# Management of Extravasation Injuries in Neonates

University Hospitals of Leicester NHS Trust

**Trust ref: C33/2020**

## Contents



## 1. Introduction and Who Guideline applies to

This guideline is aimed at all health care professionals involved in the care of infants within the Neonatal Service.

### Aim:

- To facilitate the early identification and management of extravasation injuries in neonates.

### Key Points:

• To facilitate the early identification and management of extravasation injuries in neonates.

• Prevention of extravasation injuries through regular, detailed assessment of peripheral cannulation sites is key (Grade C).

• Extravasation injuries when identified require immediate medical review. Prompt intervention can help minimise the extent of tissue damage caused (Grade C).

• The Extravasation Flow Chart (appendix one) should be used in the first instance to facilitate clinical decision making.

• Treatment and management strategies vary depending on the substance extravasated, staging, extent of the injury, duration of exposure and location (Grade C).

• 0.9% sodium chloride washout is most effective when undertaken within 1 hour (was 1-6 hrs) of an extravasation injury occurring.

**Related UHL Documents:**

UHL Vascular Access Policy **B13/2010**

**Background:**

Wilkins and Emmerson (2004) undertook a UK based survey of 31 tertiary neonatal units describing an overall prevalence of full thickness, extravasation injuries occurring in 38 per 1000 infants, the majority of which occurred in the most premature neonates (</= 26/40 weeks gestation) who are described as being the highest risk group for incurring extravasation injuries (Restieaux et al 2013). Contributing factors to this increased risk include; the fragility of their veins and skin, difficult venous access, and a prolonged need for IV therapy, as well as an inability to report and localise pain (Reynolds 2007). Evidence supporting treatment and management strategies are low quality and limited to case series or reports.

## 2. Guideline Standards and Procedures

### 2.1 Prevention of Extravasation Injuries:

• Limit peripheral IV Glucose infusions to 12.5%.

• Veins in the upper extremities are less likely to infiltrate or leak, when compared to those in the lower limbs or scalp.

• Careful attention should be paid not to impede blood flow to the extremity when securing the cannula.

• Secure the cannula with a transparent, occlusive dressing. The insertion site should be visible. Date of insertion should be documented within the clinical notes.

• Hourly recording of the appearance of the cannula site for oedema, firmness, or discolouration during continuous infusions (VIP scores) should be undertaken.

• VIP score evaluation should be undertaken twice daily if the cannula is not in use, removal of the cannula should be considered if not used within a 12 hour period (as per UHL Vascular access policy).

• Short-term calcium supplementation may be given via a peripheral IV line. Central access is preferable for longer term supplementation.

