Paediatric wound healing: a global culture of prevention, innovation and humanised care: 2026 ISPeW manifesto

A call for global recognition from the International Society for Neonatal and Paediatric Wound Healing (ISPeW): Our purpose is to drive a global transformation in the prevention, assessment, treatment, education and research of neonatal and paediatric wounds. Through this document, ISPeW calls for the formal recognition of paediatric wound healing as a unique and vital discipline, deserving dedicated attention in clinical practice, scientific research and healthcare policy.

Paediatric wound healing has historically remained at the margins of mainstream wound care research and clinical organisation, frequently overshadowed by adult and geriatric models of care. Yet, children represent one of the most fragile and biologically complex populations in medicine, requiring highly specialised approaches that integrate tissue repair, developmental physiology, emotional protection, family-centred care and long-term functional outcomes.[1] In this context, awareness becomes not merely an educational concept, but a strategic, ethical and organisational imperative capable of transforming the future of paediatric healthcare worldwide. In 2026, in particular, the two extremes of life seem to converge. It becomes essential to develop a full awareness of two profoundly different forms of fragility, united by the same human vulnerability: micropreemies (extremely preterm infants) on one side and severely ill older people on the other. These two patient groups will pose the greatest challenge in the future. This challenge will require not only increasingly advanced technological evolution, but also a renewed human capacity for care and responsibility. Paediatrics and geriatrics should not be seen as separate domains, but as mirror images of human biological vulnerability at the beginning and end of life, with overlapping clinical challenges and potential shared strategies of care.[2] We, the healthcare professionals, should keep in mind the fundamental bioethical questions and concerns that are deeply rooted in human existence and provide significance to life itself and its safeguarding.[3]

Children are not small adults

The concept of awareness in paediatric wound healing must first address a persistent cultural misconception: the erroneous assumption that children are simply 'small adults'. This reductionist view has contributed over time to the adaptation of adult wound care protocols to paediatric patients without sufficient consideration of the profound anatomical, immunological, metabolic and psychosocial differences that characterise the neonatal age, infancy, childhood and adolescence.[4] Paediatric skin possesses distinct structural properties, including reduced thickness, incomplete epidermal maturation in neonates, altered dermal composition, increased permeability and a limited tolerance to pressure, friction, moisture and adhesive trauma. Beyond acting as a physical barrier, neonatal skin represents a dynamic immunological interface in which the skin microbiome plays a pivotal role in host defence and immune maturation, critical determinants of neonatal survival.[5] All these factors dramatically influence susceptibility to tissue injury, inflammatory response, pain perception, exudate management and healing trajectories. The survival of premature babies and neonates depends on specialised skin care and on an understanding of environmental toxicities absorbed through the skin; yet, equipment designed to support such skin is lacking.

The Global Burden of Diseases, Injuries, and Risk Factors Study 2021,[6] which offers detailed estimates of exposure, relative risk, and disease burden attributable to 88 risk

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factors, identifies low birthweight, short gestation and child growth failure as persistent leading global risk factors, ranking among the top ten. Importantly, low birthweight and short gestation continued to be the fourth most significant Level 3 contributor to disability-adjusted life years (DALYs) across all ages, despite notable advancements in maternal and child nutrition and health. Throughout the study period, the age-standardised DALYs rate linked to child growth failure decreased by >70%, indicating substantial progress while emphasising the ongoing impact of early-life biological vulnerability on the global disease burden.[6] Preterm infants and neonates who require immediate cardiorespiratory support and multiple life-sustaining medical devices are even more susceptible. Although these devices are critical for maintaining physiological stability, the interfaces between devices and tissue can cause continuous mechanical stress, pressure, shear and friction, thereby increasing the risk of medical device-related pressure injuries (PIs). This risk is further heightened by poor mask or nasal-prong fit and sizing, misalignment of the interface, and extended exposure to non-invasive ventilation.[7]

Fig 1. Severe medical device-related pressure injuries may cause permanent, disfiguring damage to delicate facial structures, particularly hyaline cartilage, with long-term functional and psychological consequences. This image shows a prolonged pressure from nasotracheal cannulae has destroyed the nasal septum, creating the appearance of a single confluent nasal cavity rather than two distinct passages. Such structural deformities may alter facial symmetry, expression, and the anatomy of the nose, columella, philtrum, and lips, potentially affecting self-esteem and quality of life throughout childhood and adolescence

