

IV EXTRAVASATION MANAGEMENT

PRACTICE GUIDELINE®

DOCUMENT SUMMARY/KEY POINTS

- Intravenous extravasation is the inadvertent administration of a drug or IV fluid into the surrounding tissue which has the potential to cause tissue necrosis.
- Injuries are staged according to the degree of tissue involvement which also determines initial First Aid Management of the injuries.
- Stage 4 intravenous (IV) Extravasation is classified as a **Medical Emergency**.
- Immediate first aid management for hazardous drug extravasation follow the [SLAP](#) procedure.
- Children who are non-verbal, have a neuro-sensory deficit, an intellectual disability, and/or children receiving hazardous or irritant drugs are more at risk of extravasation injuries therefore should be closely monitored for behavioural cues suggesting pain or discomfort.
- All vascular device sites pose a risk for extravasation [peripheral and central].
- The SCHN [Intravenous Cannulation and Venepuncture Procedure](#) includes insertion care, monitoring and documentation.
- Provide appropriate education on extravasation including signs and symptoms to both patients and families prior to administration of medications.
- Early detection is important to minimise damage. Throughout the administration, request the patient and/or family to monitor the vascular device site and notify staff immediately if the child experiences any pain, burning, or change in sensation at the vascular device site.
- Thermal compresses should only be applied after determining if the extravasated drug requires a warm or cool compress (Refer [Table 1](#)). Applying a compress that is the wrong temperature can exacerbate the injury.

This document reflects what is currently regarded as safe practice. However, as in any clinical situation, there may be factors which cannot be covered by a single set of guidelines. This document does not replace the need for the application of clinical judgement to each individual presentation.

Approved by:	Director of Clinical Governance, SCHN	
Date Effective:	1 st October 2016	Review Period: 3 years
Team Leader:	Clinical Nurse Specialist	Area/Dept: Vascular Access

CHANGE SUMMARY

- CHW IV Extravasation Practice Guideline has been rescinded and is replaced by this SCHN version.
- Information found in the site-specific Hazardous & Cytotoxic Drugs: Administration and Handling Procedure will be amended to direct staff to the SCHN IV Extravasation Practice Guideline.
- This document has been updated to be in line with NSW Cancer Institute on-line resources found in eviQ.

READ ACKNOWLEDGEMENT

- All clinical staff working in clinical areas should read and acknowledge they understand the contents of this document.

This document reflects what is currently regarded as safe practice. However, as in any clinical situation, there may be factors which cannot be covered by a single set of guidelines. This document does not replace the need for the application of clinical judgement to each individual presentation.

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1 Extravasation Definition

Extravasation is defined as the inadvertent administration of a drug or IV fluid into the surrounding tissue instead of into the intended vascular pathway.

Extravasation has the potential to cause **tissue necrosis** which may result in the loss of the full thickness of the skin and underlying structures including: ^{1,2,3}

- Scarring around tendons, nerves and joints
- Contracture of affected limb
- Amputation of digits and limbs

Note: Extravasation injuries can occur in both peripherally or centrally inserted vascular devices: the term '**vascular device**' in the remainder of this document refers to ALL peripheral and central inserted devices.

2 Drug Definitions

Irritant agents have the potential to cause pain, aching, tightness and phlebitis in the vein or in the surrounding tissue during administration. There may be an inflammatory response, with or without erythema at the site. Often when an infiltration occurs with an irritant agent, local treatments such as application of heat or cold may improve the reaction and decrease the pain. Finally, irritant extravasations may cause sclerosis and hyperpigmentation along the vein. Usually the symptoms disappear without long-term sequelae.

Vesicant agents are those capable of causing tissue damage after leakage into a vein and may cause progressive tissue damage over time. An extravasation from a *peripheral vein* can cause reactions ranging from pain, erythema, and soft tissue damage, with or without necrosis. Extravasation from a *centrally inserted device* can result in acute inflammation of the surrounding tissues, erythema, soft tissue damage with or without necrosis, and potential structural damage, depending upon the cause of the extravasation.

Neutral agents are inert or neutral compounds which do not cause local damage or inflammation. However, if large volumes are extravasated tissue, damage can occur.

Hazardous agents may be classified as either irritant, vesicant or neutral agents dependent on the individual drug Refer [Table 1](#)

3 Risk Factors for Extravasation

Potential risk for extravasation exists for all patients with a vascular access device, irrespective of the child's age, site of vascular device or type of fluid being infused.