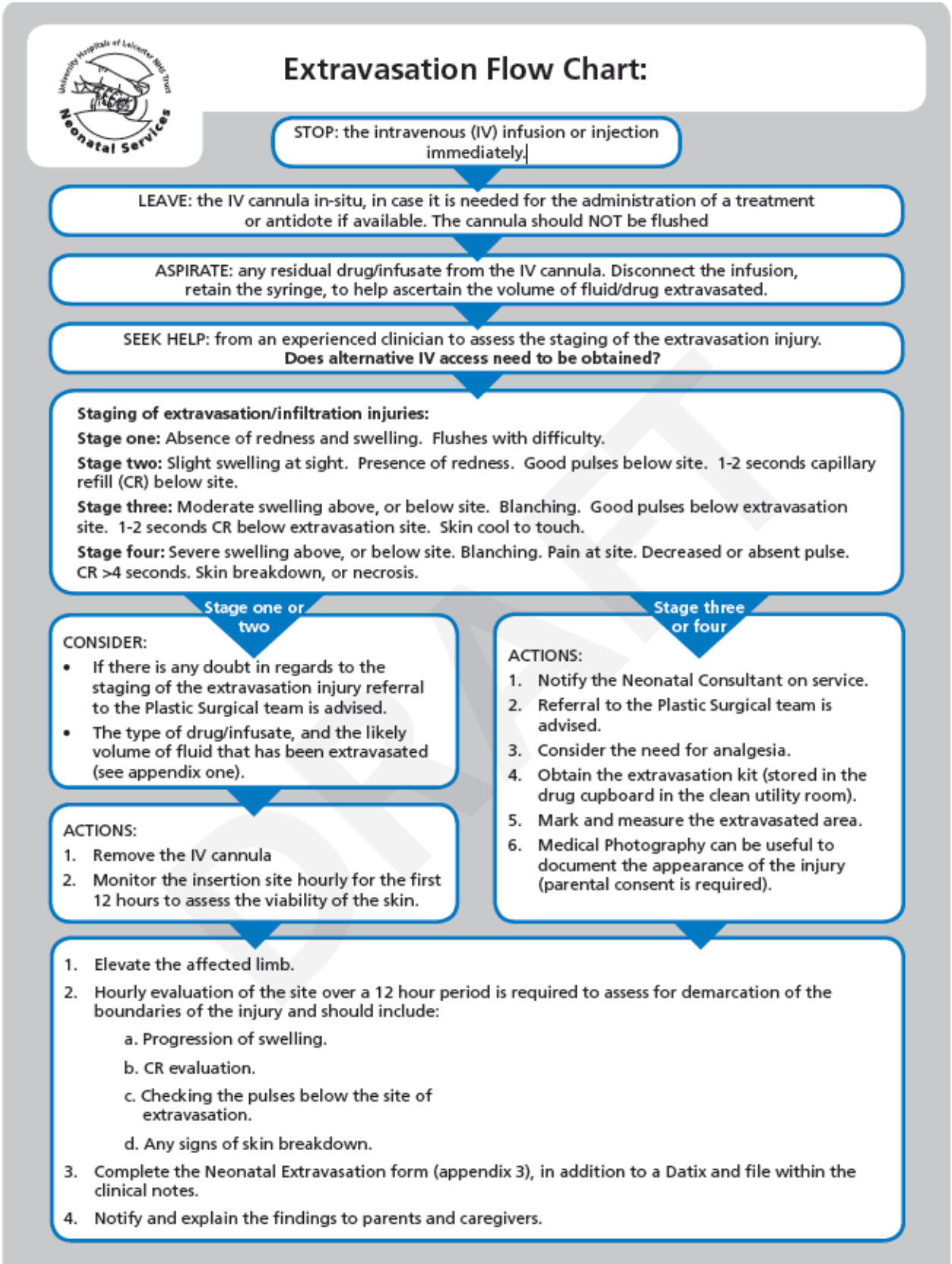
• Dilute medications as per UHL Neonatal IV monographs.

• There is no evidence that monitoring infusion pump pressures reduces the incidence of extravasation injuries (Adiotomre and Elliot 2018).

**Extravasation Treatment and Management Strategies:**

Please refer to appendix one for further background information relating to pharmacological/invasive and conservative treatment strategies.

## 2.2 Extravasation flow chart



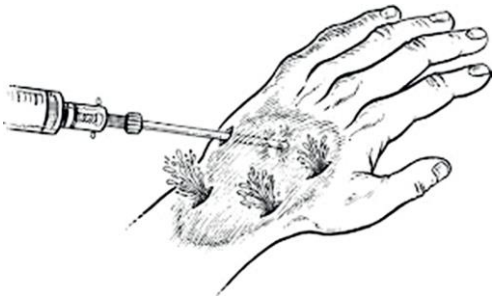
**2.3 Pharmacological treatments:**
Please refer to the UHL Neonatal Formulary for up to date dosing and administration information on the following treatments (see appendix four for further detailed background information):

- Hyaluronidase and 0.9% sodium chloride flush out.
- Lidocaine 1%.
- Phentolamine mesilate.
- Glyceryl tri-nitrate

Infiltration with Hyaluronidase and 0.9% sodium chloride Flush-out Technique:
(Extracted from Adiotomre and Elliot 2018)

Equipment:

