

## PREVENTION OF NEONATAL PRESSURE INJURIES

### Abstract

Pressure injuries in the neonatal unit can cause infection, unnecessary pain and have the potential for scarring. However there is a dearth of information available on this topic.

Preventative strategies to address pressure injury development are essential when caring for vulnerable neonatal patients. This article highlights the issues regarding neonatal pressure injuries in clinical practice. In addition, it explores skin assessment and discusses the use of a neonatal skin risk assessment tool as a quality improvement intervention to improve clinical practice and patient outcomes.

### Introduction

Pressure injury prevention for premature infants is now recognised as an important aspect of nursing care in the Neonatal Intensive Care Unit (NICU). Technological advances in neonatal care have enabled infants to survive at lower gestational ages. However, these neonates are very vulnerable to pressure injuries. Lower gestational age increases the risk of pressure injuries due to necessary life saving medical equipment being in contact with the immature skin. Hence, healthcare professionals are becoming increasingly aware that the prevention of pressure injuries in the NICU is an area of paramount importance.

## NEONATAL SKIN PHYSIOLOGY

The dermis of a full-term newborn is not as well developed as adult skin, the collagen and elastic fibres are shorter and not as thick, the skin therefore feels very soft (Stamatas et al. 2011). Evidence suggests that due to unique skin physiology, neonatal skin is just as vulnerable to breakdown as the skin of an adult (Allwood, 2011). Infants born at lower gestational ages are more at risk of skin breakdown. The 'stratum corneum', the skin's main protective barrier is 10-20 layers thick in adult skin. Neonatal skin comprises of less layers with infants less than 30 weeks' gestation only having 2-3 layers and infants born at 24 weeks' gestation or less having no layers at all. Without the protection of the stratum corneum, infants are more at risk of infection, trans-epidermal water loss, temperature instability and toxicity from antiseptic cleaning agents. In addition, other differences in preterm skin such as fewer connecting fibres between the epidermis and the dermis, less subcutaneous fat, a thinner dermis and a flattened epidermal junction all increase the risk of neonatal skin injury (Fox, 2011).

## NEONATAL PRESSURE INJURIES

A pressure ulcer can be defined as "*a localised injury to the skin and/or underlying tissue usually over a bony prominence, as a result of pressure, or pressure in combination with shear*" (EPUAP & NPUAP, 2009, p.7).

Pressure injury can occur when there is insufficient blood supply to the skin caused by pressure that is not relieved. Constant unrelieved pressure decreases blood flow to the area causing occlusion of blood and lymphatic vessels which leads to cell hypoxia, tissue necrosis and ulcer formation (Grey et al. 2006). In adults, pressure ulcers are more likely to occur over bony prominences where there is less subcutaneous fat. Subcutaneous fat

helps to spread the forces applied to the skin evenly over a large surface area therefore reducing the pressure to one particular point (Myers, 2008). However, premature infants have little if any subcutaneous fat until after thirty-two weeks' gestational age and therefore pressure ulcers can occur on any part of the body (Fox, 2011). Prevalence rates of up to 23% in Neonatal Intensive Care Units have been reported (Baharestani and Ratliff, 2007).

In an era of rapid advances in other aspects of neonatal care it seems that pressure injury prevention practices may be viewed of lesser significance. A possible explanation for this may be because most neonatal skin injuries heal quickly without any intervention. Neonatal skin has a faster rate of wound closure due to an increased number of fibroblasts producing granulation tissue (Fox, 2011). Nonetheless, neonatal skin injuries should be classed as 'never events', and neonatal nurses should be aware of the potential for skin injuries in this vulnerable population.

The incidence rate of pressure injuries among neonates is high, with reports of 16.1% (Fujii et al. 2010), 31.2% (August et al. 2014) and 42.5% (Fischer et al. 2010). Pressure injuries among neonates are commonly found on the occiput and ears and are especially prevalent in those who are critically sick or sedated with an inability to reposition themselves (Ness et al. 2013). According to Baharestani and Ratliff (2007) 50% of skin injuries in neonatal units are caused by friction from medical devices and equipment. More recent research has identified pressure injuries from equipment such as nasal Continuous Positive Airway Pressure (nCPAP) and nasal prong cannulae (Fujii et al. 2010; Schumacher et al. 2013; August et al. 2014).

Some pressure injuries can cause irreversible skin damage that requires referral to the plastics team for corrective plastic surgery. A case series of five ventilated neonates

identified severe lip injuries from friction and pressure due to the positioning and securing of endotracheal tubes (Fujioka et al. 2008). Visible scarring to the lips of infants was observed and one infant required plastic surgery (Fujioka et al. 2008). The risk of pressure injuries to the nasal septum and nasal bridge when providing continuous positive airway pressure via a CPAP driver has also been widely reported (Ottinger et al. 2016). (FIGURE 1) Some infants have suffered the loss of their nasal septum (McCoskey, 2008). Understandably, this type of injury is devastating for families who have already had to cope with the emotional rollercoaster of having a sick infant admitted to the NICU. In addition, the financial burden on the health service and increased use of hospital resources is unnecessary, especially for a skin injury that may have been prevented. Nurse Managers should ensure neonatal staff are aware of the potential for pressure injuries and receive education on preventative practices so these injuries are less likely to occur.

