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## **Emerging Horizons in Postpartum Rehabilitation: A Narrative Review of Evolving Interventions and Integrative Strategies**

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# Emerging Horizons in Postpartum Rehabilitation: A Narrative Review of Evolving Interventions and Integrative Strategies

## Abstract

**Background:** The postpartum period marks a critical phase in women's life, characterized by significant physical, emotional and social transition. Despite its profound impact on maternal health and wellbeing. Postpartum rehabilitation remains inconsistently implemented and poorly integrated into routine healthcare across many settings.

**Objective:** This narrative review explores the evaluation of postpartum, rehabilitation, highlighting both traditional physiotherapeutic approaches and emerging integrative strategies. It also identifies critical gaps in clinical practice and research while proposing future directions for enhancing maternal recovering.

**Methods:** A comprehensive narrative synthesis was conducted using recent peer-reviewed literature on postpartum rehabilitation, including randomized trials, cohort studies and scoping reviews. Key thematic areas include pelvic floor muscles training, core stabilization, tele-rehabilitation, AI-assisted imaging and multidisciplinary care framework.

**Findings:** Traditional interventions such as pelvic floor muscles training and trunk stabilization remains foundational in postpartum care, however recent innovations-such as bio feedbacks, digital health platforms, kinesis tapping and smart pelvic floor device have expanded the scope of rehabilitation. Multimodal and holistic strategies that integrate physical,

psychological and cultural dimensions of recovery are gaining prominence. Nonetheless, significant gaps persist, including the under representations of marginalized populations, lack of standardized assessment tools, limited personalization of care and insufficient long-term follow-up.

**Conclusion:** Postpartum rehabilitation must transition from a narrow, exercise – based model to comprehensive interdisciplinary framework. Personalization, inclusivity and technological integration are essential for optimizing recovery and promoting maternal wellbeing. There is an urgent need for scalable, evidence-based rehabilitation strategies that address the full spectrum of postpartum challenges and support women in resuming the role with confidence, functionality and dignity.

## Keywords:

Exercise therapy, postpartum period, postnatal care, physical therapy modalities, and women's health

## 1. Introduction

The postpartum period, often referred to as the "fourth trimester," marks a critical transition in a woman's life physiologically, emotionally, and socially.

[Romano, M , Cacciatore \(2010\)](#)

This stage, extending beyond childbirth into weeks and months of recovery, is characterized by substantial musculoskeletal, hormonal, and psychological changes that demand deliberate attention and care. Yet, despite its profound impact, postpartum rehabilitation remains under-addressed and inconsistently implemented in many healthcare systems, particularly in low- and middle-income countries. [Shaw E, Levitt C, Wong S, Kaczorowski J, Group MUPR.\(2006\)](#) Postpartum rehabilitation encompasses a range of interventions designed to restore physical function, improve psychological well-being, and

support a woman's return to daily life following childbirth. Common conditions such as pelvic floor dysfunction, diastasis recti abdomen's, urinary incontinence, lower back pain, and emotional disorders like postpartum depression affect a significant proportion of new mothers, often impeding their quality of life (QoL) and long-term health outcomes. Wu YM, McInnes N, Leong Y.(2018) Research suggests that up to 40% of postpartum women may experience some form of pelvic floor dysfunction, yet less than half receive appropriate intervention or follow-up care. Norhayati M, Hazlina NN, (2015) Historically, rehabilitation strategies centered primarily on general physical recovery through pelvic floor muscle training (PFMT), core stabilization, and progressive physical activity. Selman R, Early K,(2022) While these remain foundational, the landscape has shifted dramatically with the incorporation of technology, personalized care models, and a deeper understanding of women's biopsychosocial needs. Skoura A, Billis E,(2024) The emergence of electrical stimulation therapies, real-time video-based training platforms, kinesis taping, acupuncture, and AI-assisted imaging techniques reflects a new era in postpartum care one that is evidence-informed, multidisciplinary, and increasingly individualized. Yin P, Wang H,(2022) This narrative review aims to explore the breadth and depth of current postpartum rehabilitation strategies, moving beyond the rigidity of systematic frameworks to provide a holistic understanding of evolving trends and interdisciplinary approaches. By integrating findings from recent literature, including clinical trials, pilot studies, and innovative care models, this paper will examine both established and emerging practices in postpartum care. The objective

is not only to present what is currently known but also to identify critical gaps, promising interventions, and the future potential of rehabilitation in improving maternal health and well-being.

