

Clinical Guideline: Maintenance of skin integrity

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For use in: East of England benchmarking group members

Used by: Healthcare professionals giving direct care to neonatal patients

Key Words: Assessment, skin, card care, bathing, humidity, integrity

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Audit Standards:

Audited via Benchmark at least once a year

Audit points:

- There is an evidence-based guideline to support clinical practice.
- Assessment of skin integrity
- Maintenance of skin integrity
- Education and Training of Healthcare Professionals



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1. Scope

For use in neonatal units participating in the East of England

2. Purpose

- To promote skin integrity
- To protect the skin's immature barrier function
- To reduce trauma to the skin1

3. Background

Maintaining skin integrity is an important aspect of neonatal care as newborn infants are adapting from an aquatic environment to one where they are exposed to air₁. Throughout this adaptation process the skin assists in thermoregulation, is a barrier against toxins and infections, permits water and electrolyte excretion, stores fat and permits tactile sensation and communication₂. When an infant is born extremely prematurely, the skin is very fragile due to an underdeveloped stratum corneum providing no barrier function, and the skin itself provides 13% of the body weight compared to 3% in an adult so any trauma will have a greater significance₃. Large volumes of water can be lost through the immature skin leading to hypernatraemia and dehydration, and the lack of barrier function can lead to absorption of chemicals and drugs_{4,5}

During care the skin of the newborn is at risk of disruption of its normal barrier function by trauma caused by a variety of actions and substances that the skin is exposed to.

4. Causes of skin breakdown

- Gestational age <32 weeks
- Pressure oedema, use of paralytics/sedatives
- Use of inotropes
- Adhesive use ET tube fixation, IV securing
- Surgical wounds and ostomies
- Birth injury
- Skin disease epidermolysis bullosa
- Infection
- Friction
- Burns
- Nappy rash
- Trauma/iatrogenic injury_{2,6}



5. Prevention of skin damage

5.1 Assessment

Skin assessment is part of the provision of care and allows the healthcare professional to recognise where potential problems arise and warns of the need to initiate prompt treatment.

A Newborn Skin Assessment Tool designed to evaluate the skin condition in all infants from term down to very-low-birth-weight₂ should be used (see appendices 1 and 2 for appropriate options). Assessment should include depth of dryness, erythema, hydration, discoloration and breakdown/ necrosis and be used in conjunction with skin care guidelines to show the overall improvement in skin condition when the guidelines were applied₇. Assessments should be completed according to the skin score and documented. A daily assessment is recommended or there should be documentation to say why it has not been completed.

5.2 Handling

All handling episodes should be made as gentle as possible. Prevent trauma by not wearing any jewellery on the hands or having false or long fingernails. Hand washing is a priority as well as use of alcohol hand rub prior to handling ensuring that the alcohol has dried. All healthcare professionals should be bare to elbow.

5.3 Positioning aids and bedding

Preterm infants have poor muscle tone and disorganised movements, which are energy consumptive. If placed on a flat surface without support they will assume a flattened position, which may interfere with development. Therefore positioning aids are used to encourage the infant to adopt a flexed, tucked posture₈.

These aids should be soft to allow the infant to lie in one position for a few hours without causing any pressure. Also any bedding, hats and clothing should be soft, non-scratchy and not stretched as a hat that is tight might put pressure on not only the skin surface but also the underlying blood flow.

Consideration should be given to the detergents used to wash these products as they may cause an increase of the skin pH, which irritates the physiological protective 'acid mantle' and change the composition of the cutaneous bacterial flora9

5.4 Humidity

Preterm infants may lose up to 13% of their body weight as transepidermal water loss (TEWL) in the first day of life when nursed in 50% humidity - these losses may still be significant at 4 weeks of age₁₀. Limiting the TEWL by use of humidity will allow serum sodium levels to be maintained at normal levels without increasing the fluid load which has been shown to lead to potential complications¹¹. (See separate EoE Benchmarking Humidity Guideline).

