

LRI Children's Hospital

Extravasation UHL Childrens Hospital Guideline

Staff relevant to:	Health Professionals who administer injectable medicines to Children and Young People at UHL and applies to children and young people cared for in the Childrens Hospital
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1. Introduction and who Guideline applies to

This guideline covers the recognition, management and prevention of infiltration and extravasation injury.

Extravasation is the accidental leakage of any liquid from a vein into the surrounding tissues. If extravasation occurs with vesicant drugs, the result may be tissue damage and necrosis. (NHS England 2017)

Infiltration is the inadvertent leakage of a non-vesicant solution from its intended vascular pathway (vein) into the surrounding tissue.

Note: While this guideline refers to the 'child' throughout, all activities are applicable to young people.

Related documents:

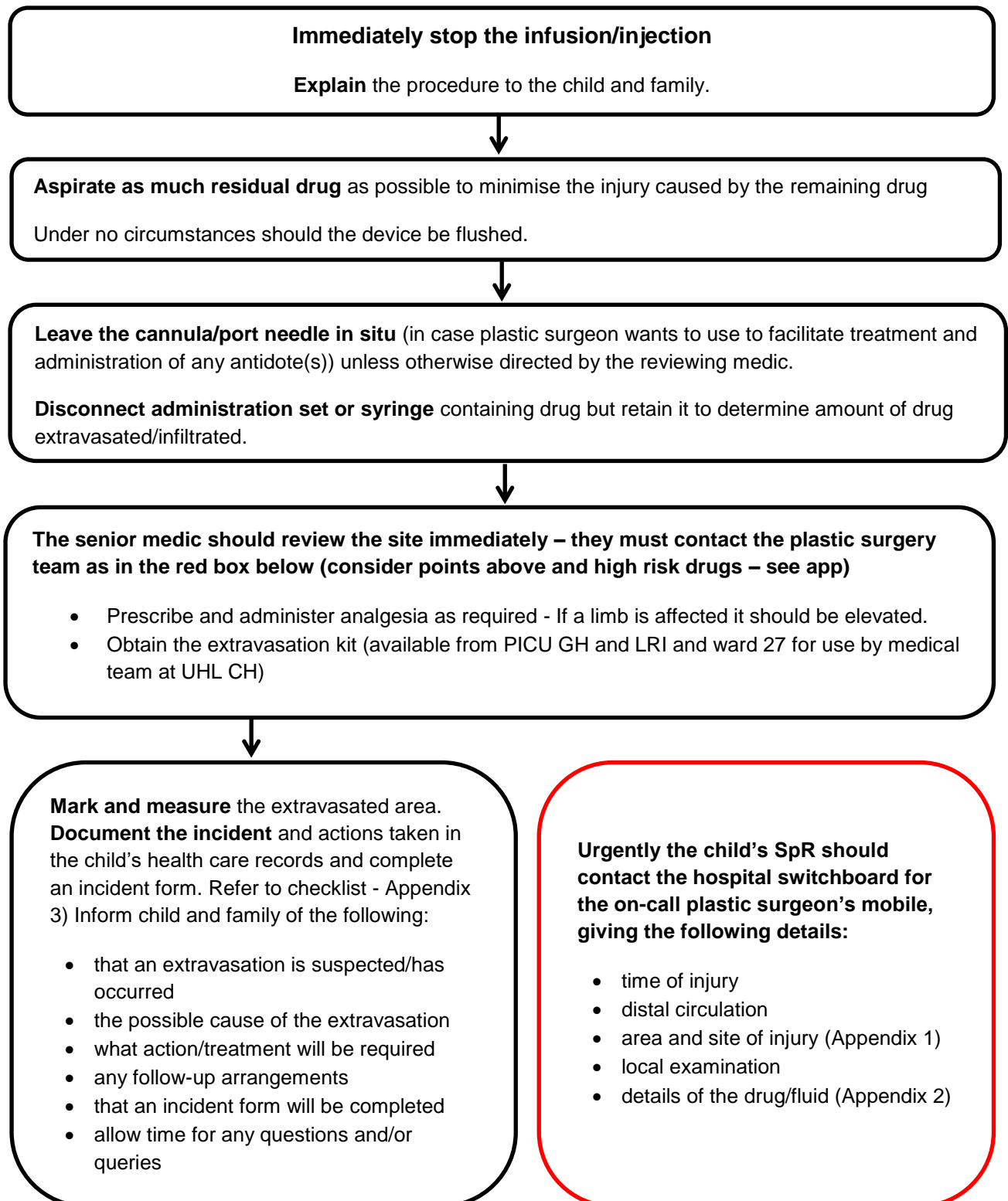
[IV \(Intravenous Therapy\) UHL Policy](#)