Knowledge as the first step towards prevention

Awareness begins with knowledge. Healthcare professionals involved in paediatric care must develop the ability to recognise subtle and often underestimated manifestations of tissue damage before they evolve into severe complications. This is particularly relevant in intensive care units, neonatal settings, paediatric oncology departments, surgical wards, operating theatres, rehabilitation centres and home care environments, where small fragile patients are exposed to prolonged immobilisation, invasive devices, complex therapies and repeated procedural trauma. However, the culture of prevention begins in the laboratory and develops through an increasingly deeper understanding of the mechanisms that govern healing at the tissue, cellular, molecular and submolecular levels in paediatric patients. This mechanistic understanding is fostering the growth of a paediatric skin care and healing approach that requires clinicians to work as a team with professionals who were not previously involved in wound care, such as bioengineers, materials scientists and device designers.[8]

The hidden burden of paediatric wounds

Despite increasing recognition of skin integrity as a fundamental component of paediatric patient safety, tissue injuries remain a significant and often under-recognised challenge across neonatal and paediatric healthcare settings. PIs, medical device-related PIs (MDRPIs), surgical wounds, burns, traumatic wounds and congenital skin disorders contribute substantially to morbidity, pain, prolonged hospital stays and healthcare costs worldwide.[9] The true scale of this burden, however, remains inadequately understood. In many regions, limited surveillance systems, inconsistent reporting practices and the absence of comprehensive registries continue to hinder accurate assessment of the incidence, impact and long-term consequences of paediatric wounds.[10]

MDRPIs: the preventable epidemic

Immobility and MDRPIs represent two of the most overlooked difficulties in modern paediatric wound management.The increasing technological complexity of paediatric medicine has paradoxically generated new forms of tissue damage associated with life-saving devices (Fig 1).[11] Continuous positive airway pressure (CPAP) masks, oxygen delivery systems, tracheostomy flanges, cervical collars, pulse oximeters, vascular access devices, casts, braces, neurophysiological monitoring cables and immobilisation systems may create prolonged pressure, microclimate alterations, friction

Table 1. Neonatal skin is characterised by a less dense and less mature collagen network, with a relatively higher proportion of type III collagen and a lower relative proportion of type I collagen compared with adult skin

Type of collagen fibre	Characterisation
Type I	Relatively less abundant compared to adult skin
Type II	Not a predominant structural component of neonatal skin and should not simply be described as 'reduced'. In neonates, dermal collagen bundles are less dense and less organised than those in adult skin
Type III	Relatively more abundant
Type IV	Non-fibrillar and organizes in sheet-like network that serves as the primary architectural framework of the basement membrane zone. Localized at the dermoepidermal junction type IV collagen stabilizes the bond between the outer epidermis and the underlying dermis.
Type V	Relatively more abundant in fetal skin
Types VI, VII, XII, and XIV collagen are also present. Among these, type VII collagen is particularly important, as it forms the anchoring fibrils of the dermoepidermal junction[62,63]	

and shear forces capable of inducing ischaemic tissue injury within a few hours of application, particularly in neonates and critically ill children.[12,13] We, The Allied Health Professional Clinicians (AHPCs), now recognise the importance of scale and proportion. A full-term infant has a dermo-epidermal complex of only 2mm thickness,[14] reflecting an immaturity characterised by a reduced capillary network and diminished oxygen supply, as well as lower levels of ceramides and fewer layers of stratum corneum. At the same time, there is also a difference in various collagen fibres and in the tissue anchoring mechanisms, making these patients far more susceptible to shear-related injuries (Table 1).[15,16] Consequently, the key principle in the care of these patients is the protection of the skin and the careful management of any direct contact with medical devices, in order to avoid exposing delicate and vital tissues such as facial (ear and nose) hyaline cartilages and causing permanent alterations to physiognomy.[17] Elimination of MDRPIs requires a culture change from a reactive one, in which the injury is repaired, to a preventive culture that emphasises understanding of pathophysiology, barrier use and frequent 'hands-on' care, which is especially challenging given ever-increasing paediatric nurse-to-patient ratios.[18,19]