5.5 Use of adhesives

Adhesives should be used sparingly to secure life support, monitoring and other devices. The diminished cohesion between the epidermis and dermis, means that when tape is removed it



remains adherent to the epidermis and this can cause stripping₂. The use of a pectin based barrier decreases the amount of epidermal stripping in preterm infants₁₂. ECG electrodes and temperature probe covers should have hydrogel adhesive to prevent stripping of the skin on removal₁₃.

Peripheral intravenous cannulae should be secured using a clear semi-permeable membrane e.g. IV3000 to permit close observation of the cannula and prevent stripping on removal. A skin protectant can also be used to care for very fragile skin e.g. Cavilon, before applying the dressing in very preterm infants¹⁴.

Where adhesives have been used great care is required to remove them gently by using warm water and gauze/cotton wool or an adhesive remover to gradually loosen the tape prior to peeling gradually back. This technique can also be employed when removing the electrode gel from EEG leads. Solvents should not be used to remove any adhesive as they contain hydrocarbon derivatives or petroleum distillates that are potentially toxic15. Dependent on local policy and procedure, adhesive removal wipes may be used to aid removal of adhesive products.

6. Pressure and Friction Injuries

There may be injuries caused by friction to the elbows and knees especially in the preterm infant, which can be reduced by nursing infants on soft sheeting and nesting that has been washed in a detergent with a pH close to the skin's acid mantle and help reduce the development of dry skin₁₆. The skin pH of full-term infants has an alkaline pH of 6.34 but within 4 days this has fallen to 4.95. Preterm infant pH on day of birth is >6 but decreases by week one of life to 5.5 and decreases to 5 by week three₁₇.

Pressure injuries are not often seen in the neonate due to the large surface area to weight ratio but there are certain areas that are more at risk such as the lobes of the ears due to too tight headgear or the head not re-positioned frequently due to severity of illness.

There may be pressure on the nares from nasal intubation or biprong CPAP. Where CPAP is used the prongs should be taken out at **every** care session to be inspected to ensure patency and also to relieve any pressure and change the position. If tolerated by the infant, CPAP prongs and mask should be alternated at every care session, and appropriate skin protection should be placed under any tight strapping on the infants' cheeks 38.

Consideration should be given to oral ET tubes, which are used for a long period of time as this may cause palatal grooving, so the position should be checked with each care session.

If an infant is side lying or prone there may be pressure on the nasogastric tube pressing against the cheek so it is important to ensure that the infant's position is changed regularly and that the end of the tubing is not under the infant.

Monitoring equipment can lead to pressure necrosis; especially where the infant is very preterm as the dermis is oedematous and this reduces blood flow to the epidermis, making the skin more



susceptible to breakdown. Therefore it is important to ensure regular re-siting of probes and repositioning of the infant.

If an infant is so sick that paralysis and sedation are required it is important to instigate preventative measures such as air mattresses, passive limb physiotherapy, flexed supported positioning and close observation of dependent areas. If an infant is hypotensive this can lead to peripheral tissue hypoperfusion, which is another risk for skin breakdown from pressure on dependent parts.

7. Products used on the skin

Care should be taken with any product used topically as there may be absorption through the skin of drugs and chemicals⁴. Absorption takes place by intracellular route by passive diffusion and is rapidly absorbed from the capillary rich dermis.

- Avoid agents with perfumes and dyes
- Apply sparingly to the smallest area possible
- Use of alcohol swabs should be limited18
- Remove antiseptic cleansing agents as soon as possible with warm sterile water
- Do not apply occlusive barrier over antiseptic solutions19

Aqueous based disinfectant rather than alcohol-based products should be used to minimise transdermal alcohol absorption and chemical damage.

Where oils are used on the skin to treat or prevent dry cracked skin these should be preservative free and able to be mixed with water. They should be dispensed in small aliquots in sterile containers and allocated as 'one patient only' use.

Oil is used for baby massage to ensure that the strokes on the baby's skin are smooth and do not cause any friction. Massaging without oil can be irritating, especially for a sensitive newborn₂₀. For vulnerable infants who have unique skin problems and may have a poorly functioning immune system, it is safer to use a highly purified/refined oil₂₁.

