

Design and implementation of a Neonatal Tissue Viability Assessment Tool on the newborn intensive care unit

There is little validated data available for the assessment of neonatal tissue viability. The need for a standardised tool for the assessment of skin to improve quality of care was identified by the NICU Clinical Practice Group at St. Mary's Hospital, Manchester. The Braden Q Scale (2003) was adapted to develop the Neonatal Tissue Viability Assessment Tool; eight different criteria assess the infant's risk of threats to skin integrity. This assessment tool has been implemented in practice and audited.

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Pressure ulcers can be a cause of considerable discomfort and morbidity for patients and so their prevention is high on the agenda of most nurses. The importance that nurses place on skin integrity is highlighted by the inclusion of pressure sore prevention in the Chief Nursing Officers 'High Impact Nursing Actions'¹. It is generally accepted that in the adult population the majority of pressure ulcers that develop in NHS-provided care are avoidable². There are a number of assessment tools utilised to assess those patients at risk but these are mostly focused within the adult and child population.

There is little validated data available for assessment of neonatal tissue viability and yet because of the vulnerable nature of this group of patients they are at potential risk of pressure damage to their fragile skin.

On NICU the staff were very keen to improve the quality of patient care by delivering nursing interventions which would bring a clear benefit to the infants. Although nursing guidelines for the care of skin in preterm infants were already available the NICU Clinical Practice Group identified that a standardised tool for the assessment of skin integrity would help nursing staff to objectively assess risk and plan appropriate interventions. This is particularly important when nursing staff are junior.

The aim of this project was to devise a tissue viability assessment tool which would accurately assess the potential for skin damage in newborn infants with a range of gestational ages. The team utilised the 'Plan Do Study Act' (PDSA) methodology of achieving service

improvement. One of the benefits of this approach is that it advocates small scale testing which enables continual learning and adjustment in order to achieve the most optimal change.

Background

Neonatal skin care is one of the most challenging aspects of caring for infants who are small and sick. Although the skin of a newborn infant is similar in function to that of an adult, the skin of premature infants in particular, has poor barrier function. As a result of immaturity of the epidermal layer and a poorly developed dermoepidermal junction there is a greater risk of injury from pressure and shearing forces. The reduced cohesiveness between the epidermal and dermal layers increases the risk of epidermal stripping which in turn increases the risk of infection and pain for the infant.

As a result of skin immaturity, babies of the earliest gestational ages, 28 weeks and less, need to be nursed in very high levels of humidity to reduce transepidermal water loss. In addition they require support from a range of equipment, some of which is in contact with their skin.

Term babies have more mature skin which more closely resembles that of a child. However, these infants may also be at risk of potential skin breakdown if, for example, they become very oedematous as a result of their illness. In contrast to older patients, where pressure areas at risk may be the sacrum and heels, the most common areas for pressure forces for infants at term would be the occiput and the back of the ears.

Keywords

neonatal skin care; tissue viability assessment tool; service improvement methodology; audit; staff education

Key points

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1. There is little available data in the literature that specifically relates to assessment of neonatal tissue viability (TV).
2. A neonatal TV tool was developed using PDSA technology and based on the Braden Q scale.
3. The aim of the tool is to ensure each infant has an initial TV risk assessment within six hours of admission and a documented care plan.
4. Infants are reassessed on an ongoing basis as their condition dictates.

Neonatal Tissue Viability Risk Assessment Tool To be completed within six hours of admission

Name:

DOB:

Hosp No:

Intensity and duration of pressure

	3 – Gestational age <28 weeks	2 – Gestational age >28 weeks and < 33 weeks	1 – Gestational age >33 weeks and <38 weeks	0 – Gestational age >38 weeks
General physical condition				
Mobility The ability to change and control body position.	3 – Completely immobile: No changes in body position. Very oedematous. Sedated or on paralytic medication.	2 – Very limited: Occasionally makes slight changes in body position. Slightly oedematous. Weaning/just commencing sedation or paralytic medication.	1 – Slightly limited: Frequent changes in body position, can turn head, limited extension/flexion. Not on any sedation or paralytic medication.	0 – No limitations: Frequent changes in position, moving all extremities, turning head, positive reflexes.
Activity The degree of physical activity.	3 – None: Does not tolerate position changes, limited position choice due to condition or equipment.	2 – Very limited: Tolerates position changes, can be lifted in incubator, not able to come out of incubator.	1 – Slightly limited: Tolerates frequent position changes, can be held and have skin-to-skin.	0 – No limitations: Can be repositioned and held freely.
Sensory perception The ability to respond in a developmentally appropriate way to pressure-related discomfort and pain.	3 – Completely limited: Unresponsive to environment or tactile stimuli, due to diminished level of consciousness, on paralytic or sedation medication. Continual pain/discomfort.	2 – Very limited: Not tolerant of environmental stimuli, oversensitive to noise, lights and touch, easily agitated, difficult to calm. Intermittent pain on movement.	1 – Slightly limited: Easily agitated but calms with comfort measures. Few self-calming behaviours, occasionally successful at self calming. Pain on handling.	0 – No impairment: Age appropriate responses to aversive stimuli, perceptive with successful self-calming behaviours. Pain free.

Tolerance of the skin and supporting structure

	3 – Constantly moist:	2 – Very moist:	1 – Occasionally moist:	0 – Rarely moist:
Moisture Degree to which skin is exposed to moisture. Condition of wound (if applicable).	3 – Constantly moist: Nursed in humidity. Area of skin continually moist due to wound, drain site, stoma, leakage, etc. Wound dry, broken, excoriated, red.	2 – Very moist: Humidity off. Skin is often, but not always moist. Increased frequency of output. Wound producing exudate.	1 – Occasionally moist: Skin is occasionally moist, 6-8 hourly cares. Wound is clean and dry.	0 – Rarely moist: Skin is usually healthy and intact, dry, routine cares. Wound healed, or going home with an ostomy.
Friction (ie babies on CPAP).	3 – Significant problem: Agitation leads to constant friction and vigorous rubbing of head and knees or extremities. Constant agitation from equipment.	2 – Problem: Fragile skin, frequently slides down the bed, requiring frequent repositioning. Frequent agitation from equipment.	1 – Potential problem: Maintains relatively good position in chair/bed occasionally slides down. Slight agitation from equipment.	0 – No problem: Maintains good positioning in bed or chair. No agitation from equipment.
Nutrition Usual milk/fluid intake pattern.	3 – Very poor: NBM, on clear IV fluids. Never tolerates a complete feed, losing weight.	2 – Inadequate: On inadequate TPN. Trophic tube feeds or see sawing with clear IV fluids. No weight gain or losing weight.	1 – Adequate: On adequate TPN. Fully fed on tube feeds, see sawing with TPN. Stable weight gain.	0 – Excellent: Taking all feeds orally, on adequate calories. Consistent weight gain.
Tissue perfusion and oxygenation	3 – Extremely compromised: Hypotensive, MAP not appropriate for gestational age, Generalised oedema, high frequency, high ventilator requirements. CRT >2 sec.	2 – Compromised: Normal BP, but compensated – extremities cool, cardiac defects, SPO ₂ <94%, Hb <10, CRT >2 sec, pH<7.25, unstable temperature, nursed in O ₂ .	1 – Adequate: BP in normal range (self compensating) SPO ₂ >92%, Hb >10, CRT <2 sec, pH normal, stable temperature, nursed in O ₂ .	0 – Excellent: Normal BP by self, SPO ₂ >92% in air, normal Hb, CRT <2 sec, stable body temperature.

TABLE 1 KEY: CRT-Capillary refill time; Hb-Haemoglobin; SPO₂-Oxygen saturation; MAP-Mean arterial pressure; NBM-Nil by mouth; BP-Blood pressure; TPN-Total parenteral nutrition.

