



## Exploring Patient Experiences of Stem Cell Therapy for Musculoskeletal Injuries: An Interpretative Phenomenological Analysis

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### ABSTRACT

Regenerative medicine and tissue engineering have emerged as transformative fields aimed at restoring damaged tissues through stem cell therapy and other advanced biotechnologies. However, while clinical outcomes in musculoskeletal disorders have been widely examined, the subjective dimensions of patients' healing experiences remain underexplored, marking a clear research gap. This study addresses that gap by employing an interpretative phenomenological analysis (IPA) to explore how patients undergoing stem cell therapy for musculoskeletal injuries interpret recovery, manage uncertainty, and reconstruct meaning in their daily lives. Data were collected through semi-structured, in-depth interviews with ten patients who had received stem cell therapy within the past year. Through iterative phenomenological coding, key experiential themes emerged—restored hope, persistent uncertainty, embodied awareness, and social reintegration—offering a nuanced account of healing as both a biomedical and existential process. Methodologically, this study contributes by demonstrating how IPA can reveal the interpretative processes that shape patients' understanding of regenerative treatments, extending beyond traditional clinical metrics. These insights underscore the importance of integrating phenomenological perspectives into regenerative medicine research and practice to design therapies that address psychological and social recovery alongside physical outcomes.



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## INTRODUCTION

Regenerative medicine and tissue engineering have emerged as transformative fields in modern healthcare, offering new possibilities for restoring function and improving quality of life among individuals with chronic injuries and degenerative conditions (Abdolmaleki et al., 2020). Stem cell therapy, in particular, has gained prominence as a promising intervention for musculoskeletal disorders, which represent one of the leading causes of disability worldwide (Abreu et al., 2022). While the biomedical advances in this area are well documented, the broader human experience of living through such therapies remains less visible in academic discourse. Patients undergoing regenerative treatments are not only recipients of biomedical procedures but also individuals navigating the social, emotional, and existential dimensions of recovery.

The significance of this phenomenon extends beyond physical restoration, as the process of healing intersects with personal identity, self-perception, and social reintegration (Bolandnazar et al., 2024). Injuries to the musculoskeletal system often limit mobility, disrupt daily routines, and alter social participation, leading to profound impacts on patients' sense of autonomy and belonging (Mukhlis et al. 2023). Consequently, regenerative therapies carry implications that reach beyond clinical outcomes, shaping how individuals re-engage with their bodies, their communities, and their aspirations for the future. In this context, exploring subjective experiences becomes essential for understanding the full scope of what it means to heal and adapt following innovative medical interventions.

Despite the potential of regenerative medicine to transform patients' lives, there is limited exploration of how these therapies are experienced on a personal and social level. Much of the existing knowledge has emphasized clinical effectiveness, while the subjective realities—such as the uncertainty, hope, or fear that accompany these therapies—have often remained underexplored (Chemaly et al., 2021). Addressing this gap requires attention to the meanings and interpretations patients assign to their treatment experiences. A phenomenological approach provides the foundation for such an inquiry, as it privileges the lived realities of participants and reveals dimensions of recovery that cannot be captured through quantitative measures alone (Chen et al., 2024). By focusing on the experiential aspects of stem cell therapy, it becomes possible to build a more comprehensive understanding of the phenomenon, one that integrates clinical outcomes with human meaning.

Building on this broader context, research that focuses on patients' lived experiences within regenerative medicine has become increasingly recognized as an essential area of inquiry (Chow et al., 2020). The significance of understanding how individuals interpret and assign meaning to their healing journey is evident, particularly in therapies such as stem cell interventions for musculoskeletal injuries (Chung et al., 2021). These experiences extend beyond the physiological dimension, reflecting psychological, social, and existential aspects that shape how recovery is lived and understood (Mukhlis, Maryam, et al., 2023). Literature in related fields has underscored the importance of examining patients' voices, yet the exploration of this dimension within regenerative medicine remains comparatively scarce.

One of the central challenges in this line of research lies in methodological limitations. Previous studies have often relied heavily on quantitative indicators—such as imaging results, biomarkers, or functional scores—that, while valuable, provide only a partial view of the phenomenon (Mukhlis & Saidah, 2025). Such measures are limited in their ability to capture the richness of subjective experiences, including feelings of uncertainty, fear, or renewed hope (Curt et al., 2020). Even when qualitative approaches have been applied, they have frequently been descriptive in nature, offering surface-level accounts that fail to reveal the deeper interpretative structures underpinning patient experiences.

