

Figure 3 Evidence-Based Schematic Synthesis of the Non-Linear, Multiphasic Recovery Trajectory Following THA.
Notes: This figure provides a conceptual visualization of recovery patterns synthesized from contemporary wearable sensor and patient-reported data. Recovery metrics including daily step count, gait velocity, pain relief (inverse VAS), and gait stability are plotted as percentage of peak recovery over a 12-month postoperative period. The trajectory is characterized by three distinct phases: (1) an acute recovery phase (0–6 weeks) featuring an initial decline attributable to surgical trauma and protective behavior, followed by early functional restoration driven by day-zero mobilization protocols; (2) a rapid progress phase (6 weeks to 6 months) during which gait parameters and activity volumes demonstrate accelerated improvement; and (3) a plateau phase (6–12 months) in which metrics approach peak values with continued optimization of movement patterns and stability. The dashed vertical line indicates the time of surgery.

on pain control and basic mobility restoration, an intermediate phase (3–6 months) of rapid gait parameter and activity volume improvement, and a late phase beyond 6 months of stabilization and further movement optimization (Figure 3).

Remote vital signs monitoring has demonstrated particular value during the acute post-discharge period. Through wearable-to-virtual-response-center data transmission, medical teams can provide real-time surveillance and early intervention for physiological deviations, effectively reducing unplanned readmissions and emergency department visits.[114] A prospective randomized trial evaluating a smartphone-based rehabilitation platform demonstrated that early functional outcomes were comparable to conventional rehabilitation, while significantly reducing outpatient physiotherapy utilization (from 55.4% to 34.0%) without increasing complications, providing a more flexible, lower-cost rehabilitation alternative compatible with the SDD model.[117] These characteristic patterns, though synthesized into a schematic representation in Figure 3 to aid clinical visualization, are fundamentally derived from objective longitudinal evidence documenting the multi-phasic nature of functional restoration.

Activity Restrictions and Individualized Rehabilitation Paradigms

Longstanding postoperative hip precaution protocols to prevent dislocation are being re-evaluated. A retrospective cohort study comparing standard versus relaxed hip precautions following posterolateral-approach THA found no statistically significant difference in three-month dislocation rates.[146] This finding is corroborated by a comprehensive review concluding that routine hip precaution recommendations may be unnecessary for elective primary THA.[147] These data support permitting SDD patients to engage in earlier, more autonomous functional activity within a safety framework.

The optimal intensity and delivery model of postoperative rehabilitation is evolving toward individualized, goal-directed strategies. A randomized controlled trial published in the BMJ demonstrated that for TKA patients at predicted high risk of poor recovery, an intensive 18-session supervised outpatient physiotherapy program yielded no clinically meaningful advantage over a single physiotherapy assessment followed by home-based exercise at 52-week follow-up across the Oxford Knee Score, pain, and functional satisfaction outcomes.[118] A Delphi consensus study recommended that regardless of recovery status, outpatient rehabilitation should commence within one week postoperatively at a frequency of twice weekly during the first month, with subsequent frequency adjustments guided by individual

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recovery trajectory.[119] Telerehabilitation was endorsed as appropriate for most patients, though not for those with slow recovery.[119] These principles support a rehabilitation model that prioritizes high-quality patient education and clear home-based guidance over high-frequency supervised attendance, while preserving the flexibility to intensify support for patients demonstrating suboptimal recovery trajectories.

Rehabilitation Resource Variability and Policy Implications

Significant variability exists in postoperative rehabilitation resource utilization. A systematic review documented that outpatient physiotherapy utilization rates following TKA range from 16.7% to 84.5%.[148] Patient characteristics influence rehabilitation including female patients, TKA (versus THA), and those requiring inpatient physiotherapy tend to receive more outpatient sessions, while older patients and those with depression histories use fewer services.[149] At the health system level, bundled payment implementation has been projected to substantially reduce skilled nursing facility referrals while increasing home health care utilization, which is a shift that may be accompanied by decreased functional recovery and reduced treatment volume.[150] This cautionary finding underscores the need for vigilance in ensuring that cost-containment policies do not inadvertently compromise functional outcomes.