The oil should contain a high percentage of Linoleic Acid which is found in Refined Sunflower Oil. This should be made up in 50ml clear bottles with a 'flip' cap for ease of use, stored in a cool dry place. It should be for 'one patient use' only and clearly labelled with an addressograph. Coconut oil could also be used as a safe alternative to Sunflower oil, if desired 37.

Parents should be advised that cleansing agents should not be added to a baby's bath water nor should lotions or medicated/perfumed wipes be used₂₂.

8. Nutrition

The infants overall nutrition should include adequate fluid, calories, amino acids, carbohydrates and fats as well as trace minerals and vitamins that are essential components for maintaining an intact



and healthy skin. Preterm infants have decreased fat stores, which can lead to scaling of the skin with irritation in the groin and neck. It can also lead to impaired clotting, as essential fatty acids are necessary to promote platelet function.

Zinc is needed for normal wound healing. Infants may lose zinc via stools or urine, have low or absent stores or increased demand due to rapid growth, stress or extensive tissue healing. Loss of zinc is indicated by red, scaly skin with excoriations in the groin and neck folds1.

Pressure ulcer and wound healing may require additional nutritional support to assist with healing.

8.1 Intravenous solutions

Where peripheral intravenous lines are used the concentration of any dextrose solution should be limited to 12.5% as hypertonic or acidic electrolyte solutions will lead to tissue damage if infiltrated₂. If higher concentrations are required the fluid should be infused via a central line. Hourly assessments using a tool (e.g. NPIP scores) can prevent or minimise the risk of infiltration. Where inotropes are used peripherally there should be close observation of the site proximal to the cannula (for management of extravasation injuries see guideline).

9. Surgical wounds and stomas

Since the normal barrier to infection function of the skin is underdeveloped in the new born, when the skin is opened surgically the risks of infection become much higher. Also the normal host defence mechanisms are not completely developed, and antibody levels are not high enough in preterm infants to mount an adequate response to invasive sepsis. The risks are greater if the wound is large or the duration of the surgery is long, there is a preoperative stay of more than five days, previous systemic infection or if there is contamination at operation but gestational age and birth weight have no influence_{21,23}. Post operatively wounds can be left exposed or a skin protectant may be used to cover the wound according to the surgeon's instructions. Advice should be sought from specialist tissue viability and wound care nurses as available.

Ostomies are often created in cases where there has been NEC, usually involving a proximal or functioning stoma and a mucous fistula to allow for decompression of the distal bowel. The skin must be protected from effluent, which can be damaging because of its enzyme content, pH level and liquid content. The skin must also be protected from damage caused by the adhesives used to stick the ostomy bags to the skin. Warm water and gauze should be used to loosen the barrier adhesive. The area around the stoma should be cleaned with water between bag applications and soap should not be used. Once dried, the area can be protected with a skin protectant/ barrier cream (refer to current formulary). A pouch and pectin-based barrier that fits the infant's abdomen should be selected; the pouch should be clear to allow for inspection of the stoma. The type of appliance will depend on the type of stoma and the faecal matter that it is capturing. Most bags have pectin-based barriers which will bond with the skin and maintain an adequate seal. Stoma size will decrease over time and will need to be re-measured with each appliance change until stabilized.



The barrier should fit closely around the stoma to protect the skin, so should be no more than 1/8th of an inch larger than the stoma, so that only 1/16th of an inch of peristomal skin is exposed. Skin barrier pastes should be avoided as they contain alcohol₂₄.

10. Use of Anti-fungal

It is important to identify a candida albicans rash and treat appropriately as normal barrier creams will worsen the condition. The typical rash is one of intense inflammation that is bright red and sharply defined in the inguinal folds, buttocks and thighs₂₅. The area should be swabbed to identify the cause and topical treatment with medication commenced. The area can also be exposed to the air and light.

11. Care of the Nappy Area

Nappy rash is an irritant contact dermatitis caused by prolonged contact of the skin with urine and faeces, making the skin more prone to disruption through friction with the nappy₂₆. Urine alters the skin pH from acid to alkaline, which makes it more easily colonised with microorganisms. The change in the pH activates the enzymes in the stool to affect the proteins in the stratum corneum, leading to skin breakdown₃.