Patients who are non-verbal, have a neuro-sensory deficit, an intellectual disability, and or patients receiving hazardous or irritant drugs are more at risk.

Phlebitis induced by the acidity or alkalinity of an infusion solution/drug may lead to vasoconstriction and reduce flow around the infusion site which may result in leakage.

Patients requiring peripheral infusion of solution/drug and/or more frequent cannulation are at a higher risk of extravasation.

Other risk factors include:

- Covering the vascular device site so insertion site and surrounding area is not visible
- Poorly secured intravenous access device
- Tightly secured intravenous access device causing a tourniquet effect
- High infusion flow pressures on infusion pumps

Sites of Cannulation Risks

All cannula sites pose a risk for extravasation however incidence of extravasation is increased when the cannula is inserted in any of the following sites:

- Dorsum of the hand and foot
- Antecubital fossa
- Near joints
- Scalp
- Joint spaces where there is little soft tissue protection for underlying structures
- Limbs with local vascular problems may have reduced venous flow, causing pooling and potential leakage of infusion solution/drug around the site of cannulation.

4 Prevention Strategies

Refer to information regarding administration of hazardous and vesicants:

At CHW see: [Hazardous and Cytotoxic Drugs Administration and Handling – CHW](#)

At SCH see: [Cytotoxic and Hazardous Drugs: Administration and Handling – SCH](#)

- Antecubital veins should not be used to administer hazardous and/or vesicant solutions.
- If a peripheral cannula is being used to infuse a vesicant the cannula should not be greater than 24hours old.
- The administration of a hazardous vesicant via a peripheral, long or mid line must only be undertaken by Medical or accredited Nursing staff deemed appropriate by NUM and CNE of ward.
- Ensure the vascular device is patent, in the correct position and suitable for administration of a vesicant.
- Comply with:
 - **CHW** [Intravenous Fluid Management Practice Guideline](#)
 - **SCH** [Intravenous Fluid and Electrolyte Therapy Practice Guideline](#)
 - **Network** [Intravenous Cannulation and Venepuncture Procedure](#)
- Have a working knowledge and understanding of:
 - all types of intravenous access devices and infusion pumps
 - the drug/infusion solution being administered
 - irritants and vesicants
 - risks of infusing fluids or drugs at large volume and/or high rate
 - high risk medications. Refer to the **SCHN** [High Risk Medicines Register policy](#)
- Consider the insertion of a central line (e.g. PICC) where appropriate, to avoid administering irritant solutions via a peripheral vascular device for long periods of time. This is to reduce the risk of phlebitis and the risk of extravasation.
- Infuse solutions as per the [CHW Paediatric Injectable Medicines Handbook](#) &/or [Paediatric Injectable Guidelines \(4th Ed\)](#) adapted for SCH.
- Taping of vascular device & dressing type. **Ensure cannula is visible at all times.**
- Perform an hourly visual check of the line (as per [IV Cannulation and Venepuncture](#))
- Regular flushing of capped IV vascular devices
- Flush the intravenous access device prior to giving irritant vesicant & non-vesicants
- Ensure patency of line before beginning infusion by obtaining blood return
- Be able to recognise signs of infiltration/extravasation
- Cease the infusion/administration if device is difficult to flush, pain is experienced or swelling observed when flushing
- Documentation (skin integrity, infusion pump pressures, fluids/drugs infused and volume)

5 Staging of Extravasation Injuries

Extravasation injuries are staged according to the presentation of the device site and the surrounding area. The initial first aid treatment, ongoing management, reporting of and documentation for extravasation injuries *is different for each Stage* as per [Appendix 1](#).

Stage 1 extravasation injuries: the cannula will be **difficult to flush** and assessment reveals:

- No swelling
- May have leakage around site
- No blistering
- No hardened area
- Warm skin temperature
- Intact skin integrity
- Skin colour may be normal or may have discolouration
- Good palpable pulses on affected limb
- 1-2 second capillary return below site
- Pain at site

Stage 2 extravasation injuries: the cannula will be **difficult to flush** and assessment reveals:

- Slight/mild swelling
- May have leakage around site
- No blistering
- Possible hardened area
- Warm skin temperature
- Intact skin integrity
- Slight/mild blanching, redness or discolouration
- Good palpable pulses on affected limb
- 1-2 second capillary return below site
- Pain at site