INSERT FIGURE 1 HERE

### PREVENTION OF PRESSURE INJURIES

Evidence based management of neonatal pressure injuries presents some challenges. These include ethical issues arising in the conduct of research with infants. Consequently, there are a lack of best practice guidelines on the management and treatment of these injuries including a lack of appropriate neonatal dressings. Limited knowledge and evidence on treatment options results in variations in practice among practitioners and often wounds are left to heal in the open air without any protection from the risks of infection (Fox, 2011). Infection remains one of the biggest threats to the survival of a neonate and results in a

longer hospital stay, poorer neuro-developmental outcomes and an increased use of hospital resources (Anthony et al. 2014). Furthermore, a lack of neonatal guidelines in this area means that policies and guidelines based on adult skin are often adapted and used for neonates. This is inappropriate considering the physiological differences in the neonatal skin makeup. For these reasons, the key to the management of neonatal skin injuries is prevention.

### SKIN RISK ASSESSMENT TOOLS

A number of neonatal units in the UK, Ireland, the United States and Canada are implementing neonatal risk assessment tools into clinical practice as a quality improvement intervention (Ashworth and Briggs, 2011; Schumacher et al. 2013; August et al. 2014; Vance et al. 2015; Grosvenor et al. 2016). A literature search retrieved 9 published paediatric pressure ulcer risk assessment tools with the BradenQ scale and the Glamorgan Scale being the only tools that have been tested for sensitivity and specificity (Baharestani and Ratliff, 2007). Only 6 published skin risk assessment tools are available for the neonatal population and of these tools few measures have been validated (Noonan *et al*, 2011; Vance *et al*, 2015). From the literature it is evident that a further 3 tools are currently being developed as a result of research but these have not yet been published (August et al. 2014; Vance et al. 2015; Grosvenor et al. 2016). Most neonatal tools have been based on the BradenQ scale which is an adaptation of the Braden Scale used for adults (Vance *et al*, 2015). The BradenQ scale consists of 7 risk factors; mobility, activity, sensory perception, moisture, nutrition, friction and shear, and tissue perfusion and oxygenation. Each risk factor contains a subscale in which the patient is scored from 1 (most risk) to 4 (least risk). Scores range from 7 to 28 and a lower score indicates a higher risk of pressure ulcer development (Noonan et al. 2011).

Risk assessment tools can help to assess an infant's mobility and identify 'at risk' infants who require regular repositioning. By carrying out a skin risk assessment staff can identify infants that may be at risk of skin breakdown from as early as their admission to the neonatal unit. The National Institute of Clinical Excellence recommends that every infant should have a skin assessment carried out within 6 hours of admission (NICE, 2005). Skin risk assessment tools together with tissue viability/skincare guidelines can ensure 'safer better healthcare' that improves clinical practice and patient outcomes (Health Information and Quality Authority, 2012). Recent evidence suggests that skin risk assessment tools help to identify infants that are at risk of skin breakdown and ensures preventative measures are in place before skin breakdown occurs (Ashworth and Briggs, 2011; Grosvenor et al. 2016). Risk assessment tools also help nurses provide a comprehensive skin assessment, improve documentation and accountability and help to standardise clinical practice (Grosvenor et al. 2016).

However, clinical judgement should not be ignored in risk assessment. For example, a sedated and paralysed infant who is immobile would be considered 'at risk' and would require regular repositioning according to their risk assessment score, however, clinical judgement may indicate that the infant is too ill to tolerate this. Furthermore, the frequent repositioning of a sick neonate could cause apnoea, bradycardia and hypoxaemia due to the stress of handling. As a result, many neonatal units foster the practice of 'minimal handling' (Baharestani and Ratliff, 2007). NICE (2005) recommend repositioning as required for the individual patient. Infants who are clinically unstable and cannot be repositioned as often may benefit from the provision of pressure relieving support surfaces such as a gel mattress (Parnham, 2012). Lund (1999) suggests the use of gel mattresses and sheepskins placed at the joints and behind the occiput, however there has been little research to support their effectiveness (Baharestani and Ratliff, 2007). Furthermore,

financial limitations in healthcare hinder the provision of such equipment and not every infant may have access to these. The use of risk assessment tools in practice can be useful to provide evidence that may be required to obtain funding for these necessary resources.

It is important to mention a recent Cochrane review on the effectiveness of risk assessment tools which highlighted that although risk assessment tools do identify infants 'at risk' they do not necessarily improve patient outcomes (Moore and Cowman, 2010, 2014). However, the updated review (Moore and Cowman, 2014) only included two studies, with adult patient samples. More trials on this topic is clearly needed. Nonetheless, the absence of a standardised skin assessment tool and the lack of best practice guidelines to assist decision making can lead to widespread variations in practice amongst hospitals and within individual neonatal units (Grosvenor et al. 2016). Moreover, evidence suggests that the use of a validated reliable risk assessment tool in conjunction with a nurse's intuition and clinical judgement can complement skin assessment and provide evidence-based accountable nursing care (Kottner et al. 2013).

## Conclusion

"Every year, an estimated 15 million babies are born preterm (before 37 completed weeks of gestation), and this number is rising" (World Health Organisation (2015, p.1). With a growing emphasis on accountability and quality improvement regarding adult pressure ulcers, it is only a matter of time before neonatal pressure injuries will require the same attention. It is vital that neonatal nurses ensure that skin risk assessment and pressure injury prevention is regarded as a top priority and should be included as part of an infant's daily care plan. Moreover, more research is needed in pressure injury prevention and the

management of neonatal pressure injuries in order to promote standardised skincare practices in the NICU.

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