Prevention of nappy rash is the primary goal of nappy area care – but if nappy rash occurs the treatment should aim to reverse the skin damage and prevent recurrence²⁷

Nappy rash does not occur in underdeveloped countries where nappies are not worn28

11.1 Predisposing factors for nappy area breakdown

- Broad spectrum antibiotic therapy
- Immaturity/maturity of skin
- Infants with substance withdrawal
- Jaundice
- Post abdominal surgery e.g. short gut syndrome and stoma reversal surgery 36.

11.2 Assessment

Assessment of the nappy area should take place at every nappy change. The frequency of the nappy change will be dictated by the infants' condition. Close observation of the infant during the nappy changing procedure is essential, as it can induce changes to heart rate and SpO₂. Therefore the angle that the buttocks are lifted to should not exceed 30 degrees as this can lead to cardiac decelerations²⁹

11.3 Prevention and Treatment

- Avoid prolonged contact with urine and faeces26
- Regular gentle cleansing of the nappy area with warm water



- Avoid the use of soap or lipid solvents for up to 8 weeks in preterm infants as they will remove the lipid from the stratum corneum 30,9
- Where possible bathe once daily in water (not before the baby is 48hrs old), as postponing bathing for 48 hours can result in improved skin moisture, which may improve skin integrity 35.
- Use a barrier cream at the first sign of redness, after cleansing at each nappy change
- Expose the nappy area to air if indicated
- Choose a disposable nappy that has absorbent gelling materials as this prevents skin overhydration and provides a more beneficial pH in the nappy area₃₁
- Treat known causes i.e. candida infection.
- Encourage breast feeding as the stools of breastfed infants are less caustic to infant skin₃₂
- A- Airing
- B- Barrier
- C- Cleansing
- D- Diaper (nappy) selection
- E- Education of caregivers_{33,34}

12. Cord care

The amount of cord handling should be kept to a minimum. There is no need to clean with an antiseptic. The nappy should be turned down to expose the cord stump to air as this had been shown to speed up the healing process. The cord clamp may be left on as this may help speed up the process of cord separation due to the increased weight. For more information see EoE Benchmarking Group Guideline for Umbilical Cord Care.

13. Audit

Audit will be through annual benchmarking activity and consequent action planning using infant's charts and care plans to assess quality outcomes and guideline adherence. Poor scores may necessitate more frequent audits to ensure progress is being made (see appendix 1).



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Appendix 1

Neonatal Skin Risk Assessment Score (NSRAS) 1

SCORE	Score 4	Score 3	Score 2	Score 1
Gestational Age	< 28 weeks	> 28 weeks but <33 weeks	>33 weeks but <38 weeks	>38 weeks—Post-term
Sensory perception	Completely Limited Unresponsive to environment or tactile stimuli, due to diminished level of consciousness, on paralytic or sedation medication. Continual pain/discomfort	Very Limited Not tolerant of environmental stimuli, oversensitive to noise, lights and touch, easily agitated, difficult to calm. Intermittent pain on movement	Slightly Limited Easily agitated but calms with com-fort measures. Few self- calming behaviours. Pain on handling	No Impairment Alert and Active. Age appropriate responses aversive stimuli
Mobility	Completely Immobile Does not make even slight changes in body or extremity position with-out assistance. Sedated or on para-lytic medication	Very Limited Makes occasional slight changes in body or extremity but unable to make frequent changes independently. Slightly oedematous. Weaning/just commencing sedation or paralytic medication	Slightly Limited Makes frequent though slight changes in body or extremity posi-tion independently. Not on any sedation or paralytic medication	No Limitations Makes major and frequ chang-es in position wi assistance (e.g. turn he
Activity	Completely bed-bound Does not tolerate position changes, limited position choice due to condi-tion or equipment	Limited bed-bound Tolerates position changes, can be lifted in incubator, not able to come out of incubator	Slightly Limited Tolerates frequent position chang-es, can be held and have skin-to-skin	Unlimited Can be repositioned an freely
Nutrition	Very Poor NBM or IV fluids (Inc TPN)	Inadequate Receives less than optimal amount or EBM or formula milk and supplement-ed with IV fluids	Adequate NG/OG feeds which meet nutrition-al needs for growth	Excellent Breastfeeds/bottle feed meal which meets nutr needs for growth
Moisture	Constantly Moist Skin is moist/damp every time infant is moved or turned. Nursed in hu-midity	Moist Skin is often but not always moist/damp: Linen must be changed at least once per shift. Humidity off. Increased frequency of output	Occasionally Moist Skin is occasionally moist/damp. Requiring an extra linen change approx. once a day. 6-8 hourly cares	Rarely Moist Skin is usually dry. Liner requires changing only 24 hours
Friction (i.e. babies on CPAP)	Significant Problems Agitation leads to constant friction and vigorous rubbing of head and knees or extremities. Constant agitation from equipment	Problem Fragile skin, frequently slides down the bed, requiring frequent reposi-tioning. Frequent agitation from equipment	Potential Problem Maintains relatively good position in bed. Occasionally slides down. Slight agitation from equipment	No Problem Maintains good positio bed or chair. No agitati equip-ment

