Review

Clinical Use of Platelet-Rich Plasma in Neonatal and Pediatric Populations: A Scoping Review

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Abstract

Introduction. Platelet-rich plasma (PRP) is a regenerative therapy that delivers concentrated platelets and growth factors to promote angiogenesis, modulate inflammation, and support tissue repair. While its use is well established in adults, evidence on PRP for neonatal and pediatric wound management remains scarce and heterogeneous. This scoping review aimed to map the existing literature on PRP for cutaneous wound healing in patients aged 0-18 years and to assess the presence of standardized preparation or application protocols.

Methods. The review followed Arksey and O'Malley's methodological framework, enhanced by Levac et al., and was reported according to PRISMA-ScR guidelines. Searches were conducted in PubMed, Scopus, and Google Scholar (January 2014-April 2025), complemented by backward/forward reference screening and gray literature searches. Eligible studies included neonates, children, or adolescents receiving PRP for any cutaneous wound etiology. Data were extracted on study design, population characteristics, wound type, PRP preparation/application, and clinical outcomes.

Results. A total of 1,812 records were identified, with 8 sources meeting inclusion criteria: 4 clinical pediatric wound-care studies, 3 randomized surgical trials, and 1 congress-level protocol. Reported outcomes included rapid healing of neonatal and pediatric surgical dehiscence (mean ~12 days), complete resolution of a chronic neuropathic ulcer within 2 weeks, and >50% ulcer reduction in pediatric chronic graft-versus-host disease. Surgical trials showed reduced fistula formation, postoperative edema, and complications. One transient citrate-related reaction was the only adverse event

recorded. Across studies, substantial heterogeneity in PRP preparation techniques and absence of validated pediatric protocols were observed.

Discussion and conclusions. Findings suggest that PRP is safe and potentially effective for complex wounds and postoperative recovery in neonates and children, especially when conventional treatments are insufficient. However, methodological variability, small sample sizes, and the lack of standardized pediatric protocols limit comparability and clinical implementation. Pediatric-specific challenges – such as limited blood volume, venipuncture difficulty, and risks of iatrogenic anemia – further underline the need for tailored approaches. High-quality, prospective pediatric studies and validated clinical protocols are required to support evidence-based adoption.

Keyword: Platelet-Rich Plasma, PRP, Pediatric Neonatal Wound Healing, Regenerative Medicine, Pediatric Surgical Wound Care

Introduction

Regenerative medicine represents one of the fastest-growing fields in the management of acute and chronic skin injuries. Although advances in advanced dressings and wound-care protocols have significantly improved clinical outcomes, a substantial proportion of wounds – particularly those that are surgically complicated, neuropathic, or associated with systemic comorbidities – continues to exhibit delayed healing or lack of closure, especially in complex surgical wounds and postoperative dehiscence.[1-3]

In this context, platelet-rich plasma (PRP) has emerged as an innovative and biologically supported therapeutic strategy. PRP is a blood component obtained through centrifugation of autologous or heterologous blood, characterized by a high concentration of platelets and bioactive growth factors released following cellular activation.[4-6] Molecules such as platelet-derived growth factor (PDGF), vascular endothelial growth factor (VEGF), transforming growth factor-β (TGF-β), and epidermal growth factor (EGF) play a key role in angiogenesis, cell proliferation, inflammatory modulation, and extracellular matrix deposition, thus promoting tissue repair and modulating inflammatory and proliferative processes.[7-10]

In the adult population, PRP has found wide application – particularly in orthopedics, plastic surgery, and aesthetic medicine – with growing interest in standardizing the preparation and classification of PRP.[11-13] However, pediatric evidence remains limited and fragmented. Recent studies report promising results regarding the use of PRP for the management of complex wounds and postoperative complications in children, showing reduced healing times, improved outcomes, and a favorable safety profile even in neonates.[14-17] In parallel, experiences in pediatric surgical settings indicate a potential role of PRP in preventing postoperative complications.[5,6,17,18]

Despite these preliminary data, no standardized protocol currently exists for the preparation and application of PRP in neonatal and pediatric populations. This gap is related to the limited availability of controlled clinical studies, the biological specificities of pediatric age – including limited blood volumes, different tissue response, and safety considerations – and to the methodological variability in preparation procedures reported in the literature.[11-13]

The aim of this scoping review is to map the scientific evidence regarding the use of PRP for wound treatment in neonatal and pediatric patients, with particular attention to the types of patients and lesions treated, the protocols described, and clinical outcomes, in order to identify knowledge gaps and guide future research toward the development of shared pediatric protocols.