Stage 3 extravasation injuries: *require review by the Plastics Registrar.* and you will **not be able to flush** the cannula and assessment reveals:

- Moderate swelling above and/or below the site
- Leakage around site
- May have blistering
- Hardened area around site
- Skin temperature is cool to touch
- Altered skin integrity
- Blanching of the skin, redness and/or discolouration which may be purple or black
- Good or weak palpable pulses on affected limb
- 2-3 second capillary return below site
- Pain at site

Stage 4 extravasation injuries: **medical emergency; requires immediate review.** You will **not be able to flush** the cannula and assessment reveals:

- Severe swelling above and/or below the site
- Leakage around site
- Blistering around site
- Hardened area around site
- Blanching of the skin, redness &/or discolouration which may be purple or black
- Skin temperature is cool or cold to touch
- Altered skin integrity
- Weak or absent palpable pulses on affected limb
- Greater than 4 second capillary return below site
- Pain may or may not be present at site as the degree of extravasation damage may mean reduced sensation therefore no pain felt

6 Initial First Aid Extravasation Injury Management

6.1 Immediate Management of a Hazardous Drug Extravasation

In addition to Prevention Strategies (section 4 above), the following should be implemented to avoid a hazardous drug extravasation⁴:

- Assess intravenous access site throughout administration of hazardous infusion.
- Do not attempt to give an intravenous drug unless you are confident of accessing the vein.
- Blood backflow must be confirmed for all CVADs prior to the administration of hazardous drugs. If blood flow is difficult or does not flow easily, consult MO for treatment of potential blockage or tip migration/malposition prior to administering hazardous drugs.
- Extravasation should be suspected if the patient complains of burning, stinging, pain or discomfort or there is swelling, oedema, erythema, leakage at the site. Inflammation and blistering are the late symptoms of an extravasation. In the event of a mixed drug extravasation it is recommended to act in accordance with the drug that has the most harmful properties.

In the event of a hazardous extravasation injury the initial management should occur as **SLAP**.

STOP the injection or intravenous infusion immediately.

LEAVE the central venous access device (CVAD) in place.

ASPIRATE any residual drug from the CVAD using a sterile syringe.

PLAN

- **CALL** **for assistance:** notify medical officer, pharmacist and or a senior nurse
- **COLLECT** the extravasation kit – Refer to [Section 11](#)
- **ASSESS** Drug extravasated, dose, volume
 Position and size of wound
 Amount and type of exudate
 Presence of swelling, oedema
 Extent and spread of erythema, trace the affected area with pen
 Pain
- **PHOTOGRAPH** the area – Refer to [SCHN Clinical Images Policy](#)
- **ADMINISTER** pain relief if indicated
- **INITIATE** appropriate drug specific management measures as per protocol
For Vinca Alkaloids, apply warm compress to the affect area for 15 minutes. Do not apply pressure or wrap the compress to the skin. For all other vesicants or irritants, apply a cold compress to the affected area for 15 minutes. For further management consult medical team.
- **REMOVE** the IV device or port needle. Do not apply pressure. If a central venous catheter is in situ this should remain in position - refer to a medical officer for further instructions
- **REFER** to a plastic surgeon if indicated

Note: CTCAE grading will be required for reporting back to study centre for patients enrolled on clinical trials.

6.2 Immediate Management - Non-Hazardous Drug Extravasation

- The initial Management of an extravasation injury is dependent on classification of the injury Stage (See [Appendix 1](#)).^{2,5}
- All extravasation injuries require immediate notification to the Team, Nurse in charge, documentation in the patient's clinical notes and completion of IIMs reports (see [Appendix 2](#)).

The drug or solution being infused may affect the management of the injury; however the initial first aid treatment for all extravasation injuries is as follows:

6.3 Stage 1 and Stage 2 Initial First Aid Treatment

- Stop the infusion; contact the team under whom the patient is admitted urgently and inform nurse in charge.
- Carefully examine site
- Assess patient for pain, administer pain relief if required
- Aspirate residual drug
- Determine if the intravenous access device should be removed. Determining factors include pain, drug and placement. If possible, attempt aspiration of non-hazardous vesicant through the IV device.
- Topical application of a warm or cold compress is then applied, depending upon the agent. (See [Table 1](#)) **Compresses are never applied on neonates.**
- Elevate the limb if applicable (See [Table 1](#))
- Report all extravasations to the Nurse in charge
- Arrange to have cannula resited if necessary
- Inform parents/carers
- Document in patient notes and complete an IIMS report if necessary
- Continue hourly observations of site or as clinically indicated