As the global maternal health agenda evolves, it is imperative that postpartum rehabilitation be positioned as a vital component of comprehensive maternal care—not an afterthought, but a cornerstone. Through this review, we hope to contribute to this paradigm shift, advocating for accessible, personalized, and evidence-based rehabilitation strategies that honor the complexity of postpartum recovery.

## **2. Conceptualizing Postpartum Rehabilitation**

Postpartum rehabilitation is a multifaceted process that addresses the complex interplay of physical recovery, emotional well-being, and social reintegration after childbirth. Unlike the acute care provided during labor and delivery, postpartum rehabilitation unfolds over weeks and months, requiring sustained support tailored to each woman's experience. The scope of rehabilitation spans across restoring musculoskeletal function, addressing pelvic floor integrity, managing pain, and ensuring psychological resilience all of which are influenced by the mode of delivery, individual health status, and broader social determinants.

### **Physical Sequelae of Childbirth**

Physiological changes during pregnancy such as ligament laxity, pelvic floor strain, and abdominal wall separation do not resolve immediately postpartum. Wu YM, McInnes N, Leong Y.(2018) These changes, when unaddressed, may evolve into persistent dysfunctions. Skoura A, Billis E,(2024) Common complications include pelvic floor dysfunction, urinary or fecal incontinence, diastasis recti abdomen's, lumbopelvic pain, and sexual

dysfunction, each of which can compromise daily functioning and quality of life. [ElDeeb AM, Abd-Ghafar KS \(2019\)](#) A growing body of research indicates that nearly one in three women experiences some degree of pelvic floor disorder after childbirth, and many symptoms are underreported due to stigma or lack of awareness. [Norhayati M, Hazlina NN, \(2015\)](#) , [Sun Z, Zhu L, Lang J,\(2015\)](#) Cesarean sections, while often perceived as bypassing pelvic trauma, are not without their rehabilitation needs. Women undergoing cesarean deliveries frequently face delayed ambulation, abdominal muscle weakness, and pain associated with incision healing. [Uzunkaya-Öztoprak P,\(2023\)](#) Targeted strategies such as gentle core reconditioning, pain management, and scar mobilization are essential in supporting recovery [Lalmand M, Wilwerth M,\(2017\)](#)

### **Psychosocial Dimensions**

Beyond physical symptoms, the postpartum period is emotionally charged, often characterized by mood instability, fatigue, and identity transitions. Conditions such as postpartum depression (PPD) and anxiety affect approximately 10–20% of new mothers globally and can be exacerbated by physical impairments, poor sleep, and lack of support. [Ma B, Tao X, Qi Y,\(2004\)](#) Rehabilitation programs that integrate mental health screening, psycho education, and group support have been shown to improve overall recovery outcomes. [Shaw E, Levitt C,\(2006\)](#)

Cultural and socioeconomic contexts further shape postpartum experiences. In many cultures, traditional confinement practices emphasize rest and recovery but may also limit access to rehabilitative care. [Early K,\(2022\)](#), Conversely, in high-income countries, women often resume daily responsibilities rapidly, sometimes at the expense of adequate recovery time.

These contextual variations underscore the importance of culturally competent and accessible rehabilitation models. [Selman R, Webb DA, Bloch JR,\(2008\)](#)

### **Personalization and Timing of Intervention**

Rehabilitation should ideally begin in the immediate postpartum period, yet the approach must be nuanced. Early interventions such as breathing exercises, gentle pelvic tilts, and isometric contractions can safely initiate recovery without overburdening healing tissues. [Kim S, Yi D, Yim J.\(2022\)](#), As recovery progresses, structured exercise programs, biofeedback tools, and physical therapy modalities can be introduced, tailored to the woman's needs and tolerance. [Kim E-Y, Kim S-Y, \(2012\)](#) Importantly, rehabilitation is not one-size-fits-all. Factors such as parity, baseline fitness, comorbidities, delivery type, and support systems all play pivotal roles in designing appropriate interventions. Personalized care pathways integrating obstetric history, individual goals, and multidisciplinary input enhance adherence and efficacy. [Hilde G, Stær-Jensen J,\(2023\)](#)