ations

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em

good positioning in ir. No agitation from nt

Morris, Bethia Procedure Review date Version



(Hosted by Cambridge University Hospitals)

Tissue perfu-sion and oxygenation

Extremely Compromised Hypotensive, MAP not appropriate for GA. Generalised oedema, HFOV, high ventilator requirements CRT>2 secs. Therapeutically

cooled

Compromised

Normal BP, but compensated—Extremities cool, cardiac defects, SPO₂ < 94% Hb <10 CRT > 2 sec pH <7.25 Unstable temperature, nursed on O_2

Adequate BP in normal range SPO₂ >92% Hb > 10 CRT < 2 secs pH normal, stable temperature, nursed in O_2

Excellent

Normal BP SPO₂ >92% in air nor-mal Hb CRT < 2 secs stable body temperature

Appendix 2

Skin Risk Assessment and Management Tool (SRAMT) 2

RISK SCORE	CATEGORY	SUGGESTED ACTION
<8	Low risk	Continue daily assessment and documentation of skin integrity on a daily basis.
9-16	Moderate risk	Reposition neonate every 6-8 hours. Assess and document skin integrity 6-8 hourly.
17-24	High risk	Reposition neonate and equipment devices at least every 4-6 hours. Reassess and document every 4-6 hourly.
25-32	Extreme risk	Inspect skin at least 2-4 hourly, ensuring equipment/ objects are not pressing on the skin. Reassess and document every 2-4 hourly.

Current Gestational Age	4	Neonate <28 weeks
	3	Neonate >28 weeks and <33 weeks
	2	Neonate >33 weeks and <38 weeks
	1	Neonate >38 weeks
Sensory Perception	4	Diminished level of consciousness/ muscle relaxed/ heavily sedated/ cooling for HIE

Morris, Bethia Procedure Review date Version



	3	Oversensitive to noise, lights and touch/ easily agitated/ difficult to calm.
	2	Easily agitated but calms with comfort measures/ few self-calming behaviours.
	1	Responds appropriately to stimuli, alert, good self-calming behaviours.
Activity/ Mobility	4	Makes no change in position- full assistance required.
	3	Makes occasional slight changes in body or extremity position.
	2	Makes frequent changes in body or extremity position, eg, turns head
	1	Makes major and frequent changes in position, moving all extremities, turns head.
Moisture	4	Constantly moist due to humidity/ urine/ wound/ stoma/ respiratory support/ NAS.
	3	Skin often moist- linen needs to be changed <12 hours
	2	Skin occasionally moist- needs linen change >12 hours
	1	Skin usually dry, routine nappy changes and linen once/ day
Respiratory Support	4	Intubated and ventilated or CPAP >6cm H2O
	3	CPAP >5CM H2O
	2	High flow/ low flow/ micro low flow/ cot O2
	1	No respiratory support
Skin Integrity	4	Extensive loss of skin integrity/ wound/ pressure area
(visual examination)	3	Localised loss of skin integrity/ broken area/ oedema/ nappy rash/ excoriation
	2	Minor skin irritation/ redness
	1	Skin integrity intact
Blood Collection	4	Neonate requires cannulation/ PICCS/ daily blood collection
	3	Neonate requires heel prick for blood collection
	2	Blood collection weekly
	1	No blood collection required
Nutrition	4	TPN + Lipids/ IV fluids/ NBM/ does not tolerate feeds
	3	TPN + Lipids/ IV fluids/ trophic feeds
	2	TPN + Lipids/ IV Fluids/ gastric feeds increasing as tolerated