6.4 Stage 3 Initial First Aid Treatment

- Stop the infusion; contact the team under whom the patient is admitted urgently and inform nurse in charge.
- Attempt aspiration. Do not remove or flush the intravenous access device at this stage, wait for further instructions from Plastics Team.⁴
 - Recommendations for removal are equivocal. Guidelines exist for both immediate removal of the needle, as well as for its continued use as an access route to aspirate the extravasated solution.
- Carefully examine site
- Plastics registrar needs to be consulted and report extravasation to nurse in charge.
- Collect IV Extravasation Kit – Refer to [Section 11](#).
- Assess patient for pain, administer pain relief if required

- Topical application of a warm or cold compress is then applied, depending upon the agent (See [Table 1](#)) **Compresses are never applied on infants.**
- Elevate the limb if applicable (see [Table 1](#))
- Medical Officer to order removal of the intravenous access device if indicated.
- Photograph the site. Refer to [SCHN Clinical Images Policy](#).
- Apply dressing as per Plastics team orders.
- Inform parents/carers.
- Document in patient notes and complete an IIMS report.
- Continue hourly observations of the site or as clinically indicated.

6.5 Stage 4 Initial First Aid Treatment

- Stage 4 Extravasation injuries are a **medical emergency** and require **immediate review** by the Plastics Registrar. Contact the Plastics Team as soon as a Stage 4 Extravasation Injury is identified via a Rapid Response call.
- Stop the infusion, attempt aspiration, do not remove or flush the intravenous access device at this stage, wait for further instructions from plastics team.⁴
 - Recommendations for removal are equivocal. Guidelines exist for both immediate removal of the needle, as well as for its continued use as an access route to aspirate the extravasated solution.
- Carefully examine site
- Plastics registrar needs to be consulted and report extravasation to nurse in charge.
- Collect IV Extravasation Kit – refer to [Section 11](#)
- Assess patient for pain, administer pain relief if required
- Topical application of a warm or cold compress is then applied, depending upon the agent. (See [Table 1](#)) **Compresses are never applied on infants.**
- Elevate the limb if applicable (see [Table 1](#))
- Remove the intravenous access device if ordered to by MO
- Photograph the site. Refer to [SCHN Clinical Images Policy](#)
- Apply dressing as per Plastics team orders.
- Inform parents/carers.
- Document in patient notes and complete an IIMS report.
- Continue hourly observations of the site or as clinically indicated

7 Application of Compresses

The drug or agent causing the extravasation will determine whether or not a warm or cold compress should be applied to an IV Extravasation Injury. Refer to [Appendix 3](#) and [Table 1](#) for compress guidelines and when to apply a compress.

Compresses are never applied on infants.

- **Cold Pack:** Place in freezer for at least 2 hours prior to use, Wrap in a light towel before placing cold pack to required area. **Do not apply directly to skin.** The compress can be stored in the freezer until needed. In the absence of DRYPAC, a convenient source of ice and a pliable waterproof container may be used.
- **Hot Pack:** Place in hot water for approximately 5 mins (no more than 10 mins) until desired heat is achieved. Alternatively place in microwave for 20 seconds on normal power. Test the hot-pack before applying to ensure it is not too hot. If desired heat is not reached continue heating in microwave in 10 sec increments until desired temperature is reached.

Caution: Great care should be taken when heating in microwave as settings and outputs can vary. If there is any sign of bulging of the pack heating should stop immediately. Wrap in light towel before placing heat pack to the required area. **Do not apply directly to the skin.** In the absence of DRYPAC, a local source of hot water in a waterproof container may be used.

Do not apply warm or cool compresses for more than 15-20 mins. Compresses should be applied 4 times a day for a maximum of 48hours.⁵

While using compresses, it is important to maintain vigilant monitoring of the patients skin for marked increase in redness, swelling, pain, and oedema.

Do not use towels, or any other linen heated in a microwave as a warm compress.