Patient-Reported Outcomes and Functional Assessment in Monitoring Recovery Quality

Patient-Reported Outcome Measures in SDD-THA

Patient-reported outcome measures (PROMs) have become indispensable for capturing the patient perspective on recovery quality, complementing objective clinical assessments. Instruments including the Oxford Hip Score (OHS), Hip Disability and Osteoarthritis Outcome Score Joint Replacement (HOOS-JR), and Quality of Recovery-15 (QoR-15) provide multidimensional assessment of pain, function, and health-related quality of life.[151,152] Studies consistently demonstrate significant PROMs improvement from three months to one-year post-THA.[28,153] Crucially, early discharge does not appear to compromise patient-reported outcomes. A prospective study in planned SDD patients found no significant differences in postoperative day 1–7 pain scores, morphine consumption, or one-year OHS between patients discharged on the day of surgery and those who stayed overnight.[154]

A prospective investigation of the relationship between patient expectations and outcomes revealed that high preoperative expectations are associated with greater objective functional improvement but also greater unmet expectation as improvements frequently fall short of the magnitude anticipated, generating subjective dissatisfaction despite objectively favorable recovery.[155] Furthermore, surgeon expectations have been shown to influence patient expectations and, in turn, objective outcomes.[155] These findings highlight the limitations of relying exclusively on objective metrics and the importance of integrating expectation management into preoperative education.

Functional Assessment Tools for Risk Stratification

Standardized functional assessment instruments serve dual roles: preoperative risk stratification and postoperative recovery monitoring. The LEFS has demonstrated significant associations with THA surgical outcomes across multiple dimensions. Patients in the highest preoperative LEFS quartile achieve shorter LOS, higher SDD rates, greater independent ambulation at discharge, and higher home discharge rates.[43] Grip strength measurement offers additional predictive power: in female TKA patients, preoperative grip strength exceeding 19 kg predicts adoption of a more efficient stair ascent pattern at one year.[156] These assessments can therefore inform individualized perioperative care plans and resource allocation.

Digital PROM Platforms and Real-Time Alert Systems

The digitalization of PROM collection enables continuous, remote recovery surveillance with the capacity for automated early-warning intervention. A randomized controlled trial protocol has described a system in which digital PROM data are collected at regular intervals from THA/TKA patients, with algorithm-defined thresholds triggering alerts when recovery deviates from expected trajectories.[115] Research assistants then contact the patient and physician to investigate the deviation and potentially adjust the management plan. A secondary analysis of a randomized trial (the Promoting Quality study) demonstrated that PROM-based monitoring with alerts significantly reduced post-surgical healthcare utilization, providing evidence that this approach can both improve care quality and contain costs.[116] Such systems provide a viable framework for remote follow-up and precision intervention following SDD-THA.

Social Support and Its Association with Recovery Outcomes

A systematic review and meta-analysis confirmed that social support is a prognostic factor for selected patient-reported outcomes after joint replacement, with positive effects on long-term WOMAC scores and Oxford Knee Scores.[157] These findings reinforce the importance of evaluating social network adequacy and home support systems as part of the comprehensive SDD assessment. Preoperative identification of patients with insufficient support should prompt proactive planning for community care resources or consideration of alternative surgical management models.