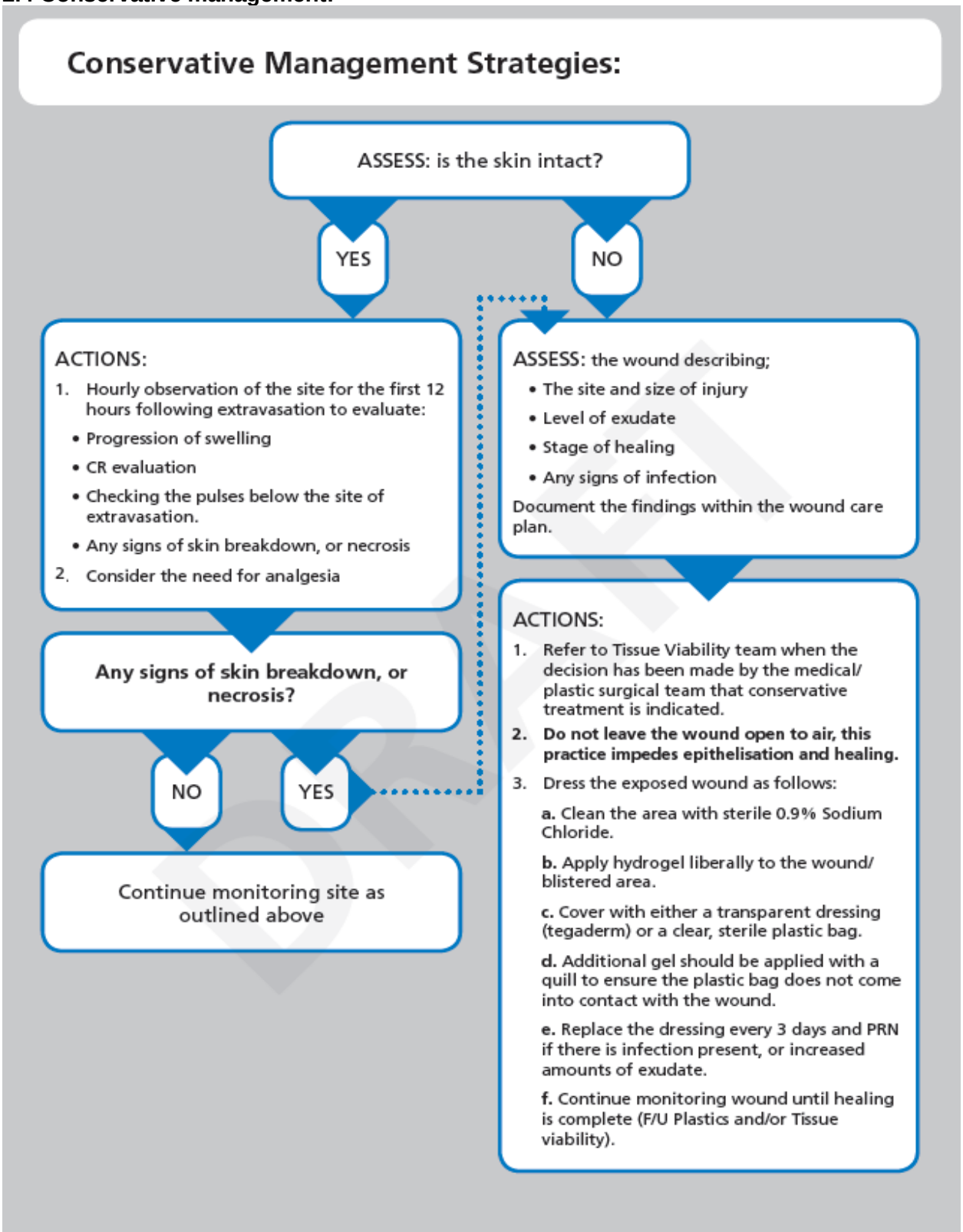
- 1% Lignocaine hydrochloride (up to 0.3 ml/kg maximum)
- 2nd point- 1500 unit/ml vial of hyaluronidase- dilute with 3ml water for injection
- 0.9% sodium chloride for injection
- 1 ml syringes
- Size 19G cannula
- 3 way tap
- 20 ml syringe
- 25G needles
- Sterile towel
- Dressing pack
- Sterile gloves
- Chlorhexidine solution (0.05% w/v)
- Water proof sheet