Methods

This scoping review was conducted with the aim of exploring and synthesizing the available literature on the use of platelet-rich plasma (PRP) in the treatment of skin wounds in neonatal and pediatric populations, with particular attention to the existence of standardized protocols for the preparation and clinical application of PRP in this age group. The choice of a scoping review was driven by the need to map an emerging and rapidly evolving field, in which the available evidence remains fragmented and heterogeneous, and an insufficient number of clinical studies exists to support a traditional systematic review.

The review was designed and performed following the methodological framework originally proposed by Arksey and O'Malley (2005)[19] and subsequently enhanced by Levac et al (2010).[20] The reporting of results was guided by the PRISMA-ScR (Preferred Reporting Items for Systematic Reviews and Meta-Analyses extension for Scoping Reviews) recommendations.[21] Literature search and study selection activities were carried out between January and April 2025.

Research question and PCC framework

The research question was structured using the Population-Concept-Context (PCC) framework, which is recommended for scoping reviews, as reported in Table 1.

Table 1. PCC framework for the scoping review.

P	Neonates, children, and adolescents (0-18 years)
C	Use of PRP for promoting tissue healing
C	Hospital, outpatient, and surgical settings

The primary research question was: "What scientific evidence exists regarding the use of PRP for the healing of skin wounds in pediatric patients, and are standardized protocols available for the preparation and administration of PRP in this population?"

Search strategy

The literature search was conducted in PubMed, Scopus and Google Scholar, chosen to ensure broad coverage of clinical studies, case series, and emerging academic contributions. Manual screening of reference lists (snowballing) was performed to identify further relevant records. In addition to database searching, both ancestry (backward reference screening) and descendant (forward citation tracking) strategies were applied. Gray literature sources, including conference proceedings and non-indexed pediatric PRP protocols, were also screened. Articles published between January 2014 and April 2025 in Italian, English, Spanish, and Portuguese were considered.

Boolean research strings included, among others: (Pediatric OR neonatal OR children) AND ("platelet-rich plasma" OR PRP) AND (wound OR ulcer OR skin); ("platelet-rich plasma") AND pediatric AND (protocol OR guideline); ("wound healing" OR "wound dressing") AND PRP AND (child OR infant).

Search terms were adapted as needed to maximize sensitivity and capture non-indexed evidence, including preliminary studies and conference abstracts.

Eligibility criteria

Studies were included if they involved patients aged 0-18 and reported clinical use of PRP to promote healing of cutaneous wounds of any origin (surgical wounds, dehiscence, chronic ulcers, wounds secondary to systemic conditions). Case reports, case series, clinical trials, and systematic reviews were eligible.

Studies were excluded if they were: conducted exclusively on adults, animal or in vitro studies, focused on orthopedic or aesthetic PRP applications only

Classification of studies

Given the increasing application of PRP in pediatric surgical practice – particularly in urological surgery – studies involving pediatric surgical wounds were included and analyzed separately, distinguishing interventions targeting the management of complex wounds from intraoperative PRP applications as adjuncts to tissue repair.