Healthcare Policy, Economic Evaluation, and Care Model Transformation

Policy and Administrative Consequences

The growth of SDD-THA is inherently associated with the reform of healthcare reimbursement. The CMS removal of THA from the inpatient-only list triggered a dramatic increase in outpatient-designated procedures, which combined with COVID-19-related hospital capacity pressures, resulted in over 50% of all THA and TKA procedures being completed as outpatient by the end of 2020.[12] The transition from fee-for-service to value-based alternative payment models, particularly bundled payment programs, has fundamentally altered perioperative decision-making by incentivizing cost containment across the entire episode of care.[150]

However, the administrative implementation of these policy shifts has generated unintended consequences. The "two-midnight rule," which classifies anticipated stays shorter than two midnights as outpatient, has compelled many hospitals to designate all THA procedures as outpatient to avoid audit and reimbursement denial risk.[158] Surgeon surveys reveal that over 80% consider these classification changes to have increased administrative burden, while over 60% have encountered patients facing unexpected out-of-pocket costs due to outpatient designation.[159] Patients classified as "outpatient" differ systematically from "inpatient" patients in baseline characteristics, average LOS, and discharge disposition.[160] When patients requiring short-term observation are forced into outpatient classification, the resulting financial burden may fall disproportionately on the patient.[161]

Health-Economic Evaluation of SDD-THA

From a health-economic perspective, SDD-THA demonstrates favorable cost-effectiveness. Cost-utility analysis from a societal perspective, using a willingness-to-pay threshold of $50,000 per quality-adjusted life year, indicates that outpatient THA is more cost-effective than inpatient THA.[162] Time-driven activity-based costing reveals lower mean facility costs for ambulatory surgery center (ASC)-based THA compared with hospital-based inpatient THA, primarily attributable to personnel cost reductions.[163] However, CMS reimbursement reductions following the inpatient-only list removal substantially exceed the actual cost savings achievable, potentially undermining institutional incentives for ASC-based SDD programs.[163]

A patient-level value analysis has demonstrated that HOOS-JR improvement correlates weakly with total episode-of-care cost, whereas surgical setting and discharge destination are the primary determinants of "value".[151] THA performed at an ASC with home discharge generates substantially higher value than hospital-based THA with skilled nursing facility discharge. This emphasizes that value optimization requires comprehensive pathway redesign, not merely surgical technique refinement.

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Safety of Ambulatory Surgery Center-Based THA

The safety of the ASC as an operative venue for THA has been substantiated by accumulating evidence. Comparative analyses of near-elderly, non-Medicare patients demonstrate lower readmission and complication rates for ASC-based versus hospital outpatient department-based arthroplasty.[164] Private practice experience confirms that enhanced recovery pathways incorporating multimodal analgesia can achieve SDD rates exceeding 96%, with significantly reduced post-operative opioid consumption and no increase in complication rates with expanding SDD volumes.[165] Novel "hyper-specialty" ASCs with extended care suites have demonstrated safety profiles equivalent to inpatient arthroplasty.[26] Opioid-related adverse drug events are associated with increased inpatient mortality, prolonged LOS, higher costs, and elevated 30-day readmission rates, reinforcing the centrality of opioid-minimizing strategies regardless of surgical venue.[166]

Conclusions and Future Perspectives

Synthesis of Evidence and Clinical Paradigm Shift

SDD-THA has matured into an evidence-supported paradigm that, when integrated within rigorous ERAS-driven pathways, achieves clinical outcomes equivalent or superior to traditional inpatient management in appropriately selected candidates. Early recovery is a multidimensional, non-linear trajectory that can be objectively characterized via wearable technology.[144,145] This process is governed by a synergistic interplay between patient-intrinsic factors such as functional reserve and resilience, and modifiable perioperative strategies, including motor-sparing anesthesia, multimodal analgesia, and protocolized mobilization.[15,28,32,41,44,98] Successful implementation is predicated upon the systematic integration of risk-stratified selection utilizing validated tools like OARA and RAPT scores, and seamless digital transitions to home-based recovery.[32,54,56,114,117]

A fundamental paradigm shift is required: transitioning from the administrative goal of shortening hospital length of stay (LOS) to the clinical priority of optimizing recovery quality as the definitive endpoint. Fast-track protocols that prioritize discharge velocity over comprehensive physiological restoration risk deviating from the foundational ERAS objectives of minimizing complications and maximizing functional gains.[10,167] Consequently, future SDD-THA pathways must anchor their success metrics to "optimal-recovery-quality-guided safe discharge," focusing on the control of perioperative pathophysiology and the promotion of early functional independence.[121,168,169]