Process of change

Plan

An extensive literature search was undertaken to uncover any information already known about the assessment of skin integrity in the neonatal population. The Infant Braden Q scale is used in some US hospitals and is an adaptation of the Paediatric Braden Q scale³.

The Infant Braden Q was reviewed by the group, and the group consensus was that although this was a valuable foundation from which to build, it would need local adaptation to encompass the range of infants cared for on NICU, who have both medical and surgically-related problems within a wide gestational age range.

Do

The tissue viability link nurses for NICU adapted the Infant Braden Q scale and sought the input of senior neonatal nurses with both surgical and medical expertise to ensure the appropriate information was



FIGURE 1 Premature infant at increased risk of shearing injury from equipment and procedures. BRUNO BOISSONNET/SCIENCE PHOTO LIBRARY.

captured. The resultant neonatal tool calculates infant risk by assessing eight different criteria:

- Gestational age – decreasing gestational age renders the skin immature and its tolerance to pressure decreases while susceptibility and shearing injury increases (**FIGURE 1**).
- Mobility – decreasing mobility increases the risk of pressure concentrating in a

Score 20 or over	Very high risk	Refer to tissue viability link nurses/specialist nurses. Implement regular position changes and relief from equipment pressure as tolerated. Use gel mattress if appropriate/needed. If a wound is present commence wound assessment sheet, ensure appropriate dressing and dressing changes, if needed. Reassess twice daily or more frequently if condition changes.
Score 11 - 19	High risk	Seek advice from the tissue viability link nurses/specialist nurses. Implement regular position and equipment pressure relief as tolerated. Use gel mattress if appropriate/needed. If a wound is present, commence wound assessment sheet, ensure appropriate dressing and dressing changes, if needed. Reassess daily or as condition changes.
Score 6 - 10	At risk	Commence Tissue Viability Care plan. Reassess twice weekly or as condition changes.
Score 0 - 5	Low risk	Reassess weekly or as condition changes.

TABLE 2 Assessment of risk for skin breakdown. A tissue viability care plan should ALWAYS be commenced if there is an existing wound or if in the healthcare professional's opinion the infant is at risk, regardless of the score. Adapted from the Neonatal/Infant Braden Q Scale. Sue Wilson Surgical Care Practitioner, Louise Briggs Junior Sister (2011).

Instruction for using the Neonatal Tissue Viability Risk Assessment Tool

The tool is designed to assist in the identification of neonates who are at risk of skin damage. It is designed to support your clinical judgment and should be not used in isolation, but as part of the assessment of the individual care needs of the neonate. Appropriate information and explanation must be given to the family prior to undertaking the assessment.

The initial assessment MUST be completed within six hours of admission

1. For each risk factor make an assessment of the infant's condition and mark the relevant score 0, 1, 2, or 3, work through all eight risk factors and score each factor.
2. The score will indicate the level of risk, '**very high risk**' **high risk**' **'at risk**' or **'low risk**'.
3. In infants who score '**very high risk**' or **'high risk**' the tissue viability care plan should be initiated. The care plan must be updated and evaluated after each assessment.
4. A tissue viability care plan should be commenced if in the opinion of the healthcare professional the infant is at risk regardless of the score.
5. The positioning of infants and the frequency should be incorporated into the care plan, and all skin assessments should be recorded on the nursing documentation.
6. If there is an existing wound then a wound assessment chart should be commenced and each dressing change and dressing documented.
7. A risk assessment form must be completed if a wound or extravasations injury develops or deteriorates and the guideline followed.
8. Reassessment must take place as the risk assessment score or the infant's condition dictates.

specific area over a period of time. In neonates typical pressure prone areas include the occiput (back of the head).

- Activity – sick infants are inactive and become haemodynamically unstable when their position is changed limiting how often position changes can be made.
- Sensory perception – infants whose level of consciousness is reduced will not respond to pressure-related discomfort by moving.
- Moisture – skin which is continually wet is often prone to excoriation.
- Friction – constant friction may lead to shearing injuries. Some pieces of equipment (eg nCPAP) may cause friction to areas of skin if pressure is not relieved frequently.
- Nutrition – adequate nutritional intake is important to promote general health.
- Tissue perfusion and oxygenation – less well perfused infants are more at risk of pressure damage to their skin.

Within each criterion, the maximum score would be 3, indicating high risk, while the lowest possible score is 0, indicating low risk (TABLE 1). Cumulatively the maximum score can be 24.

Once risk is assessed, nursing staff are advised about possible interventions and ongoing frequency of assessment (TABLE 2). The educational input to staff when devising and implementing the tool stressed that the risk assessment should not be a substitute for individualised approach to care, and that reassessment should always be undertaken in the event of a deterioration in infant condition when skin integrity may also be threatened (for example, reduction in oxygenation/tissue perfusion, or reduction of level of consciousness), irrespective of previous scoring frequency.

Study

Utilising the new assessment tool a small group of infants was selected and experienced neonatal nurses were asked to subjectively assess the risk of the infant for threats to their skin integrity using their existing knowledge base and experience. The same nurses were then asked to assign a tissue viability TV risk score to the baby based on the criteria within the tool.

The findings of the nursing team were mostly consistent and led us to believe that the tool was an accurate assessment of risk to skin integrity. On the basis of some comments the tool was adjusted slightly to give additional clarity for the nursing team.

The following case studies illustrate the scoring tool in use:

Case study 1

A 23-week gestation infant was assessed within six hours of admission. The infant required assisted ventilation via an ET tube, rate 50bpm, in 40% O₂, was being nursed in 70% humidity, and was nil by mouth (NBM), on clear IV fluids. The score of 22 (TABLE 3) indicated the infant was very high risk, and needed to be reassessed twice daily or as condition dictated.

Case study 2

A 39-week gestation infant transferred from a DGH and was assessed within six hours of admission. The baby had necrotising enterocolitis (overwhelming gut infection) and was very oedematous requiring assisted ventilation via ET tube, rate 45bpm in 70% O₂. Full inotropic support was needed along with sedation and paralysis. The baby was NBM on clear IV fluids. The score of 18 (TABLE 3) indicated the infant was high risk, and needed to be reassessed daily or if condition deteriorated further.

	Case 1	Case 2
General physical condition	3	0
Mobility	2	3
Activity	3	3
Sensory perception	2	3
Moisture	3	1
Friction	3	2
Nutrition	3	3
Tissue perfusion and oxygenation	3	3
Tissue viability assessment score	22	18

TABLE 3 Examples of new assessment tool scoring.

Act

Once the tool had been peer reviewed, educational sessions were undertaken with small groups of nurses to help them understand the principles for introducing the risk assessment tool and how to apply it properly. Staff, were also advised about appropriate interventions after the score was obtained. Introduction of the scoring tool took place over several weeks with the tissue viability link nurses continually reinforcing the information with the nursing team. Education is pivotal in any change to clinical practice and staff were encouraged to use the tool effectively. The

aim is to ensure that each infant has an initial TV risk assessment within six hours of admission and ongoing assessment as condition dictates.

Four weeks after the introduction of the TV assessment tool into the NICU, an audit was undertaken to assess the following questions:

- What percentage of infants had a TV assessment within six hours of admission?
 - Of those infants at risk of skin pressure damage, how many had a documented plan of care in place?
- Audit results indicated that:
- Of 18 infants assessed, 15 (83%) had had their TV assessed within six hours of admission.
 - Of those infants at risk of pressure damage, 10 (55%) had a documented plan of care in place.

Conclusion

The audit results are encouraging and suggest that the nursing team understand the importance of assessing the risk of threats to skin integrity as part of the admission assessment. Further support will be offered to the team to ensure that there is widespread knowledge of the use of documented plans of care when the TV assessment score is high. A re-audit of these standards will be undertaken in six month's time when the change has had the opportunity to embed thoroughly into practice.

Overall this change in practice will represent a benefit to infants by ensuring that preventative measures are in place to reduce risk of skin breakdown and thus to alleviate pain and the risk of associated morbidities.

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