Protocol evidence

To complement peer-reviewed evidence, a non-peer-reviewed yet clinically relevant source was included: the PRP protocol presented by Hugo Sousa as an e-poster at the EWMA 2024 conference and published in the Journal of Wound Management abstracts supplement, representing one of the few existing pediatric-specific procedural algorithms for PRP preparation and application.[22]

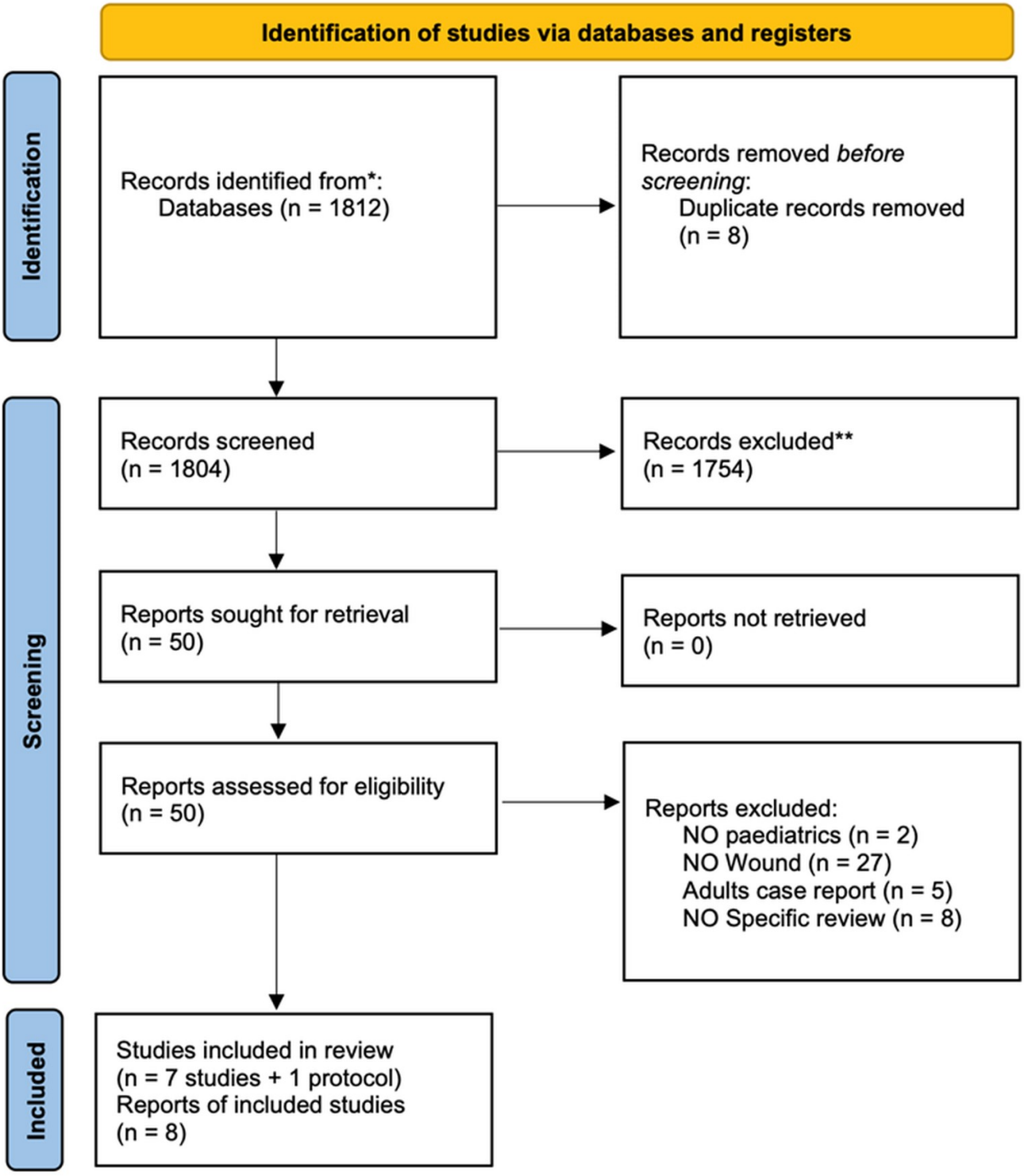

Figure 1. PRISMA flow diagram of study selection. A total of 1.812 records were identified, with 1.804 screened after removing duplicates. Following eligibility assessment, 8 reports (7 studies and 1 protocol) were included in the review on PRP use for wound healing in patients aged 0-18 years.

Data extraction and synthesis

For each study, the following were extracted: author, year, study design, patient characteristics, wound type, PRP preparation/application method (when reported), and clinical outcomes. Due to the heterogeneity of methodologies, a narrative synthesis was performed, summarized in the PRISMA flow diagram (Figure 1).

Table 2. Characteristics of the included evidence on PRP in neonates, children, and adolescents with acute or chronic wounds, including clinical outcomes and reported application protocols.

Authors, year	Study Design	Population / Setting	Condition	Key Findings	Protocol Reported
Nicolosi B. et al. (2024)	Case series	7 neonates/ children	Surgical wound dehiscence	Complete healing in ~12 days; 1 citrate reaction	Clinical use; no standardized pediatric protocol
Joshi A.D. et al. (2020)	Case report	1 child (11 years)	Chronic neuropathic ulcer	Epithelialization after 3 applications; complete healing in 2 weeks	Weekly PRP; no formal protocol
Mohseni R. et al. (2024)	Randomized Controlled Trial	Pediatric cGVHD patients	Refractory cutaneous ulcers	>50% ulcer reduction in 87.5% vs 6.25% control; no adverse reactions	Umbilical cord PRP protocol; not generalizable
Di Mitri M. et al. (2024)	Systematic review	Pediatric surgical population	Pediatric surgical wounds (e.g., hypospadias)	Reduced postoperative infections and fistulae; promising results	No standardized pediatric protocol identified
RCT Hypospadias Trial A – Full author list not reported (2025)	Randomized Controlled Trial	Children undergoing hypospadias repair	Hypospadias surgical wound	Reduced fistula and complications; improved healing	Intraoperative PRP; not a wound-care protocol
RCT Hypospadias Trial B (African J Urology) – full author list not reported. (2025)	Randomized Controlled Trial	Children undergoing hypospadias repair	Hypospadias surgical wound	Significant fistula reduction vs controls	Intraoperative protocol only
RCT Circumcision Trial (J Clin Med) – full author list not reported (2025)	Randomized Controlled Trial	Children undergoing circumcision	Post-circumcision wound	Reduced edema/ bleeding; faster healing	Intraoperative PRP application
Sousa H.M. and Gonçalves V. (2024)	Conference protocol (EWMA poster)	Pediatric complex wound care	Pediatric complex wounds	Detailed pediatric PRP/PRF procedural algorithm presented	Yes – pediatric PRP protocol (experimental)

Results

The initial search identified 1.812 records. After removal of duplicates and preliminary screening, 50 articles were assessed in full text. In total, 8 sources met the inclusion criteria: 4 studies on PRP in pediatric wound care, 3 randomized trials evaluating PRP in pediatric surgical wounds, and 1 congress protocol (Table 2).

The included studies indicate that PRP may represent a valuable therapeutic option for complex pediatric wounds.

Evidences in Neonates

Nicolosi B. *et al.* (2024) reported complete healing of surgical dehiscence in seven neonates and children within a mean of 12 days, demonstrating rapid clinical benefit and treatment safety, with only one transient adverse reaction related to the anticoagulant.[4,14]

Joshi A.D. *et al.* (2020) documented the case of a child with a chronic neuropathic ulcer refractory to conventional treatments, achieving complete epithelialization within two weeks following weekly PRP applications.[14,15]

Mohseni R. *et al.* (2024), in randomized clinical trial, observed significant improvements in the healing of ulcerative lesions associated with cutaneous graft-versus-host disease (cGVHD), with >50% reduction in ulcer area in the majority of patients treated with cord-blood platelet gel.[8,10,16]

Di Mitri M. *et al.* (2024), through a systematic review, confirmed that PRP is associated with lower postoperative complication rates in pediatric surgery, although standardization of preparation and application techniques is still lacking.[12,13,17]

Collectively, these studies suggest good tolerability, absence of major adverse events, and encouraging clinical outcomes in the management of complex pediatric wounds.[5,18]

Evidence in Children and Adolescents

Three randomized controlled trials in pediatric urological surgery (hypospadias repair and circumcision) consistently reported reduced postoperative fistula formation, edema, and bleeding, and accelerated wound healing.[1,3]

The randomized trials identified, conducted predominantly in pediatric urological surgery (hypospadias repair and circumcision), showed reduced fistula formation, decreased postoperative edema and bleeding, and improved surgical healing times. However, these studies describe intraoperative procedures rather than structured protocols for complex wound management or postoperative follow-up. Therefore, although confirming the biological effectiveness of PRP in pediatric tissues, they do not provide practical recommendations generalizable to pediatric wound care.[2,23]

The protocol presented by Sousa & Gonçalves (2024) represents a valuable source, as it outlines an operational algorithm for the preparation, centrifugation, and application of PRP and PRF, which can potentially be adapted to clinical context and pediatric physiological constraints. Although not yet validated through controlled clinical studies, it constitutes the first structured protocol proposed in this field.[11-13,22]

Overall, available evidence suggests that PRP is a promising and safe treatment in pediatrics, promoting faster healing of complex wounds and demonstrating good tolerability even in neonates. However, no shared and standardized protocol currently exists for this population. The Sousa protocol represents a pioneering contribution but requires scientific validation and multidisciplinary consensus.[4-6,12,13]

In addition to clinical outcomes, mechanistic studies indicate that PRP supports wound healing by modulating inflammation, enhancing fibroblast recruitment, stimulating angiogenesis, and promoting extracellular matrix remodeling.[4,7,8,10]

Discussions

This scoping review highlighted a growing interest in the use of PRP for the treatment of neonatal and pediatric wounds, despite the limited number of structured clinical studies and the marked methodological heterogeneity. The findings suggest a relevant potential for this therapy in clinical scenarios where conventional treatments prove insufficient, while simultaneously emphasizing the need for specific protocols and further scientific evidence. This observation is consistent with the broader literature on the role of platelets and growth factors in activating the regenerative cascade and the wound-healing process.

Clinical Evidence and Therapeutic Potential

The included studies reported encouraging results regarding the efficacy and safety of PRP in the management of complex pediatric wounds. In particular, Nicolosi *et al.* described complete healing within a mean of 12 days in seven neonatal and pediatric patients with surgical dehiscence, with no adverse events reported.[14] The only adverse event attributable to PRP use in pediatrics is documented in a case report, described as a transient event related to the citrate anticoagulant.[24] Similarly, Joshi [et al]. reported rapid resolution of a neuropathic ulcer refractory to conventional treatments in an 11-year-old child.[15] These findings support the evidence that platelet-derived products can accelerate cellular proliferation, angiogenesis, and tissue remodeling, as previously demonstrated in preclinical and clinical studies in non-pediatric populations.

The randomized clinical trial by Mohseni et al. further demonstrated significant benefit from cord-blood–derived platelet gel in ulcerative lesions associated with cGVHD, with more than 50% reduction in ulcer area in 87.5% of treated patients.[16] These results confirm the biological role of PRP in activating regenerative processes, even in complex clinical conditions.[4-6,11] The role of platelet-derived growth factors and inflammatory modulation is well documented.[7-9]

PRP has also been successfully used in pediatric surgical contexts, particularly in hypospadias repair and other urological procedures. Although these studies reported reduced fistula formation, edema, and infectious complications, they primarily describe intraoperative applications and cannot be directly translated into protocols

for postoperative wound care or advanced dressings.[25-27] This limits the generalizability of those results to the management of chronic or complex wounds.[2,18]

The use of PRP in surgery aligns with consolidated evidence supporting the intraoperative use of biological materials and sealants.[1,25,28] However, such applications have limited impact on the nursing-driven postoperative wound-care pathway, as described in studies on surgical wounds healing by secondary intention.[3,23,29]