- Clean the discoloured area and surrounding skin with chlorhexidine solution and place on sterile towel. Place a sterile bowl underneath towel.
- Infiltrate area with 1% lignocaine.
- Inject 500-1000 units of hyaluronidase into the subcutaneous tissue beneath the damaged skin.
- Make four small punctures in the tissue plane around the affected area.
- Insert the 19G cannula subcutaneously through one of the puncture sites and remove the needle.
- Using a 20 ml syringe attached to a three-way tap, inject 0.9% sodium chloride into the area. This should flow out freely from the other three incisions.
- Repeat the process injecting normal saline through each incision and using up to 500 ml of normal saline depending on size of wound and of baby.
- If the limb gets oedematous, excess fluid can be removed by massaging towards the incisions.
- Dress area with sterile non-stick dressing such as mepitel or intrasite conformable gel dressing. The stab wounds should not be closed as they may drain for a while. Check wound 6 hourly for 24 hours following the procedure.

- Antibiotics might be indicated in some cases, if the baby is not already on antibiotics, discuss with microbiology.
- Elevate limb for 24 hours.

**2.4 Conservative management:**



### 2.5 Stages of wound healing

**Stages of Wound Healing:**

| | |
|---|---|
| Necrotic stage | The surface of the wound may initially be covered with devitalised tissue which is unbroken if area of damage is away from the cannulation site. |
| Slough stage | Slough is composed of dead white cells and can be mistaken for pus, often with the lack of signs of infection such as redness, swelling, heat and loss of movement. |
| Granulating stage | Granulation tissue develops quickly when the wound bed is clean and gives a red appearance. This is highly vascular and bleeds easily if disturbed. Care should be taken during dressing changes or handling to prevent damage and bleeding. |
| Epithelisation stage | This is the last stage of healing when the epithelial cells move from the wound edges towards the centre. Wound bed has a pink appearance at this stage. |

**Education and training:**
None

**Monitoring Criteria:**

None

**References:**

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## 6. Key Words

Cannula, Intravenous, Tissue viability

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**The Trust recognises the diversity of the local community it serves. Our aim therefore is to provide a safe environment free from discrimination and treat all individuals fairly with dignity and appropriately according to their needs.**
**As part of its development, this policy and its impact on equality have been reviewed and no detriment was identified.**

| CONTACT AND REVIEW DETAILS | |
|---|---|
| **Guideline Lead (Name and Title)**<br>**Original authors:** Alice Kavati ANNP, Demi Leigh Nicols SSN, Lucy Stachow Neonatal Pharmacist and Dr Venkatesh Kairamkonda, Neonatologist<br>**Alice Kavati - ANNP**<br>Sumit Mittal – Neonatal Consultant | **Executive Lead**<br>Chief Nurse |
| **Details of Changes made during review:**<br>0.9% Sodium chloride washout is most effective when conducted within 1 hour of extravasation occurring. | |

## Appendix 1: Background information

Appendix One:

# Background information: Pharmacological/ invasive and Conservative treatment options.

Pharmacological treatments include the use of antidotes or enzymes such as hyaluronidase. Use of these treatments in the management of extravasation, have been associated with improved tissue perfusion and prevention of progressive tissue necrosis, when undertaken as soon as possible following the extravasation injury (Beall and Mulholland 2013). Gopalakrishanan et al (2017) suggests that the use of saline irrigation in the management of stage 3 or 4 injuries has resulted in improved outcomes; however, these findings are based upon case reports alone and therefore should be interpreted with caution. There have been no clinical trials comparing the outcome of treatment with occlusive dressings to that of infiltration with hyaluronidase and saline (Gopalakrishnan et al 2017).Conservative management strategies involve the use of occlusive dressings. Features of optimal dressings are those that are small, conformable, tolerate a humidified environment, and do not restrict movement. The dressing should also be easy to remove, and reduce trans-epidermal water loss (Adiotomre and Elliot 2018).