Biomechanics, engineering and human-centred innovation

Awareness should also stimulate innovation. Paediatric patients continue to rely on medical devices that are frequently adapted from adult technologies rather than specifically designed for neonatal and paediatric anatomy. A biomechanical perspective further explains why neonatal and paediatric patients are particularly vulnerable to tissue injury, especially MDRPIs. Computational modelling studies[20–24] have shown that tissue damage results not only from external pressure but also from internal tissue deformations and stress concentrations generated when fragile paediatric tissues interact with medical devices. In neonates and infants, immature skin, softer subcutaneous tissues and unique anatomical features, such as a prominent occiput, magnify these forces, allowing even small devices—including electrodes, wires and tubing—to cause localised tissue distortion and injury. Biomechanical research also demonstrates that optimised device design and material selection can significantly reduce these harmful deformations and stresses. Future prevention strategies should therefore integrate bioengineering approaches, including computational modelling and paediatric patient simulators ('robotic patients'), to support human-centred device development. The goal is to identify hidden biomechanical risks before injury occurs and create technologies specifically designed for the anatomical, physiological and biomechanical characteristics of children, rather than adapting scaled-down adult solutions. Future progress will require stronger collaboration between clinicians, engineers, manufacturers and regulatory agencies to develop devices that prioritise both therapeutic effectiveness and skin safety from the earliest stages of design.

Beyond mattresses: support surfaces, adhesives and tissue protection

In many surgical settings, additional non-visible risks emerge from prolonged contact between the patient and support surfaces or operative equipment. Contact points between the skin and operating table surfaces, positioning systems, fixation devices and neurophysiological monitoring cables often remain non-inspectable during complex procedures. The interposition of protective interfaces and advanced pressure redistribution systems therefore becomes essential not only for prevention but also for maintaining tissue integrity in vulnerable anatomical regions exposed to sustained mechanical stress. This is

Fig 2. Pressure injuries affecting the occiput are among the most common pressure-related injuries in neonatal intensive care units (NICUs), reflecting the prolonged supine positioning and the vulnerability of the immature neonatal skin. One of the more recent approaches to prevention and early management is the Double Protection Strategy, which combines pressure redistribution with protection of the skin barrier. This approach typically involves placing a soft, pressure-redistributing interface, such as a silicone-based pad **(a)**, beneath the occiput, together with a protective dressing or thin silicone multilayer foam between the skin and the supporting surface **(b)**. The aim is to reduce localised pressure and shear, minimise friction and moisture-related damage, and protect the fragile skin from direct contact with the mattress or other surfaces. The strategy is particularly relevant in extremely preterm infants, in whom the combination of immature skin, limited subcutaneous tissue and prolonged positioning significantly increases susceptibility to occipital injury. Its effectiveness relies on materials, correct positioning, regular skin inspection and appropriate repositioning

why the concept of support surfaces in the prevention of paediatric skin injuries has been expanded well beyond the traditional idea of an adult anti-decubitus mattress and involves the adoption of strategies that often combine multilayer foam systems in contact with body surfaces and fluidised positioning devices using polymer microsphere and low-viscosity oil technologies (Fig 2a,b).[25] Nothing is therefore derived from adult support devices, since the different cutaneous anatomo-pathophysiology across the various and heterogeneous paediatric age groups require different devices and technologies, as well as different strategies, particularly in critical settings such as the operating room, intensive care units and high-dependency/sub-intensive care units.[26] It also requires a specific culture and approach among both surgical and anaesthesia teams, which completely avoids the use of cushions and doughnut-shaped devices, as well as the plastic, rubber or polyurethane rolls and similar tools traditionally used for adults and adolescents in the past.[27] Furthermore, fluidised positioning devices can be moulded around the patient and allow every wire, catheter and infusion line to be routed externally, where they remain immediately visible.[28]