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Algorithm for Immediate Management of Extravasation

This is a medical emergency any time of the day or night. Compliance with guidelines is essential to minimise the complications associated with extravasation or infiltration



Early intervention and identification of the first signs and symptoms of infiltration and extravasation is crucial, in order to prevent serious adverse outcomes – see following pages for more detail

2. Guideline Standards and Procedures

Further Treatment

Treatment will be determined by the plastic surgeon or medical team but may include:

- Monitoring – the site will be observed, elevated and monitored to determine whether further treatment is required.
- Conservative management – this may involve the usage of hot or cold compresses or antidotes (if possible).
- Surgical management – this involves a saline washout, a procedure that dilutes the extravasated drug in the tissue

Saline washouts

Good results have been achieved with this technique when used at an early stage with adults and children.

The age of the child and the extent of the injury will determine if a local or general anaesthetic will be required.

Antibiotic prophylaxis maybe recommended in some patients depending on the severity – discuss with microbiology

Typical Saline washout technique for an injured area:

- Injected with the enzyme hyaluronidase.
- Peripheral incisions are made around the "clock face" of the injury.
- Using an atraumatic cannula the area is perfused with 0.9% sodium chloride.
- The washout efflux may be tested for decreasing concentrations of toxin.
- Dressing applied post-operatively and the limb elevated for 24 hours.

Ongoing Care

If the plastic surgery team have been involved follow their management plan, if not, follow the plan from the child's medical team. Further surgical intervention may be required and the child may need their injury to be reviewed as an outpatient.

If no action is required, observe the extravasation site for:

- colour
- sensitivity
- swelling
- fluid leakage from cannula/device site

The frequency of monitoring should be determined by the severity of the injury, or at least eight hourly, until the site regains its normal appearance and any changes documented. Signs such as erythema/ulceration can be delayed for 48 hours post-extravasation.

Documentation of the process is essential if litigation were to occur. This documentation will be recorded by both nursing staff and doctors. Consider using a Post-surgical Wound Review Care Plan. Refer to Appendix 3 for the checklist of points to record.

If limb involvement, elevate it (if appropriate, monitor the limb mobility of the child).

If the extravasation site deteriorates or its condition does not improve another referral must be made to the Plastic Surgery team.

Extravasation and infiltration - Background

This guideline covers the recognition, management and prevention of infiltration and extravasation injury. Risk factors are listed in Appendix 1

Infiltration

Infiltration is the inadvertent leakage of a non-vesicant solution from its intended vascular pathway (vein) into the surrounding tissue.

Infiltration is increasingly seen as a benign event as it generally does not lead to tissue necrosis; however a large volume of infiltrate can cause compression of nerves and acute limb compartment syndrome (ALCS) resulting in long-term disability.

If this is the case then surgical intervention e.g. fasciotomy may be required to prevent nerve compression and compromise of arterial circulation.

A plastic surgeon referral should be sought immediately where large volumes of infiltrate have accumulated.

Extravasation

Extravasation is the inadvertent leakage of a vesicant solution from its intended vascular pathway (vein) into the surrounding tissue. (See appendix 2)

A vesicant refers to any medicine or fluid with the potential to cause blisters, severe tissue injury (skin/tendons/muscle) or necrosis if it escapes from the intended venous pathway.

- Concentration of vesicant; the amount extravasated; and the type of vesicant are all factors which will influence the severity of the extravasation.
- The degree of injury ranges from mild skin reaction to severe necrosis. Other possible consequences include: infection; complex regional pain syndrome; and loss of function.
- In severe cases extravasation injury may lead to amputation

There has been little research into extravasation due to ethical considerations limiting controlled research; most evidence is based on small, uncontrolled trials or case reports.