**Hydrogels (Aquaform gel, Hydrosorb)**

Hydrogels create a moist wound environment that is conducive to wound healing. Its use has also been associated with reduced residual scarring in premature infants (Thomas et al 1987). The use of hydrogels within the premature and term neonatal population is well established (De Leo et al 2016). Hydrogels have also been shown to be mildly bactericidal, and appear to inhibit bacterial growth within the wound bed (Tacquino 2000).

**Hydrocolloids (Duoderm)**

Hydrocolloids are practical as they offer an extended wear time of up to 7 days. Although, their use may be limited as they are unsuitable for highly exudative wounds as their absorptive capacity is limited. The dressing is opaque which may also limit visibility of the wound.

## Appendix 2: Common vesicant drugs & solutions reported to cause injury

Appendix Two:

# Common Vesicant drugs and solutions reported to cause extravasation injury

Note – this is not an exhaustive list – any agent could cause injury

### Commonly used IV medications

- Vancomycin
- Acyclovir, Ganciclovir
- Gentamicin
- Phenytoin
- Amphotericin
- Cefotaxime
- Mycophenolate Mofetil
- Vasocompressive agents
- Dobutamine
- Dopamine
- Epinephrine (adrenaline)
- Norepinephrine (noradrenaline)
- Vasopressin

### Concentrated electrolyte solutions

- Calcium chloride
- Calcium gluconate
- Potassium chloride
- Sodium bicarbonate 4.2% & 8.4%
- Sodium chloride 10%

### Hyperosmolar agents

- Total parenteral nutrition
- >10% dextrose
- Mannitol 15%

### Other

- Radiographic contrast media
- Promethazine
- Diazepam
- Digoxin

## Appendix 3: Medication information

Appendix Four:

| Medication | Dose and Administration | Cautions/ Contraindications | Mode of Action |
|---|---|---|---|
| **Hyaluronidase and 0.9% Sodium Chloride flush-out.** | 500-1000 units of hyaluronidase subcutaneously (s/c) dilute 1500units with 3 mls of water for injection.<br>Suggested maximum volumes for 0.9% Sodium Chloride Flush-out; Minimum volume 100mL.<br>**<1000g**<br>200mL<br>**<1000-2000g**<br>300mL<br>**>2000g**<br>500mL | **Hyaluronidase is contraindicated in neonates <1000 grams.**<br>Hyaluronidase is only to be used in conjunction with 0.9% Sodium Chloride flush-out.<br>Hyaluronidase is not to be used to enhance the absorption and dispersion of vasoconstrictors<br>Outcome is better where irrigation with 0.9% Sodium Chloride is undertaken within 1-6 hours of the injury.<br>Consider potential for over-hydration especially in renal impairment. Adverse effects are uncommon. | Hyaluronidase is an enzyme that temporarily and reversibly breaks down hyaluronic acid which is present within the intercellular matrix of connective tissue thus, increasing the distribution and absorption of extravasated substances.<br>Efficacy of hyaluronidase is based on evidence from case reports and animal studies and is supported by an FDA subcommittee evaluation from 2009. |
| **Phentolamine Mesilate** | Injection: 10mg/ml.<br>Further dilute to make a 0.5 to 1mg/ml solution with 0.9% Sodium Chloride.<br>**Dose:** 0.1-0.2mg/kg, max dose 5mg in neonates.<br>Administer as subcutaneous injections into the extravasation site and via the cannula if it remains in situ. | Systemic absorption may result in tachycardia, dysrhythmias and hypotension.<br>Continuous monitoring of heart rate, blood pressure, and CRT during administration is recommended.<br>Effective up to 12 hours post extravasation injury. | Occasionally used for the treatment of dermal necrosis following extravasation of vasoconstrictors.<br>Competitive alpha-adrenergic blockade. Reverses the alpha mediated vasoconstriction properties of vasopressors (dobutamine, dopamine, adrenaline, and nor-adrenaline).<br>Efficacy has been demonstrated in animal studies and case reports. |