Modern paediatric support surfaces are not based on adult PI risk factors and include integrated systems designed to redistribute pressure, reduce tissue deformation, control temperature and humidity at the skin interface, and minimise frictional forces. Their application may involve direct or indirect contact with intact skin, fragile periwound tissue, surgical sutures, donor sites, wound beds, grafted areas and sites managed with advanced therapies, such as negative pressure wound therapy, and may not address PI risk factors for this vulnerable population.[29] In a nutshell, the most recent innovations in paediatric PI prevention represent a driving force and, increasingly, a model for older age groups, particularly severely frail older patients. The lessons learned from paediatric care are therefore being translated to patients at the other end of the lifespan, as well as to patients who become frail prematurely and develop skin injuries at an early stage, such as paediatric and adult patients with haematological malignancies and paediatric and adult patients receiving palliative care.[30,31] In addition, insufficient knowledge of paediatric skin vulnerability may increase the risk of MDRPIs, device failure and treatment complications in children with cancer. The integration of advanced pressure-monitoring, smart-sensing and tissue-protection technologies, combined with individualised positioning and device-management strategies, is therefore essential to detect early tissue stress, preserve skin integrity and ensure safe, effective and uninterrupted care.[32]

The selection of these technologies must account not only for biomechanical performance but also for skin maturity, age-related anatomical variability, procedural duration and the emotional tolerability of the device for the child. In addition, adhesive-related skin injuries in the most fragile patients are a substantial problem resulting from underinvestment in gentler materials.[23]

Thermoregulation and skin integrity: protecting the fragile newborn

Another major but preventable cause of neonatal skin morbidity, and even mortality, is perioperative hypothermia. Prevention should focus on maintaining a neutral thermal environment throughout this crucial period.[33] Key measures include maintaining appropriate operating theatre temperature, continuous temperature monitoring, use of preheated incubators and warming devices, minimising heat loss and warming intravenous fluids and blood products. Standardised, evidence-based protocols, multidisciplinary teamwork and continuous quality improvement are essential to reduce hypothermia and improve surgical outcomes in neonates. Hypothermia can cause significant skin damage in newborns, particularly in preterm and low-birthweight infants whose skin is immature and highly vulnerable. Peripheral vasoconstriction, impaired skin barrier function, and pressure-related and cold injuries should all be considered equally as mechanisms of skin damage.[34]

Pain, compassion and family-centred care

Awareness in paediatric wound healing also requires a deeper understanding of pain and the parent's role and involvement. Pain in children is frequently underestimated, inadequately assessed or poorly communicated because of age limitations, fear, developmental stage or cognitive conditions. Every dressing change, adhesive removal, cleansing procedure or repositioning manoeuvre may become a traumatic experience capable of influencing psychological development and future healthcare interactions. Consequently, atraumatic care is not a secondary aspect of wound management but a central therapeutic principle. The selection of atraumatic dressings, silicone interfaces, gentle fixation systems, silicone-adhesive releasers and pain-reducing procedural strategies represents an ethical obligation before being a technical choice.[35,36] Repeated painful procedures, prolonged hospitalisation, visible scars and social limitations may influence self-esteem, body image, trust in healthcare professionals and future healthcare experiences. This applies not only to children, because we are treating, caring for and managing entire families. In this view, parents often experience profound distress when wounds or visible skin injuries arise in their newborn, particularly in extremely premature infants whose course becomes far more complex than anticipated.[37] Many families enter the neonatal period expecting a brief hospitalisation and a healthy baby to bring home, only to instead face prolonged intensive care, complications of prematurity and tissue injuries associated with necessary interventions.[38] In this setting, compassionate communication and family-centred support become just as important as the technical aspects of wound management itself. Paediatric wound care must therefore embrace a trauma-informed approach capable of protecting both physical and psychological wellbeing.[39] In the true spirit of education, parent-delivered pain management is increasingly integrated into the neonatal intensive care unit practice worldwide, with 65.1% of units reporting routine implementation, although only 40% include it formally in their clinical guidelines.[40,41] This discrepancy underscores the need for standardised, evidence-based international frameworks and highlights caregivers as integral components of the neonatal pain management system, extending across inpatient care and the post-discharge continuum. From a neurodevelopmental perspective, caregiver-mediated interventions modulate stress-mediated nociceptive processing via attenuation of hypothalamic–pituitary–adrenal axis activation and sympathetic overdrive, thereby contributing to improved autonomic stability, reduced behavioural pain expression and enhanced parent–infant dyadic regulation. Positioning caregivers as active agents in procedural and non-procedural analgesic strategies—both in hospital and in the community—supports a continuum of care model aligned with developmental neuroprotection.[42]