### **3. Traditional Rehabilitation Approaches**

Conventional postpartum rehabilitation is grounded in physical therapy techniques that aim to restore musculoskeletal function, relieve pain, and improve pelvic floor integrity. These methods, while longstanding, continue to form the cornerstone of care due to their non-invasive nature, accessibility, and proven efficacy. In recent years, refinements in delivery models such as supervised group sessions and tele-rehabilitation have allowed these traditional approaches to evolve while remaining central to postpartum care. [Wu YM, McInnes N, Leong Y.\(2018\)](#)

## **Pelvic Floor Muscle Training (PFMT)**

Pelvic floor muscle training is one of the most widely endorsed rehabilitation strategies for postpartum women, particularly those recovering from vaginal deliveries. PFMT targets the muscles supporting the bladder, uterus, and rectum, aiming to improve urinary continence, pelvic stability, and sexual function. Supervised PFMT, compared to unsupervised programs, has shown superior outcomes in improving muscle strength and patient adherence. [Hilde G, Stær-Jensen J,\(2023\)](#)In a randomized controlled pilot trial, [Kim et al. \(2012\)](#) found that women participating in supervised pelvic floor and trunk stabilization exercises experienced greater improvements in vaginal squeeze pressure, symptom control, and overall quality of life than those engaging in unsupervised training at home. The effectiveness of PFMT also extends to managing elevator ani avulsion and pelvic floor laxity, though not all studies report statistically significant differences compared to natural recovery. [Sun Z, Zhu L, Lang J,\(2015\)](#)

## **Trunk Stabilization and Core Strengthening**

Beyond localized pelvic interventions, trunk stabilization exercises play a crucial role in restoring core strength and reducing postural dysfunctions. These exercises typically include deep abdominal activation, diaphragmatic breathing, and motor control training to re-establish core coordination. For postpartum women with diastasis recti—a common separation of the rectus abdomen's muscles—core stabilization offers both functional and aesthetic improvements. A notable study by [Kim et al. \(2022\)](#) compared online versus in-person trunk stabilization programs for postpartum women with diastasis recti. Both groups showed

marked improvements in inter-recti distance, abdominal muscle thickness, and quality of life, though face-to-face training showed slightly superior results. Importantly, this study highlights the potential for hybrid models of care to enhance accessibility without compromising effectiveness.

## **Segmental Stabilization with Pelvic Floor Integration**

The integration of pelvic floor training with segmental stabilization exercises represents a synergistic approach. [ElDeeb et al. \(2019\)](#) demonstrated that combining pelvic floor muscle training with segmental stabilizing exercises significantly improved outcomes related to pain, trunk range of motion, and functional disability among postpartum women with pelvic girdle pain. This integrated method appears to be more effective than isolated exercise protocols.

These findings underscore the importance of a comprehensive approach to musculoskeletal rehabilitation—one that addresses both the local (pelvic floor) and global (core and spine) systems for optimal postpartum recovery.

## **4. Technological Integration in Postpartum Recovery**

In recent years, the integration of technology into postpartum rehabilitation has transformed the delivery, accessibility, and effectiveness of care. These innovations not only bridge geographic and logistic barriers but also enhance personalization, precision, and patient engagement. Technology-enabled strategies now complement or even enhance traditional methods, offering a broader scope of tools tailored to women's diverse postpartum needs.

### **Electrical Stimulation and Biofeedback**

Electrical stimulation (ES) techniques, particularly trans vaginal electrical stimulation (TVES), have shown promising results in improving pelvic floor muscle (PFM) strength and control. For women with severe postpartum muscle weakness, TVES enhances neuromuscular re-education by stimulating muscle contractions that are otherwise difficult to initiate voluntarily. [Li et al. \(2020\)](#) demonstrated that five sessions of TVES led to significant improvements in contractile amplitude and coordination, especially in women with poor baseline strength. Similarly, biofeedback offers visual or auditory cues to help women improve the precision of PFM contractions. In a study by [Liang et al. \(2022\)](#), combining biofeedback-assisted pelvic floor training with neuromuscular electrical stimulation led to greater rectus diastasis closure and improved quality of life compared to electrical stimulation alone.