1 Full gastric feeds

TYPE OF INJURY	CAUSE OF INJURY	GUIDELINES AND
		PREVENTATIVE MEASURES
Bruises	Venepuncture and heel lance	Try not to hold limb too tightly causing a tourniquet effect Warm site to improve perfusion Do not squeeze heel/ wrist during blood collection (increases risk of bruising) After 2 attempts call senior staff member Hold site till bleeding stops- do not use cotton wool and adhesive tapes
Epidermal stripping	Removal of adhesive tapes used to secure devices (tubes/ lines)	Avoid products that bond to skin Double back tapes or fluff with cotton wool Use saturation wraps for holding lines in place instead of tapes (especially in neonates <28 weeks) To assist in the removal of tapes use an alcohol free product, adhesive remover Remember remove in a 'low and slow' manner
Excoriation	Neonatal Abstinence Syndrome (NAS), skin infections (fungal), medications	Take preventative action by following management of Nappy Rash Guideline Frequent nappy changes 3 to 4 <i>hourly</i> , apply skin barrier cream Assess cause of excoriation (swab/ thrush) Treat cause of excoriation
Extravasation	Peripheral arterial line causing vasoconstriction Intravenous infusions (especially hypertonic/ ionic/acidic or alkaline) may infiltrate the vein causing swelling at the cannula site	Secure all line to maintain good visibility of the cannula site and surrounding tissue Position arterial line/site to allow constant monitoring Ensure brisk cap refill to all digits Remove line if fingertips are dusky/ white in colour Try to infuse hypertonic/ ionic/ acidic or alkaline drugs via a central line Flush cannula to check patency before attaching intravenous infusion Check line/ site/ pressures hourly
Chemical burns	Alcohol based skin preparation solutions, eg, chlorhexidine, iodine and alcohol swabs	Skin preparation for procedures- only use chlorhexidine 0.2% (antiseptic) Ensure skin is cleansed straight away with normal saline or water to prevent burns DO NOT use alcohol swabs to clean neonates skin, before venepunctures or cannulation
Thermal burns	Heat from monitoring equipment Cold lights Saturation/ temperature probes	Reset the time and temperature of transcutaneous oxygen monitor according to the age and gestation of the neonate Check light is on the correct setting Minimise the length of time light is used Resite probes 2-4 hourly Mefix underneath probe of neonates <28 weeks
Pressure	All medical devices CPAP nasal prongs or mask Anatomical position/ lying prone/ NAS babies	Avoid the infant lying on tubes or rolls of linen, such as lines/ devices Increased risk of injury if neonate is exposed to unrelieved pressure, humid microclimate



Ensure prongs are nursed off the septum
and not causing damage to inner nares
Ensure ears are not rolled up under hat
and the neonate is not lying on one side
constantly, ie, rotated from side to side
Cover knees with duoderm to prevent
rubbing injuries from being nursed prone



References

1. Luton and Dunstable University Hospital. (2018) Neonatal Skin Assessment Score.

2. Broom M, Dunk AM, Mohamed A. (2019) Predicting neonatal skin injury: The first step to reducing skin injury in neonates.

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Exceptional Circumstances Form

Form to be completed in the **exceptional** circumstances that the Trust is not able to follow ODN approved guidelines.

Details of person completing the form:			
Title:	Organisation:		
First name:	Email contact address:		
Surname:	Telephone contact number:		
Title of document to be excepted	d from:		
Rationale why Trust is unable to	adhere to the document:		
Signature of speciality Clinical L	ead: Signature of Trust Nursing / Medical Director:		
Date:	Date:		
and sign):	ale Date acknowledgement receipt sent out.		
Please email form to: mandybaker6@nhs.net requesting receipt. Send hard signed copy to: Mandy Baker EOE ODN Executive Administrator			
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