Caring for children with congenital skin disorders

Special consideration should be given to neonates and infants with congenital skin disorders such as epidermolysis bullosa and ichthyosis, who represent particularly vulnerable population because of severe impairment of epidermal barrier function, increased transepidermal water loss, altered thermoregulation, susceptibility to infection, electrolyte imbalance and impaired wound healing. These patients require highly specialised perioperative and intensive care management aimed at minimising cutaneous trauma while maintaining physiological homeostasis. Management should focus on strict preservation of skin integrity through atraumatic handling protocols, elimination of adhesive-based fixation systems and use of advanced silicone-coated contact layers, soft silicone dressings, polymeric membrane dressings, lipidocolloid interfaces and pressure redistribution surfaces. Continuous assessment of skin perfusion and tissue viability is essential, particularly in areas exposed to pressure, monitoring devices, vascular access and surgical positioning. Thermoregulatory management is critical because extensive skin barrier dysfunction significantly increases evaporative heat loss. Servo-controlled incubators, radiant warmers with skin-feedback control, heated and humidified respiratory circuits, conductive warming mattresses and microenvironmental humidity control should be used to maintain thermal neutrality. Continuous core and peripheral temperature monitoring using calibrated skin probes and oesophageal or rectal temperature sensors during anaesthesia is recommended to prevent perioperative hypothermia and its associated metabolic consequences, including increased oxygen consumption, metabolic acidosis and impaired tissue perfusion.[43] Perioperative care should incorporate active warming strategies, including pre-warmed transport incubators, warmed intravenous fluids and blood products, humidified anaesthetic gases and maintenance of operating theatre temperatures adapted to neonatal requirements. Advanced patient monitoring systems integrated with closed-loop thermal regulation technologies may further improve temperature stability in patients at high risk. Infection prevention is equally important, given the compromised cutaneous barrier and high risk of bacterial colonisation and sepsis. Comprehensive care should therefore integrate meticulous wound management, microbiological surveillance, nutritional optimisation and multidisciplinary coordination among neonatology, paediatric surgery, dermatology, anaesthesiology, wound care specialists and specialised nursing teams. The adoption of standardised clinical pathways supported by modern skin-protection and thermoregulation technologies has demonstrated the potential to reduce morbidity, prevent avoidable skin injury, decrease infection-related complications, improve wound healing, shorten hospitalisation and ultimately improve survival and long-term outcomes in these highly complex premature and neonatal patients.[44,45]

Equity, policy and global access to care

Beyond the clinical dimension, awareness must extend to organisational systems and healthcare policies. Paediatric wound care still lacks standardised pathways in many hospitals around the world. Dedicated paediatric wound teams remain uncommon, educational opportunities are limited and evidence-based paediatric guidelines are frequently extrapolated from adult literature. This gap becomes even more evident in low- and middle-income countries (L-MICs),[10] where the burden of trauma, burns, surgical complications, infectious diseases, malnutrition and delayed access to healthcare significantly increases the incidence of complex paediatric wounds. In these L-MICs as well as in active armed conflicts,[46] paediatric wound management often occurs in environments characterised by limited resources, inadequate infrastructure, shortages of advanced dressings, restricted access to trained personnel and insufficient prevention programmes.[47] Here, awareness acquires an additional social and global health dimension. Preventing avoidable paediatric wounds may reduce disability, long-term morbidity, hospitalisation costs, school absenteeism, social stigma and mortality. Education of families, community healthcare workers and local caregivers becomes as important as the introduction of advanced technologies.[48,49] The development of dedicated paediatric skin integrity and wound care teams should be considered a strategic priority for modern healthcare systems. These teams can facilitate prevention programmes, staff education, clinical consultation, research initiatives, quality improvement projects and continuity of care across hospital and community settings.