### **Digital Tools and Tele-rehabilitation**

As remote health interventions have become more mainstream, online platforms for delivering postpartum exercise programs are gaining momentum. For example, trunk stabilization and core training delivered via real-time video conferencing have shown comparable outcomes to in-person interventions in terms of muscle strength, inter-recti distance, and maternal quality of life.. [Kim et al. \(2022\)](#) These tools not only improve accessibility but also empower women who might face logistical, cultural, or financial barriers to attending in-person sessions. Mobile health (mHealth) apps for postpartum tracking, guided exercises, symptom logging, and reminders are increasingly incorporated into maternal care pathways. While many remain in pilot

phases, their potential to enhance adherence, self-monitoring, and communication with healthcare providers is substantial.

### **Acupuncture and Non-Invasive Innovations**

Technological integration also includes the application of non-invasive methods such as auricular acupuncture and kinesis taping. [Yang et al. \(2019\)](#) found that auricular acupuncture, when added to routine care for cesarean section patients, significantly reduced postpartum pain and complications, while expediting bowel recovery and hospital discharge.

Similarly, kinesis taping applied over surgical or muscular regions has demonstrated positive effects on pain reduction, breastfeeding comfort, and functional recovery in early postpartum days. [Uzunkaya-Öztoprak P, \(2023\)](#)

### **Artificial Intelligence and Imaging**

Emerging use of artificial intelligence (AI) in imaging—especially ultrasound enhanced by AI algorithms—has shown promise in objectively assessing pelvic muscle function and treatment outcomes. [Yin et al. \(2022\)](#) demonstrated that AI-processed ultrasound images improved diagnostic accuracy for pelvic organ prolapse and better tracked improvements in muscle thickness and hiatus diameter post-rehabilitation. In another study, [Chen et al. \(2022\)](#) employed image enhancement algorithms to assess and guide pelvic floor rehabilitation training, leading to more accurate diagnoses and tailored interventions.

### **Smart Devices and Wearable's**

Though still an emerging field, smart pelvic floor trainers and vibrating vaginal balls offer interactive, sensor-based feedback systems that encourage engagement and correct technique during exercise. The feasibility trial by [Oblasser et al. \(2016\)](#) highlighted the acceptability

and usability of vibrating pelvic floor devices, which may support long-term adherence and better outcomes.

### **5. Multimodal and Holistic Strategies**

As postpartum care evolves beyond isolated interventions, a growing body of evidence supports multimodal and holistic strategies that integrate physical, emotional, and social dimensions of recovery. These approaches acknowledge the complexity of postpartum health and aim to provide women with comprehensive, individualized care plans that combine traditional rehabilitation techniques, complementary therapies, and psychosocial support.

#### **Combination Therapies: Physical and Complementary Approaches**

Integrated rehabilitation protocols that combine pelvic floor exercises, trunk stabilization, pain management, and complementary therapies such as acupuncture or kinesis taping have shown superior outcomes over single-modality interventions. [Uzunkaya-Öztoprak P, \(2023\)](#) Studies reveal that multimodal approaches address a broader spectrum of postpartum symptoms, including pelvic pain, incontinence, abdominal separation, and emotional distress. [ElDeeb AM, Abd-Ghafar KS, \(2019\)](#) For example, combining segmental stabilization with pelvic floor muscle training (PFMT) leads to significant improvements in pelvic girdle pain and functional movement. [Skoura A, Billis E, \(2024\)](#) Likewise, programs that blend core training with kinesio taping or manual therapy enhance postural alignment, reduce musculoskeletal strain, and expedite return to daily activities.

[Hilde G, Stær-Jensen J, Siafarikas F, \(2023\)](#)

#### **Multidisciplinary Team (MDT) Models and Enhanced Recovery After Surgery (ERAS)**

Multidisciplinary team models involve collaboration among physiotherapists, obstetricians, midwives, psychologists, and lactation consultants. [Kearns EC, Fearon NM, \(2021\)](#) These models, such as the Enhanced Recovery After Surgery (ERAS) framework used post-cesarean, support early mobilization, individualized pain control, and coordinated education, reducing hospital stay and accelerating functional recovery. [Stone J, Skibiski K, \(2021\)](#) In ERAS programs, early implementation of nutrition, breathing exercises, and physical activity within the first 24–48 hours postpartum is encouraged. These strategies contribute to improved maternal satisfaction and reduced risk of chronic pain and mood disorders. [Kleiman K, Waller H. \(2023\)](#)

#### **Psychosocial and Cultural Sensitivity in Care**

Holistic care must also be culturally responsive and psychologically attuned. Women from different cultural backgrounds have varied expectations about confinement periods, physical activity, and postpartum roles. [Soffer A. \(2023\)](#) Rehabilitation strategies that respect these differences while encouraging safe physical recovery are more likely to achieve long-term engagement and success. [Avalos-Fuentes N. \(2024\)](#)

Group-based interventions that incorporate peer support, relaxation training, and mental health education have been effective in managing postpartum depression and anxiety. In addition, involving family members in education and care planning strengthens support networks and improves adherence to rehabilitation programs. [Shaw E, Levitt C, \(2006\)](#)

### **Lifestyle Coaching and Long-term Health Promotion**

Postpartum rehabilitation is increasingly seen not only as a recovery tool but as a gateway to lifelong health promotion. Lifestyle coaching focused on physical activity, sleep hygiene, nutrition, and stress management plays a key role in preventing recurrence of musculoskeletal issues, managing body weight, and reducing the risk of chronic disease later in life. [Whitaker KM, Sharpe PA,\(2014\)](#)

Incorporating health coaching into postpartum visits helps bridge the gap between acute recovery and long-term well-being, ensuring that women remain empowered advocates of their own health beyond the initial postpartum window.

### **6. Pharmacological and Medical Interventions: A Complementary Role**

While the primary emphasis in postpartum rehabilitation rests on physical and psychosocial recovery, pharmacological and medical interventions serve as essential adjuncts, particularly in managing acute symptoms such as pain, inflammation, or severe mood disturbances. These interventions often provide the necessary physiological relief that enables more effective participation in rehabilitation.

Analgesic regimens ranging from NSAIDs to localized anesthetic infusions such as ropivacaine are commonly used post-cesarean to facilitate early mobilization and reduce discomfort during physical therapy sessions. A study by [Lalmand et al. \(2017\)](#) compared continuous subfascial ropivacaine infusion with intrathecal morphine, noting similar pain relief outcomes but fewer side effects in the former group, supporting its role in enhanced recovery protocols.

In cases of postpartum depression or anxiety, selective serotonin reuptake

inhibitors (SSRIs) are occasionally prescribed. These medications, when used judiciously and with appropriate psychiatric oversight, can stabilize mood sufficiently for patients to engage in broader rehabilitation strategies. However, non-pharmacological treatments such as cognitive behavioral therapy (CBT) or structured support groups remain preferred first-line interventions, particularly in breastfeeding women.

In summary, while not central to physiotherapeutic practice, pharmacological care complements and often enables holistic postpartum recovery. Its role is best understood within an interdisciplinary framework that integrates medical management with physical, emotional, and social rehabilitation.

### **7. Current Gaps and Future Directions**

Despite growing awareness of the importance of postpartum rehabilitation, substantial gaps persist in both research and clinical implementation. Many of these limitations stem from fragmented care models, lack of standardized guidelines, insufficient follow-up, and underrepresentation of diverse populations in clinical trials.

#### **Limited Personalization and Continuity of Care**

Most postpartum rehabilitation protocols still adopt a generalized “one-size-fits-all” approach, often failing to differentiate based on variables such as mode of delivery, pre-existing conditions, or cultural background. For example, recovery needs for women undergoing cesarean sections differ considerably from those with vaginal births, yet few studies stratify interventions accordingly. [Skoura A, Billis E,\(2024\)](#) Similarly, women with complex birth experiences such as forceps delivery, perianal trauma, or prolonged labor are rarely given targeted

rehabilitation plans, leading to suboptimal outcomes. Moreover, postpartum care is often time-limited, typically ending around six weeks after delivery, despite evidence that physical and emotional recovery can extend over many months. The absence of long-term follow-up impedes monitoring for conditions like persistent diastasis recti, chronic pelvic pain, and mental health deterioration. [Webb DA, Bloch JR,\(2008\)](#)

### Underrepresentation in Research

A notable gap in existing literature is the underrepresentation of women from low- and middle-income countries, rural settings, and marginalized communities. These populations often face greater barriers to access—including cultural stigma, financial limitations, and health system constraints—yet their specific needs are rarely studied. [Norhayati M, Hazlina NN, \(2015\)](#) Additionally, there is limited inclusion of women with disabilities, high-risk pregnancies, or postpartum complications such as preeclampsia or gestational diabetes in rehabilitation-focused trials.

Addressing these disparities requires purposeful sampling, community-based participatory research, and inclusive program design that reflects the full spectrum of maternal experiences.

### Lack of Standardized Assessment Tools

There remains a lack of consensus on the most appropriate and reliable outcome measures for postpartum rehabilitation. Tools for assessing pelvic floor strength, abdominal integrity, and psychological well-being vary widely across studies, limiting comparability and scalability of interventions. [Liang P, Liang M, Shi S, Liu Y,\(2022\)](#)

Digital solutions like AI-based imaging and validated self-assessment apps may offer future standardization but require

rigorous validation before widespread adoption.

### Opportunities in Digital and Remote Rehabilitation

Tele health and mobile health (mHealth) platforms present exciting opportunities for improving access, especially in underserved areas. However, research into long-term engagement, effectiveness in various delivery formats (asynchronous vs. synchronous), and data privacy remains in early stages. Future work should explore how digital rehabilitation can be optimized for maternal engagement and adapted to diverse learning styles and literacy levels. [Kim S, Yi D, Yim J.\(2022\)](#)

### Recommendations for Future Research and Practice

Develop stratified rehabilitation protocols tailored by delivery type, comorbidities, and psychosocial risk factors.

Expand longitudinal studies that follow women beyond the 6-week postpartum period to track sustained outcomes.

Standardize outcome measurement tools for physical and emotional domains.

Prioritize inclusive research by involving diverse populations and using participatory methods.

Invest in scalable, culturally sensitive digital platforms for guided postpartum care.

**Table: Gaps and Future Directions in Postpartum Rehabilitation**

Key Area	Gaps Identified	Future Directions
<b>Limited Personalization</b>	Generic protocols for all delivery types; minimal long-term follow-up	Stratified rehab based on delivery type and individual risk profiles

<b>Underrepresentation</b>	Marginalized, rural, and disabled populations often excluded from research	Inclusive, community-based participatory research frameworks
<b>Non-Standardized Tools</b>	Inconsistent outcome measures; lack of validated assessment tools	Develop and validate standardized clinical and digital tools
<b>Digital Rehab Potential</b>	Limited research on engagement, retention, and data privacy in mHealth platforms	Test usability, security, and effectiveness of telehealth and mHealth solutions
<b>Research Recommendations</b>	Few programs reflect cultural or psychosocial diversity	Design adaptable programs with culturally sensitive and diverse perspectives

NOTE: This table summarizes the most pressing gaps identified in current postpartum rehabilitation literature and practice. Addressing these areas through targeted research and inclusive program development is essential for advancing maternal health outcomes globally. By integrating personalized care, culturally

responsive strategies, and innovative technologies, future rehabilitation frameworks can become more equitable and effective.

#### 8. Conclusion

Postpartum rehabilitation represents a pivotal, yet often overlooked, component of maternal healthcare. As childbirth initiates a profound physiological and emotional transition, comprehensive rehabilitation must move beyond isolated physical interventions and embrace a broader, woman-centered framework. This review has illustrated the evolving nature of postpartum rehabilitation—from traditional pelvic floor training and core stabilization to the integration of advanced technologies, multidisciplinary care models, and holistic approaches that honor cultural and psychosocial diversity.

Despite significant progress, persistent gaps remain. Rehabilitation practices are frequently generalized, with minimal attention to delivery-specific needs or long-term recovery trajectories. Underrepresentation of diverse populations, inconsistencies in outcome measurement, and limited personalization further restrict the effectiveness and accessibility of care. However, the future is promising. Advances in telehealth, AI-enhanced diagnostics, smart devices, and integrative lifestyle programs offer scalable, innovative pathways to support maternal recovery in diverse contexts.

To fully realize this potential, rehabilitation must be redefined—not as a singular set of physical exercises, but as an interdisciplinary process that empowers women, supports their return to full participation in life, and addresses the interconnected dimensions of body, mind, and community. As healthcare systems seek to improve maternal health outcomes, postpartum rehabilitation should be recognized as a cornerstone of recovery—

not an optional afterthought, but a clinical and public health priority.

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