Limitations of Current Evidence and Future Frontiers

While current evidence is predominantly positive, it remains subject to selection bias, as most literature focuses on low-risk populations at high-volume centers. A relative paucity of data exists regarding SDD outcomes in complex populations, including those with severe obesity, cognitive impairment, or inadequate social support. Furthermore, the long-term impact of SDD on implant survivorship and patient-reported quality of life beyond the first year remains to be fully elucidated through larger, registry-based longitudinal studies.

To transcend current standardized protocols, several critical frontiers warrant prioritization. First, precision perioperative medicine may eventually integrate genomic and multi-omics data, such as identifying genetic polymorphisms like IL-6-174G>C that influence analgesic needs, with AI algorithms to design individualized SDD pathways.[58,59,170] Second, integrated digital ecosystems via developing interoperable platforms that synthesize electronic health records, wearable-derived kinetics, and digital PROMs into real-time clinical decision support for both patients and care teams[114–117,144] (Figure 4). Third, long-term outcome evaluation through national arthroplasty registries and extended follow-up studies is needed to determine whether the SDD model influences implant survivorship, long-term functional trajectories, and patient quality of life beyond the early postoperative period. Fourth, expanding research on the socioeconomic and psychological consequences of SDD on informal caregivers, who assume a pivotal role in home-based recovery.[48,49] Finally, policy refinement must ensure alignment between reimbursement incentives and clinical quality standards, preventing the inappropriate shifting of financial burdens to patients.[150,158,161]