Recognition of infiltration/extravasation

It is important for the nurse to be able to recognise the early signs and symptoms of infiltration and extravasation – common examples below

Peripheral cannula

Signs and symptoms of infiltration:

- coolness or blanching at the cannula insertion site
- swelling
- tenderness/discomfort
- taut or stretched skin
- leakage of fluid at the insertion site
- inability to obtain blood return (not always present)
- change in quality and flow of the infusion or injection
- numbness, tingling or 'pins and needles'
- Signs and symptoms of extravasation are as for infiltration plus:
 - burning, stinging pain
 - redness may occur followed by blistering, tissue necrosis and ulceration

Central Venous Access Devices (CVADs)

Signs and symptoms of infiltration and extravasation from CVADs

Event	Can occur with	Etiology	Potential objective manifestations	Potential subjective manifestations
Needle dislodgement	IVAP	Needle not in port, needle not stable/secured, incorrect needle length	Sudden swelling about port pocket or chest area; no or loss of blood return; palpable subcutaneous tissue; fluid leaking around needle	Pain, stinging, burning at port pocket or chest area
CVC damage	IVAP, tunneled CVC	Separation of port from catheter; nicked catheter at insertion	Swelling and erythema in port pocket or catheter tunnel with infusion; no or loss of blood return	Pain or burning around port or CVC tunnel with infusion
CVC pinch off	IVAP, tunneled CVC	Subclavian insertion medial to midclavicular line	Loss of blood return; swelling and erythema in clavicular area with infusion	Clavicular pain or burning with infusion
CVC tip displacement through SVC	IVAP, tunneled CVC, PICC	Early: difficult insertion; Late: unknown; thrombosis of SVC or great veins may increase risk	Intractable cough with infusion, pleural effusions, abnormal CXR/CT	Substernal chest pain, dyspnea, fatigue
CVC tip displacement from SVC	IVAP, tunneled CVC, PICC	Unknown, possible increased risk with severe coughing	Loss of blood return, erythema in neck (if CVC in IJV)	Discomfort in chest about CVC or tip with infusion of irritants or vesicants
Fibrin sleeve and back-tracking	IVAP, tunneled CVC, PICC	Fibrin sleeves are nearly universal; thrombosis is uncommon	Erythema at venous insertion site during infusion; backtracking can be confirmed by linogram	Discomfort at CVC insertion site

IVAP-implanted venous access port

CVC-central venous catheter

PICC-peripherally inserted central catheter

SVC-superior vena cava

IJV-internal jugular vein

CXR-chest x-ray

Distinguishing extravasation from other local reactions

Making the distinction between extravasation and other local reactions can be difficult. There are several conditions that resemble extravasation:

- flare reaction
- vessel irritation
- venous shock
- phlebitis
- hypersensitivity

KEY POINT

The principle differences between extravasation and the above conditions relates to the nature and timing of the patient's complaints, type and extent of erythema, and the location and presence of swelling (see table below).

When a nurse cannot differentiate between extravasation and a local reaction, the nurse should err on the side of caution and manage the patient as if an extravasation has occurred

Distinguishing extravasation from other conditions

Characteristic	Flare reaction	Vessel irritation	Venous shock	Extravasation
Presenting symptoms	Itchy blotches or hives; pain/burning uncommon	Aching & tightness	Muscular wall of blood vessel in shock (can be caused by very cold drugs or by rapid administration)	Prolonged pain/ burning common at injection site; stinging may occur during infusion
Colouration	Raised red streak, blotches or hive like erythema along the vessel; diffuse or irregular pattern	Erythema or dark discolouration along vessel	n/a	Erythema around needle/venepuncture site
Timing	Usually appears suddenly and dissipates within 30-90 minutes	Usually appears within minutes after injection. Colouration may only appear later in the process.	Usually appears right after the injection.	Symptoms start to appear right after injection, symptoms endure
Swelling	Unlikely	Unlikely	n/a	Occurs often; does not dissipate for several days
Blood return	Usually, but not always intact	Usually, but not always intact	Often absent	Usually absent or sluggish

For parent/patient information leaflet extravasation information leaflet which can be found at YourHealth www.yourhealth.leicestershospitals.nhs.uk

3. Education and Training

The education requirements for administering intravenous therapies to children is governed by the IV policy and Leicester Medicines Code (Section 13).