These limitations have resulted in a narrow understanding of regenerative therapies, where the human dimension of healing is insufficiently addressed (Danilkowicz et al., 2022). Without careful attention to how patients construct meaning from their treatment, essential insights into adaptation, identity reconstruction, and psychosocial integration remain overlooked. As a result, previous approaches have often been inadequate in uncovering the full essence of the phenomenon (Defachelles et al., 2021). This gap underscores the need for a phenomenological approach—particularly interpretative phenomenological analysis (IPA)—that is capable of engaging deeply with patients' narratives, thereby revealing the complex interplay between clinical outcomes and subjective meaning.

While existing approaches to evaluating regenerative therapies have largely relied on clinical and biomedical metrics, such as imaging outcomes, biomarker levels, or standardized functional scores, these measures only partially capture the realities of patient recovery (Ferreira et al., 2023). These practical solutions remain essential for assessing physiological changes, yet they fall short of addressing how patients experience, interpret, and ascribe meaning to the healing process (Mukhlis, 2025). Consequently, much of the literature reflects a medically driven perspective, often overlooking the psychosocial and existential dimensions of treatment that are equally critical to long-term adaptation and quality of life.

Furthermore, even when qualitative research has been employed, many studies have adopted descriptive thematic approaches that provide valuable but surface-level insights (Fessler et al., 2022). Such methods often lack the interpretative depth necessary to uncover how patients navigate uncertainty, reconstruct their identities, or re-establish social participation following stem cell therapy (Haskell et al., 2024). As a result, the essence of the phenomenon—how individuals live through regenerative treatments and integrate these experiences into their broader life contexts—remains insufficiently understood.

This gap underscores the need for a phenomenological framework, particularly interpretative phenomenological analysis (IPA), which enables an exploration of the deeper structures of meaning embedded in patients' narratives (Jeyaraman et al., 2024). By privileging the subjective and interpretative dimensions of experience, such an approach offers the potential to move beyond biomedical indicators and to reveal a more holistic understanding of the phenomenon (Jiang et al., 2022). Addressing this gap is crucial for developing a comprehensive perspective on regenerative medicine that integrates clinical outcomes with the lived realities of patients.

Previous studies in regenerative medicine have examined clinical outcomes of stem cell therapies, emphasizing functional recovery, biomarker changes, and imaging results. While these studies provide valuable biomedical insights, they often neglect the subjective dimension of healing, which shapes how patients interpret their recovery (Kaneda et al., 2023). A few qualitative works have highlighted psychosocial adaptation and patient narratives, but many remain descriptive and limited in depth (Mukhlis & Abdullah, 2025). Interpretative frameworks such as IPA have been less frequently applied in regenerative medicine, leaving much of the lived experience unexplored. This study builds on these gaps by focusing on the experiential meanings patients construct through stem cell therapy for musculoskeletal injuries.

To address this gap, a phenomenological approach was adopted, specifically interpretative phenomenological analysis (Mukhlis, Arifin, Ridwan, Zulbaidah, et al., 2025). This method was chosen because it enables the exploration of personal meanings and subjective interpretations that extend beyond descriptive accounts (Knapik et al., 2021). Through this approach, the study seeks to uncover how patients navigate hope, fear, and identity reconstruction while undergoing regenerative treatment (Lana et al., 2021). The use of IPA allows for a deeper engagement with patient narratives, offering insights into experiences that cannot be captured through clinical or quantitative measures. In doing so, the research responds directly to the limitations identified in the knowledge gap.

This article is structured to guide the reader through both the conceptual and experiential dimensions of the study. The introduction presents the background, research gap, and rationale for the phenomenological approach. The methods section details the design, participants, data collection, and interpretative analysis process. The results section presents thematic findings supported by patient narratives that reveal essential aspects of lived experience. The discussion and conclusion elaborate on the implications for theory, clinical practice, and future research in regenerative medicine.

## **RESEARCH METHODS**

### **Study Design**

A phenomenological approach was employed to explore the lived experiences of patients undergoing stem cell therapy for musculoskeletal injuries. Phenomenology was selected as it emphasizes the subjective meanings and personal perspectives of individuals, allowing for in-depth understanding of how patients interpret and give meaning to their recovery journey (Main et al., 2020). The interpretative phenomenological analysis (IPA) framework guided this study, as it focuses not only on describing experiences but also on interpreting how participants make sense of those experiences within their social and personal contexts. This design was particularly relevant for capturing the complexity of patients' hopes, fears, and identity transformations associated with regenerative medicine interventions.

### **Participants**

Participants consisted of individuals who had undergone stem cell therapy for musculoskeletal conditions within the past 6 to 12 months. Inclusion criteria required participants to be adults aged between 25 and 65 years, with the cognitive and communicative ability to articulate their personal experiences. Exclusion criteria included individuals with severe psychiatric disorders or those who had undergone multiple concurrent regenerative interventions that could confound the focus on stem cell therapy (Mesa Bedoya et al., 2024). Purposive sampling was used to identify participants who could provide rich, relevant, and diverse perspectives on the phenomenon. The final

sample comprised ten participants, balanced across gender, with an average age of 47 years. The demographic variation supported the identification of both common and unique experiential themes.

### **Data Collection**

Data were collected through semi-structured, in-depth interviews conducted face-to-face in private consultation rooms within the clinical facility. Each interview lasted approximately 45 to 90 minutes, allowing participants sufficient time to reflect on and share their experiences. An interview guide was used to ensure consistency while enabling flexibility for participants to elaborate on aspects of personal significance. Questions focused on perceptions of treatment, bodily changes, emotional responses, and the impact of therapy on daily life and social identity (Rogers et al., 2024). All interviews were audio-recorded with permission and transcribed verbatim. To enhance comfort and authenticity, participants were encouraged to speak freely in their own words, and probing questions were used to clarify emerging insights.

### **Data Analysis**

Data were analyzed using interpretative phenomenological analysis (IPA). Transcripts were read and re-read to achieve familiarity, followed by coding of meaning units that reflected significant experiential statements (Rowe et al., 2023). These codes were clustered into preliminary categories and progressively refined into broader thematic structures. The iterative process involved identifying patterns both within and across individual accounts, allowing the extraction of essential themes that captured the depth of lived experiences. NVivo software was used to support the organization of data, although the analytical focus remained on interpretative engagement with the text. The final themes represented a synthesis of participants' narratives that illuminated the essence of their experience with stem cell therapy.

## **RESULTS**

### **Reconstructing Hope Through Stem Cell Therapy**

Participants consistently described their engagement with stem cell therapy as a process of regaining hope after prolonged suffering from musculoskeletal injuries. For many, the intervention was perceived not merely as a medical treatment but as a symbolic renewal of bodily integrity. One participant stated:

“Before the therapy, I could not imagine walking without pain. Now, even though I am still recovering, I feel like my body is finally listening to me again.”

Another participant echoed this transformation, saying, “It wasn't just my leg that healed—it was my belief that I could live normally again.”

These direct expressions illustrate how stem cell therapy became a medium through which participants reconstructed meaning and agency in their recovery. This sense of restored hope was intertwined with participants' redefinition of what healing meant. Rather than measuring recovery purely in clinical terms, they emphasized the experiential dimension of being able to resume everyday tasks, to interact socially without constant discomfort, and to regain confidence in their physical capability.

Analytically, this theme demonstrates that hope functions as both an emotional and existential resource—mobilizing participants to reinterpret pain, uncertainty, and bodily change within a renewed narrative of possibility.

### **Navigating Uncertainty and Fear of the Unknown**

Despite optimism, participants also expressed deep uncertainty regarding the novelty of stem cell therapy. Several described fear of adverse outcomes, particularly because of limited public knowledge and mixed messages from healthcare providers. One patient reflected:

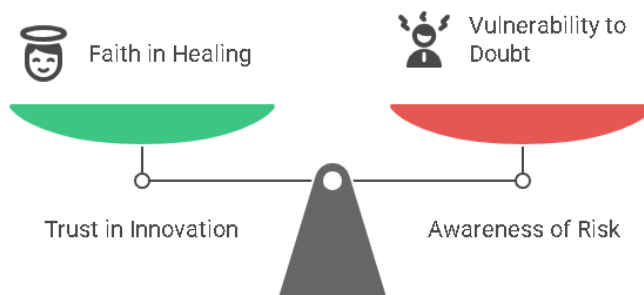
“I was afraid—afraid that this was just an experiment, and maybe I would end up worse than before. But at the same time, I thought: what choice do I have?”

Another participant admitted, “Sometimes I questioned if the doctors really knew what would happen. It felt like stepping into the dark.”

These statements underscore that uncertainty was not merely informational but existential—patients negotiated trust amid limited evidence and the unknown future of regenerative medicine.

This tension between trust and doubt revealed the fragile psychological balance patients maintain when undergoing innovative regenerative procedures. From an analytical perspective, this theme suggests that uncertainty becomes an integral part of the healing experience, where faith in medical innovation coexists with a persistent awareness of risk and vulnerability.

### **Balancing Trust and Risk in Regenerative Medicine**



### **Experiencing the Body as Both Fragile and Resilient**

Participants often articulated a heightened awareness of their bodies following treatment. They described their musculoskeletal system not only as a site of injury but also as a living system capable of renewal. A participant noted:

“Every small movement feels different now. Sometimes my knee feels stronger, sometimes weaker, but I am more conscious of my body than I ever was.”

Others conveyed similar bodily awareness, such as one who remarked, “I listen to my body now—it tells me when to rest, when to push, and when to trust the process.”

These quotations reveal an interpretative shift: the body is no longer viewed as a passive recipient of treatment but as an active, communicative partner in recovery.

This theme captures the paradoxical coexistence of fragility and resilience. The body was perceived as vulnerable to failure but simultaneously capable of surprising regeneration, leading participants to reframe their relationship with their own physicality. Analytically, this dual perception illustrates how embodiment becomes a site of negotiation between vulnerability and empowerment—a reorientation central to phenomenological healing.

### **Social Reintegration and Shifts in Identity**

Several participants reported that improvements in physical function enabled them to reintegrate into social and occupational roles, which in turn reshaped their self-identity. One participant shared:

“After the therapy, I could finally return to work part-time. It is not just about the job—it is about feeling useful again, not being a burden to my family.”

Another emphasized the social renewal of identity: “When my friends saw me walking again, they said I looked happier. I realized I was reconnecting not just with them, but with myself.”

These quotations demonstrate that healing was relational—anchored in the restoration of social participation and recognition.

This theme highlights the social dimension of recovery, where personal healing was closely tied to reestablishing a sense of dignity, agency, and belonging. Regenerative medicine was therefore not only a biomedical process but also a social re-entry point. Analytically, this theme shows that

identity reconstruction occurs through social validation, positioning recovery as both a personal and communal phenomenon.

## **DISCUSSION**

The findings of this study reveal that stem cell therapy for musculoskeletal injuries is experienced as a multidimensional journey marked by hope, uncertainty, embodied awareness, and social reintegration (Luskin et al., 2025). These themes collectively answer the central research question by showing that recovery is not only a biomedical process but also a deeply subjective and social experience.

### **Contribution of Findings to the Research Question**

The study contributes to answering the overarching research question by demonstrating that patients' lived experiences extend beyond measurable clinical outcomes to include profound psychological and social dimensions (Ma et al., 2020). Hope emerged as a transformative element, shaping how individuals perceived progress and future possibilities, while uncertainty highlighted the vulnerability inherent in undergoing novel medical procedures. The awareness of the body as both fragile and resilient revealed how patients negotiated their physical limitations while simultaneously embracing the potential of regenerative healing (Mukhlis et al. 2025). Furthermore, the theme of social reintegration illustrated how recovery restored identity, dignity, and relational belonging. These insights provide a richer understanding of the essence of healing, offering a perspective that situates stem cell therapy within the broader human experience rather than reducing it to biomedical effectiveness alone.

### **Relationship with Previous Literature and Theory**

The findings align with earlier qualitative research that underscores the importance of subjective experiences in medical interventions, such as the work of Mukhlis et al. (Mukhlis et al., 2024), who identified ambivalence in patients' trust toward stem cell therapy. Similarly, Marín et al. (2022) emphasized the psychological adjustments of patients following tissue engineering, which resonates with the present study's theme of navigating uncertainty. However, this study extends existing literature by highlighting the paradoxical coexistence of fragility and resilience in the embodied experience of recovery, a dimension less explored in previous works. The theme of social reintegration complements McKenna et al. (2022), who reported the centrality of quality of life in regenerative medicine, yet here it is presented as an active reconstruction of social identity rather than a passive outcome. Taken together, the findings both confirm and expand upon existing knowledge, illustrating how phenomenological exploration deepens our understanding of the lived realities of regenerative therapies.

### **Implications of the Findings**

The findings of this study hold significant implications for both clinical practice and the broader understanding of regenerative medicine. The lived experiences of patients highlight that healing is not solely defined by clinical success but also by how individuals reconstruct meaning, manage uncertainty, and reintegrate socially after therapy (Mukhlis, Janwari, et al., 2023). This suggests that healthcare providers should integrate psychosocial support and patient-centered communication into the treatment process, ensuring that hope and fear are acknowledged alongside biomedical progress. From a cultural and social perspective, the findings emphasize the role of identity reconstruction, indicating that regenerative medicine is not only a physical intervention but also a transformative life event (Mizuno et al., 2024). These insights are relevant not only to patients undergoing stem cell therapy but also to wider populations facing novel or experimental medical treatments, underscoring the universality of lived experience as a key component of healing.

### **Limitations of the Study**

This study is not without limitations. The sample size was relatively small and limited to individuals who had undergone stem cell therapy for musculoskeletal injuries within a specific clinical context, which may restrict the transferability of findings to other patient groups or settings

(Patel et al., 2024). The reliance on self-reported narratives, while essential in phenomenological inquiry, may also be influenced by memory, personal biases, or social desirability (Ramme et al., 2020). Furthermore, although interpretative phenomenological analysis allows for deep engagement with personal meaning, it inherently involves interpretive subjectivity that may shape the representation of participants' voices. These limitations do not undermine the value of the findings but rather point to the need for cautious interpretation and contextual application.

### **Prospective Directions for Future Research**

Future research could expand these findings by including more diverse patient populations, different clinical conditions, or cross-cultural perspectives to examine how social and cultural contexts shape the meanings of regenerative therapy (Mukhlis, 2025a). Longitudinal phenomenological studies may also provide valuable insights into how experiences evolve over time, particularly as regenerative interventions progress from experimental to more established treatments. Comparative studies between regenerative therapies and conventional medical interventions could further clarify the unique psychosocial dimensions of stem cell treatments (Reinders et al., 2021). Additionally, integrating phenomenological inquiry with complementary approaches such as narrative medicine or patient-reported outcome frameworks could strengthen the practical application of findings in clinical decision-making. Such future work would not only enrich theoretical understanding but also support the design of more holistic patient care strategies in regenerative medicine.

### **CONCLUSION**

This study explored the lived experiences of patients undergoing stem cell therapy for musculoskeletal injuries, addressing the limited understanding of how individuals interpret and give meaning to such innovative treatments. The findings revealed that recovery was shaped by themes of restored hope, persistent uncertainty, embodied awareness, and social reintegration. Beyond describing these experiential patterns, the study offers a distinctive phenomenological account of how regenerative medicine reshapes patients' sense of self, agency, and bodily identity. This represents a unique contribution to the growing literature on regenerative health, which has predominantly emphasized clinical efficacy rather than subjective transformation.

These insights highlight that healing extends beyond biomedical outcomes and encompasses psychological, social, and existential dimensions that are often overlooked in previous research. Practically, the findings underscore the need for integrative care models that attend to emotional resilience, patient meaning-making, and social reintegration as essential components of recovery. Incorporating phenomenological insights into rehabilitation programs and clinician training may enhance empathy, communication, and long-term adherence to therapy. By adopting an interpretative phenomenological approach, this study contributes a deeper understanding of how regenerative medicine impacts patients' lives in ways that traditional quantitative methods cannot capture.

Methodologically, it demonstrates the value of interpretative phenomenological analysis (IPA) as a tool for bridging experiential and clinical domains, providing a qualitative complement to biomedical evaluation. The results provide valuable implications for patient-centered care, suggesting that clinicians should integrate psychosocial support alongside clinical treatment. Future research should not only include diverse populations and longitudinal perspectives but also examine how patients' meaning-making processes evolve across different stages of treatment, thereby informing ethically grounded and person-centered innovation in regenerative medicine.

### **CONFLICT OF INTEREST**

The authors declare that there is no conflict of interest regarding the publication of this article.

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