Methodological Variability and Lack of Standardized Protocols

A clear finding was the absence of standardized protocols for the preparation and application of PRP in pediatric patients. Several studies highlight that variables such as centrifugation settings, platelet concentration, potential activation, and the purity of the preparation influence clinical outcomes.[5,11,12] Such methodological variability limits reproducibility and makes it difficult to compare existing studies, as already noted in adult and regenerative-medicine contexts.[5,6]

This heterogeneity is also reflected in consensus documents aimed at standardizing PRP.[13] Specific pediatric methodological guidelines are still lacking, as also noted in recent clinical reviews.[6]

The only operational reference identified was the protocol presented by Sousa and Gonçalves at the EWMA 2024 congress, proposing a preliminary algorithm for adults.[22] However, this constitutes congress-level evidence not yet clinically validated.[1,18]

Pediatric Specificities: Practical and Safety Considerations

The management of PRP in pediatric patients poses specific challenges, particularly in neonates, where the available blood volume is limited.30,31. Multiple blood draws may alter homeostasis and lead to hemodynamic instability, especially in patients weighing <2,500 g, where guidelines recommend limiting blood sampling volumes to less than 1-2% of total blood volume.32,33 This supports the growing interest in alternatives such as heterologous PRP or cord-blood platelet gel, which has demonstrated safety in the included pediatric RCT.16

Vascular fragility and reduced circulating blood volume in neonates are also critical factors in the pathophysiology of tissue repair.8,34

Further challenges relate to the difficulty of venipuncture in neonates and the need for atraumatic techniques to minimize pain and stress, in accordance with pediatric and neonatal nursing recommendations.[32,35,36]

Nursing implications

The introduction of PRP in pediatric care opens new perspectives for advanced nursing practice. Nurses play a crucial role in blood collection, PRP preparation, clinical application, and monitoring for adverse reactions, as well as caregiver education.[5,37]

The development of a structured and validated protocol would promote standardized management, reduce clinical variability, and ensure an evidence-based approach, while also supporting the advancement of specialized nursing competencies.[11-13,37]

This direction is consistent with the expanding nursing role in advanced wound-bed management and regenerative therapies.[1,38,39]

Prospective, multicenter studies with larger cohorts are needed, reporting standardized technical parameters and clinical outcome indicators.[4,6]

The definition of pediatric-specific guidelines, particularly for neonates and hematologically fragile patients, is a priority to ensure the safe and appropriate adoption of PRP in pediatric wound management.

Limitations

This scoping review is limited by the small number of available studies, heterogeneity of PRP preparation techniques, and the predominance of small case series and surgical trials. The inclusion of one non-peer reviewed protocol further reflects the scarcity of standardized pediatric data. The absence of multicenter prospective studies restricts generalizability and prevents robust comparison across different PRP methodologies.

Conclusions

This scoping review highlights the emerging therapeutic potential of PRP in the management of pediatric and neonatal wounds. Although the current evidence base remains limited and largely heterogeneous, preliminary findings suggest that PRP may promote accelerated wound healing, reduce postoperative complications, and demonstrate an acceptable safety profile even in vulnerable populations such as neonates.

At present, the absence of standardized pediatric preparation and administration

protocols represents a major barrier to widespread clinical adoption. Variability in centrifugation techniques, platelet concentration, activation procedures, and clinical application methods limits comparability across studies and hinders the development of evidence-based clinical pathways. Moreover, unique pediatric physiological characteristics – including restricted blood volumes, vascular fragility, and distinct wound-healing mechanisms – require tailored approaches and careful safety considerations.

Future research should prioritize well-designed, prospective, multicenter trials with defined clinical endpoints and harmonized methodological criteria. The development of pediatric-specific consensus guidelines and standardized protocols is essential to ensure safe, effective, and ethically appropriate implementation of PRP in clinical practice. Collaboration between clinicians, researchers, and nursing professionals is critical to advancing knowledge, refining indications, and optimizing care pathways.

In conclusion, while PRP represents a promising regenerative tool for pediatric wound care, robust clinical validation and standardized frameworks are needed to translate its biological potential into consistent, high-quality clinical outcomes for children and neonates.

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