Appendix Four:

| Medication | Dose and Administration | Cautions/ Contraindications | Mode of Action |
|---|---|---|---|
| **Glyceryl Trinitrate (GTN) patch** | Glyceryl Trinitrate (GTN) patch<br>Apply half a GTN patch (24hours) proximal to the affected area.<br>This will deliver a dose of 0.2mg/ hour. | Continuous monitoring of heart rate, blood pressure, and CRT during administration is recommended.<br>The site of the patch should be rotated each time it is changed to avoid skin sensitisation.<br>Consider a patch free period if tolerance develops. | Topical vasodilatation of capillaries to improve blood flow and reduce peripheral ischaemia. |
| **Lidocaine 1%** | Anaesthesia by local infiltration<br>Up to 3mg/kg/ dose.<br>Dose may be repeated, not more often than every 4 hours.<br>3mg/kg equivalent to 0.3mL/kg of 1% solution. | Avoid injection into infected, or inflamed tissues. | Lidocaine works as a local anaesthetic by stopping the sodium ions from passing through the voltage-gated channels. Therefore the pain signals are stopped even before the signals are formed. |

## Appendix 4: Documentation form

# Standardised Extravasation Event Documentation Form

Surname: .....

Forename: ..... Please affix patient ID label

Date of Birth: .....

Hospital No: .....

**Date and time of the event:**

.....

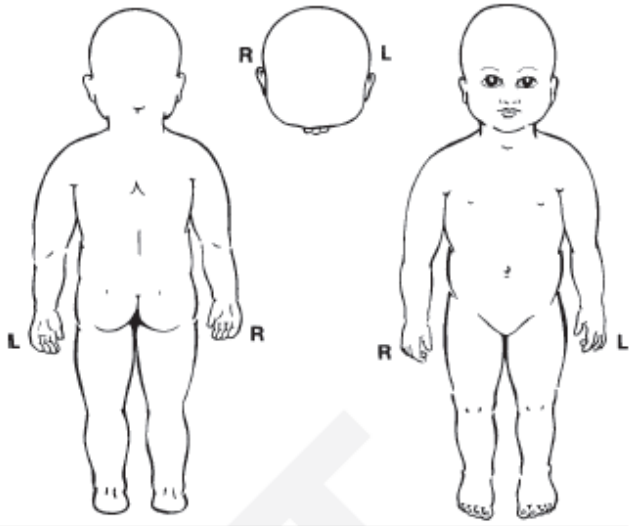
**Name (sign and print with designation):**

.....

## Details Of Extravasation Event

| | |
|---|---|
| Insertion Site: | |
| Type and batch number of cannula/catheter: | |
| (UVC/UAC) Position secured at stump on removal: | |
| (UVC/UAV/LL) Most recent confirmed x-ray position at removal: | |
| Staging assessment and dimensions of extravasation injury: | ..... |
| Type and estimated volume of drug/diluent extravasated: | ..... |
| Describe the appearance of the site of extravasation (peripheral cannula): | ..... |
| Clinical symptoms/ complications associated with the extravasation (UVC/ UAC/LL): | ..... |

**Please note on the body map the area affected by the extravasation injury:**




| | |
|---|---|
| Date and time Consultant neonatologist notified; information discussed and advice given: | |
| Have the appropriate referrals been made? (Plastics/Tissue viability team/ Radiology): Tick Box | YES ☐ NO ☐ |
| Management/treatment of the extravasation undertaken: | |
| Future follow up plans discussed (if relevant): | |
| Has a Datix been completed? Please document W identifier for this document: | |

# Neonatal Extravasation Monitoring Form

| Date and Time (Hourly for 12 hours) | Site of Extravasation | Pregression of swelling YES / NO | Capillary refill evaluation • Brisk • 2-3 seconds • >/= 3 seconds | Pulses below the site of extravasation YES / NO | Signs of skin breakdown YES / NO |
|---|---|---|---|---|---|
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