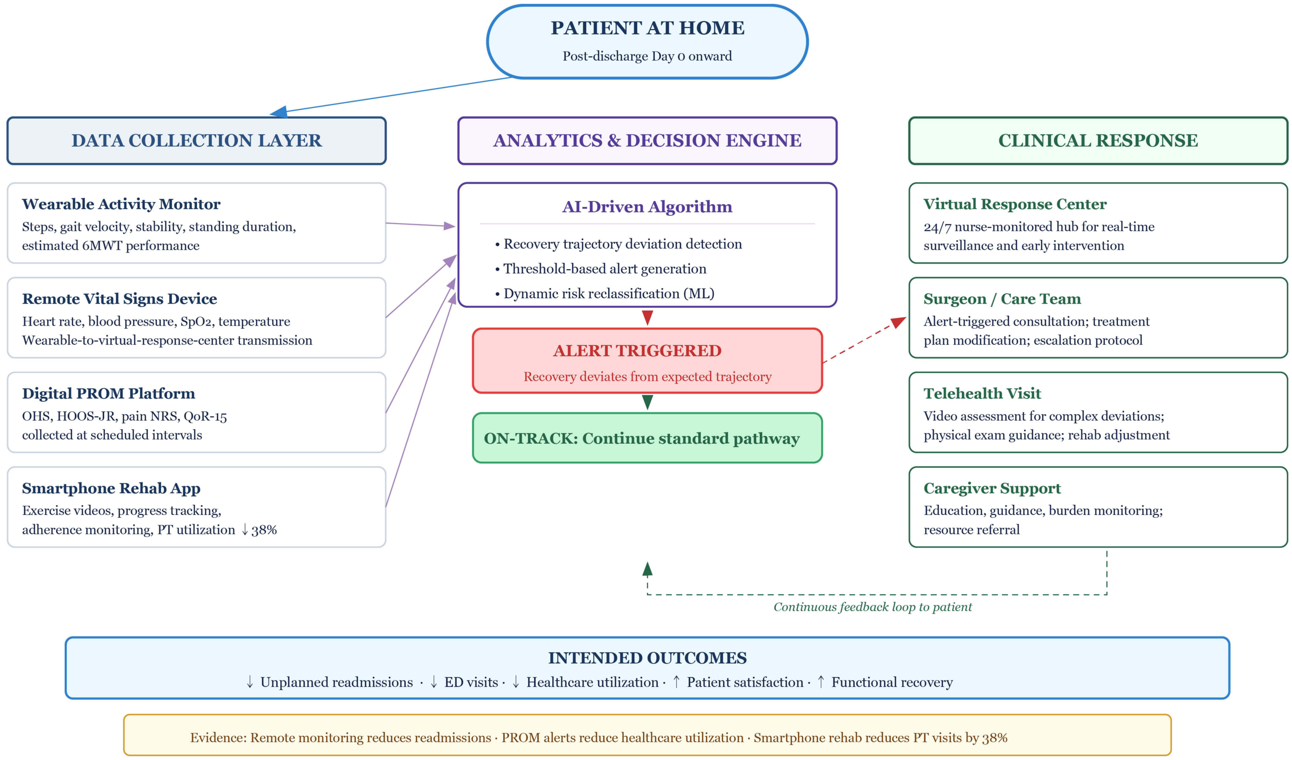

Figure 4 Proposed Conceptual Framework for an Integrated Digital Health Ecosystem.

Notes: This schematic integrates current evidence-based digital tools into a unified clinical model for remote post-discharge surveillance and intervention. Arrows denote the direction of data transmission and feedback loops within the ecosystem. In the "Intended Outcomes" section, ↑ indicates an increase or improvement, and ↓ indicates a reduction or decrease in the respective metric.

Abbreviations: SDD, same-day discharge; THA, total hip arthroplasty; 6MWT, six-minute walk test; OHS, Oxford Hip Score; HOOS-JR, Hip Disability and Osteoarthritis Outcome Score Joint Replacement; NRS, numeric rating scale; QoR-15, Quality of Recovery-15; PT, physical therapy; ML, machine learning; PROM, patient-reported outcome measure.

Conclusions

The paradigm of SDD-THA holds transformative potential for addressing the escalating global demand for hip arthroplasty in an ageing population. Realizing this potential is dependent upon a sustained focus on patient-centered recovery quality—transcending reductive LOS metrics to embrace a holistic vision of functional independence and sustainable healthcare value. Through continued multi-disciplinary research collaboration, clinical pathway refinement, and health system innovation, SDD-THA has the potential to become a cornerstone of surgical practice, enabling more individuals to safely and comfortably regain quality of life following hip replacement surgery.

Abbreviations

THA, Total hip arthroplasty; OECD, Organisation for Economic Co-operation and Development; SDD, same-day discharge; ERAS, enhanced recovery after surgery; LOS, length of stay; CMS, Centers for Medicare and Medicaid Services; PONV, postoperative nausea and vomiting; OI, orthostatic intolerance; TKA, total knee arthroplasty; ASA, American Society of Anesthesiologists; CCI, Charlson Comorbidity Index; TUG, Timed Up and Go; LEFS, Lower Extremity Functional Scale; OARA, Outpatient Arthroplasty Risk Assessment; BMI, body mass index; RAPT, Risk Assessment and Prediction Tool; PENG, pericapsular nerve group; ESP, erector spinae plane; QLB, quadratus lumborum block; LIA, local infiltration analgesia; TXA, Tranexamic acid; SSI, surgical site infection; ADL, activities of daily living; PROMs, patient-reported outcome measures; OHS, Oxford Hip Score; HOOS-JR, Hip Disability and Osteoarthritis Outcome Score Joint Replacement; QoR-15, Quality of Recovery-15; ACS, ambulatory surgery center.

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Author Contributions

All authors made a significant contribution to the work reported, whether that is in the conception, study design, execution, acquisition of data, analysis and interpretation, or in all these areas; took part in drafting, revising or critically reviewing the article; gave final approval of the version to be published; have agreed on the journal to which the article has been submitted; and agree to be accountable for all aspects of the work.

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Disclosure

The authors declare that they have no conflicts of interest to disclose for this work.

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