Local training/Education around extravasation management for staff who caring for children with a vascular access device

4. Monitoring Compliance

What will be measured to monitor compliance	How will compliance be monitored	Monitoring Lead	Frequency	Reporting arrangements
Monitoring of all Datix reports on extravasation	Extravasations highlighted by UHL reporting system	Risk & Pharmacy Teams	Monthly/Quarterly	Local Quality & Safety Board
Procedure used by all staff when treating extravasation to children (under 16yrs)	Peer review by LCAT assessment	Ward Sisters	Monthly/Quarterly	Senior Nurses Board

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6. Key Words

Extravasation, Infiltration, Necrosis, Vesicant

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	
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Details of Changes made during review: New guideline	

Appendix 1 - Risk factors for infiltration and extravasation

Device-related	<ul style="list-style-type: none"> • Peripheral cannula: • metal/steel needles (butterfly) • large gauge cannula relative to vein size • inadequately secured cannula • undesirable cannula site location (e.g. antecubital fossa, dorsum of hand or wrist rather than forearm, areas of joint flexion and use of dominant hand) • Central venous access device (CVAD): • CVAD surgically placed in an area prone to movement; difficult to secure • clot formation above cannula site • inadequately secured needle in implanted port • inadequately secured catheter • inappropriate needle length for Implanted Intravenous Access Port (IVAP) (i.e. too short to reach back of reservoir) • development of fibrin sheath/thrombus at catheter tip • IVAP (port)/catheter separation, catheter fracture or catheter dislodgement • flushing with a small gauge syringe
Drug-related	<ul style="list-style-type: none"> • vesicant potential • volume of drug/fluid infiltrated • repeated use of the same vein for vesicant administration • pH of drug/fluid (extremes of pH ie acid or alkaline - pH < 5 or >9) • osmolarity of drug/fluid (osmolarity >375 can influence the degree of tissue damage eg hypertonic drugs/solutions e.g. 10% Dextrose and parenteral nutrition solutions) • concentration of vesicant drug/fluid • vasoconstrictive potential (extravasation of vasoconstrictive substances e.g. dobutamine, dopamine, epinephrine, norepinephrine and vasopressin can cause ischaemic necrosis) • cytotoxicity (drugs that bind to DNA can cause greater damage and may remain in the tissues causing further damage)
Patient - related	<ul style="list-style-type: none"> • Age (very young or old) • Patients with small, fragile or thrombosed veins • Impaired communication- unable to communicate due to young age or confusion, sedation, inability to speak or language issues • Compromised circulation • Altered sensory perception • Poor understanding of risk related to anxiety or fear, cultural barriers or medicines • Active patient • Lymphoedema
Clinician - related	<ul style="list-style-type: none"> • Unfamiliarity with CVAD use and management • Administration • Interruptions or distractions during drug administration • Lack of intravenous therapy skills/knowledge

Appendix 2 - 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	<ul style="list-style-type: none"> • Vancomycin • Aciclovir, Ganciclovir • Gentamicin • Phenytoin • Amphotericin • Cefotaxime • Mycophenolate Mofetil • Vasocompressive agents • Dobutamine • Dopamine • Epinephrine (adrenaline) • Norepinephrine (noradrenaline) • Vasopressin
Concentrated electrolyte solutions	<ul style="list-style-type: none"> • Calcium chloride • Calcium gluconate • Potassium chloride • Sodium bicarbonate 4.2% & 8.4% • Sodium chloride 10%
Cytotoxic agents – Refer to East Midlands Cancer Alliance – search “extravasation”	<ul style="list-style-type: none"> • Busulphan • Actinomycin-D • Daunorubicin • Doxorubicin • Epirubicin • Idarubicin • Mitomycin • Paclitaxel • Treosulfan • Vinblastine • Vincristine • Vinorelbine
Hyperosmolar agents	<ul style="list-style-type: none"> • Total parenteral nutrition • >10% dextrose • Mannitol 15%
Other	<ul style="list-style-type: none"> • Radiographic contrast media • Promethazine (phenergan) • Diazepam • Digoxin

Appendix 3 – Documentation required after an extravasation injury

Ensure the following information is clearly listed in the patient notes

Tick	
	date and time of event
	patient's comments
	clinician's comments
	insertion site (precisely located by detailed anatomical descriptors or marking an anatomical drawing)
	photographs of the involved site
	catheter gauge and length
	non-coring needle gauge and length (IVAPs)
	type and volume of diluent
	administration by IV bolus, piggyback, gravity or pump (if a pump include infusion rate)
	appearance of the infusion site
	type and estimated volume of the extravasated drug
	techniques used to manage the extravasation
	use of antidotes or treatments
	description of wound care
	grade extent of injury
	notification of doctor, including time, information discussed and advice received
	outcome of surgical consultation when applicable
	description of follow up measures
	patient education
	signatures and credentials of all personnel involved
	complete incident form

Completed by:

Date: