



# Neonatal and Pediatric Pressure Injuries Secondary to Limb Splinting for Intravascular Access: Case Series and Literature Review

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## Abstract

**Aim:** This review aims to present a case series on pressure injury (PI) formation secondary to limb-splinting for preservation of peripheral intravascular catheter (PIVC) access in neonatal and pediatric patients. A literature review was undertaken to analyze the existing knowledge base on this phenomenon.

**Background:** Medical devices and attachments are considered a risk factor for PI development in neonates, infants, and children. Three cases of PI formation caused by contact with limb boards used to preserve PIVC access were identified in an Australian tertiary pediatric facility during 2016.

**Methods:** A literature search was conducted during December 2017 using the Cumulative Index of Nursing and Allied Health, Excerpta Medica database, MEDLINE, PubMed, and the Cochrane Library. Keywords used were pressure injury(ies), pressure ulcer, pressure ulcers, decubitus ulcer, and decubitus ulcers. Articles were excluded if published before 2006, patients were adolescents or adults, and if injuries were not caused by PIVC-associated limb-splinting. Patients included in the case series were identified through screening of admissions in one ward of a tertiary paediatric hospital.

**Results:** Five low-quality studies were included in the literature review. Three children were included in the case series. Each child acquired a PI subsequent to limb-splinting and taping adjacent to a PIVC. Hydration, nutritional state, and oxygenation did not appear to contribute to PI development in these cases.

**Conclusions:** There is a gap in the evidence base pertaining to PIVC splinting and its involvement with PI formation in neonates, infants, and children. The existing literature provides low-quality evidence this problem exists; thus, further research is recommended.

**Keywords:** intravenous catheter, limb-splinting, neonate, pressure injury, pediatric

## Introduction

Medical devices have been strongly implicated in pressure injury (PI) development. Devices commonly associated with PI development include continuous positive airway pressure devices, oxygen saturation probes, nasal

prongs, and intravascular catheters.<sup>1</sup> International prevalence rates of PIs in neonatal and paediatric settings range from 0.5% to 43.3%.<sup>2-4</sup> When considering the involvement of intravascular catheter attachments in PI formation, current evidence largely implicates hubs and tubing.<sup>5</sup> The pressure these projecting elements of the cannula apply onto the skin is substantial, particularly when they are firmly secured with adhesive tape.<sup>6</sup> It is considered best practice to splint limbs to preserve peripheral intravascular (PIVC) access, maintain PIVC patency, and decrease risk of venous damage.<sup>7,8</sup> There exists evidence against limb splinting to preserve PIVC access in the neonatal population<sup>9</sup>; however, increased mobility in older infants and

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**Figure 1.** Neonatal limb board used for splinting limbs when securing intravascular access.

children supports the ongoing practice of limb splinting in these populations. When splinting limbs to preserve PIVC access, a firm board is used to immobilize the relevant joint and to prevent accidental removal.<sup>8</sup> These commercially available boards (Figure 1) come in a range of sizes and are held in position with adhesive tape (Figures 2 and 3). In Australia, commercially prepared limb boards are typically composed of a thin, metallic, moldable core encased in foam. Newer ergonomic-focused PIVC limb boards and intravenous line protectors are available internationally<sup>10</sup> and may better distribute pressure across the limb, subsequently reducing likelihood of PI development. These are currently not in common use in Australia.

In an Australian tertiary pediatric facility in September 2016, 3 cases of PI formation were attributed to contact with limb boards used in PIVC splinting. The following cases were generated based on the CARE Checklist<sup>11</sup> for case reporting, and accompany a literature review that was undertaken to analyze the existing knowledge base in relation to PIVC limb splints and PI formation. The authors secured a waiver of ethical review from the Children's Health Queensland Hospital and Health Services Human Research Ethics Committee. Informed consent was obtained from the parent/guardian of each child included in the case series.



**Figure 2.** Intravascular access secured in a neonate's anterior forearm.



**Figure 3.** Intravascular access being maintained by splinting the limb. The limb board has been placed adjacent to the posterior forearm and secured with adhesive tape and a Tegaderm (3M Company, St Paul, MN) cover.

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