Artificial intelligence: democratising expertise and improving outcomes

Within this scenario, artificial intelligence (AI) may represent one of the most revolutionary opportunities for the future of paediatric wound healing. AI-assisted medicine has the potential to democratise access to specialised wound care knowledge, particularly in underserved regions where expert clinicians are scarce. Through machine learning systems, image analysis algorithms, predictive analytics and telemedicine platforms, AI may support clinicians in early wound recognition, tissue classification, risk stratification, infection prediction and monitoring of healing progression.[50] The integration of AI into paediatric wound care could also facilitate real-time decision support systems capable of guiding dressing selection, identifying early signs of deterioration, predicting PI development and optimising individualised treatment pathways. In remote or low-resource environments, smartphone-based AI technologies may allow healthcare workers with limited training to obtain expert-supported wound assessments and recommendations, significantly improving diagnostic accuracy and therapeutic timeliness. Equally important is the role of AI in education and awareness dissemination. Digital platforms may accelerate global knowledge sharing, facilitate virtual training programmes, standardise paediatric wound documentation and support international collaborations between clinicians, researchers and academic institutions.[51] Artificial intelligence should be embraced as a powerful enabler of clinical excellence, augmenting professional expertise while ensuring that clinicians, patients and families remain at the heart of all care decisions. This technological evolution may become particularly valuable in Asia, Africa and South America, where demographic expansion, healthcare inequalities and rapid technological adoption coexist.

A global perspective for research, education and scientific leadership: learning from Asia, South America and emerging healthcare systems

The Asian and South American perspectives deserve particular attention. Countries such as India, Brazil, China, Chile, South Korea, Costa Rica, Vietnam and Japan represent not only a substantial proportion of the global paediatric population but also increasingly influential healthcare markets with evolving approaches towards wound care technologies. Cultural attitudes regarding biomaterials, metals, infection control, sustainability and atraumatic care may significantly influence future therapeutic strategies. In several contexts, there is growing interest in non-metallic antimicrobial approaches and technologies capable of minimising cytotoxicity while preserving tissue regeneration, especially in paediatric populations. Scientific awareness must therefore evolve alongside industrial innovation and global collaboration. Research in paediatric wound healing can no longer remain a niche discipline. The future demands multicentre paediatric studies, stronger methodological rigour, dedicated registries, paediatric-specific endpoints and technologies designed specifically for children rather than adapted from adult practice. Publications, masterclasses, international conferences and interdisciplinary educational initiatives all play a decisive role in building this new scientific culture. Ultimately, awareness in paediatric wound healing means recognising that every wound in a child extends beyond the skin itself. It affects growth, emotional security, family stability, body image, education, social inclusion and future quality of life. Every prevention strategy, every atraumatic dressing, every technological innovation and every educational intervention carries profound human implications. Every injury leaves a scar—not solely a physical one, but also a lasting imprint on the psychological state of children and adolescents, resembling a disfiguring mark. Addressing these significant wounds is equally vital to prevent children from experiencing dysfunction later in life.[52–55]

Shaping futures, not simply healing wounds

The future of paediatric wound healing will depend not only on new products or advanced therapies, but on our collective ability to create a culture of awareness capable of integrating science, empathy, technology, prevention and global equity. In this continuum of care, all children with complex and severe skin conditions are involved, including those with unavoidable wounds and congenital, autoimmune, chromosomal and oncological disorders, as well as patients receiving palliative wound care.[56] These are children who require compassionate and highly attentive care, delivered through a holistic approach that addresses not only the clinical aspects of wound management, but also their emotional and psychological world, while supporting age-appropriate activities such as play, as an integral part of care.[57]Neonatal wound healing may influence not only immediate tissue repair, but also long-term developmental, emotional and quality-of-life outcomes. The idea that we are shaping futures and not simply treating wounds is consistent with the broader philosophy of this manifesto. Only through this broader vision will paediatric wound care truly evolve into a discipline able to protect not only tissue integrity, but the dignity and future of every child.[58–61]

The ISPeW commitments for 2026–2030 are to:

- Promote global awareness of paediatric wound healing
- Advance prevention of paediatric PIs and MDRPIs
- Foster innovation through bioengineering and AI
- Support family-centred and compassionate care
- Improve pain prevention and atraumatic practice
- Develop paediatric-specific research and registries
- Promote education and international training
- Advocate for vulnerable populations worldwide
- Build partnerships with industry and policymakers
- Protect the dignity, development and future of every child. JWC

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