8 Documentation of Extravasation

8.1 Clinical Progress Notes

Document an extravasation injury in the patients Clinical Progress Notes and include the following information:

- Date and time of incident
- Insertion site location
- Drug/fluid being administered at time of injury
- Rate and volume of infusion
- Approximate amount of drug extravasated
- Patient's symptoms and appearance of site including skin integrity
- Measure and document size of affected area using tape measure
- Initial First Aid Management provided

- Time parents/carers informed
- Time Nurse in Charge informed and their name/designation
- Time Medical Officer informed and their name/designation
- Photograph taken and consent obtained (if Stage 3 or 4 extravasation Injury). Use [Photography consent form](#). Refer to [SCHN Clinical Images Policy](#).

8.2 IIMs Report

An IIMs Report must be completed following an IV extravasation injury and should include the following information:

- Patient's MRN and name
- Date and Time of incident
- Incident Type – Medication/IV Fluid
- Incident description – please include the location of the injury and a description of the site, include any information on how the injury occurred if known, please use the word extravasation in the incident description to enable audits.
- Contributing Factors – enter any known contributing factors e.g. little vein, cannula in use for 5 days
- Medication/IV Fluid specific questions – select the drug(s), IV Fluids involved
- Initial Action taken – please document first aid undertaken.
- Please answer the yes no questions on Medical Staff and Family notified.

9 Treatment Plan

- For inpatients, injury to be reviewed every shift by the allocated nurse.
- Continue circulation observations as required.
- Continue hot/cold compresses for a maximum 48 hours. (Refer [Appendix 3](#) & [Table 1](#))
Can continue for comfort if not contra-indicated.
- Continue elevation of limb until swelling reduced and normal circulation returns.
- Discharged patients must be reviewed in 48-72hours.

10 Discharge Planning

- Discharge plan to be determined by treating team and/or plastics team following individual assessment of the injury.
- Follow up to be arranged with either GP, Outpatient Department or appropriate service dependant on extent of injury.
- Parents/carers must be consulted and education and relevant information provided.

11 Extravasation Kit

IV Extravasation Kits are available from:

- **At CHW:** from Pharmacy, Afterhours Drug Room, PICU, Camperdown Ward
- **At SCH:** Pharmacy, Afterhours Drug Cupboard, CICU, C2W, C3W

The Contents of the Extravasation Drug Kit include:

- 2x100mL DMSO – Dimethylsulphoxide 99% TOPICAL Solution
- 2x Hyaluronidase 1500 International Units
- [Appendix 2](#), [Appendix 3](#) and [Table 1](#) of the IV Extravasation Management
- The List of Contents of Extravasation Kit

11.1 Other Drugs and Equipment that may be required

Other **drugs** that may be required but are NOT in the Extravasation Kit are as follows:

- Phentolamine
- Sodium thiosulfate

These items can be obtained from the Pharmacy Department on presentation of a prescription on the Once Only section of the medication chart. The prescription should include the dose (if applicable), the route of administration, and the words for the “treatment of extravasation of..... (drug)”. This must be prescribed by the Plastics Team.

After hours, the ADON can be contacted to obtain supply from the After Hours Drug Room.

The **equipment** below may be required when treating an extravasation injury:

- chemoprotectant gloves
- disposable paper tape measures
- pH strips
- lignocaine

Appendix 1: Staging of Extravasation Injuries Table¹

SITE ASSESSMENT	STAGE 1	STAGE 2	STAGE 3	STAGE 4 MEDICAL EMERGENCY
Swelling	None	Slight/Mild	Moderate swelling above and or below the site of insertion	Severe swelling above and or below the site of insertion
Leakage	Yes/No	Yes/No	Yes	Yes
Blistering	No	No	Potential	Yes
Hardened Area	No	Possibility	Yes	Yes
Skin Colour	Unremarkable, may have discolouration at cannulation site	Slight/mild blanching, redness, may have discolouration at cannulation site	Blanching of the skin, redness &/or discoloration which may be purple or black	Blanching of the skin, redness &/or discoloration which may be purple or black
Site Temperature	Warm	Warm	Cool to touch	Cool to touch or cold
Skin integrity	Intact	Intact	Altered	Altered
Palpable Pulse	Good	Good	Good or weak	Weak or absent
Capillary refill	1-2 sec distal to site	1-2 sec distal to site	2-3 sec distal to site	> 4 sec distal to site
Flush	With difficulty	With difficulty	Unable to flush	Unable to flush
Pain at site	Yes	Yes	Yes	Yes/No Degree of extravasation may mean there is altered sensation to limb resulting in no pain at site

Appendix 2: IV Extravasation Initial First Aid Management

STAGE 1	STAGE 2	STAGE 3	STAGE 4
<ul style="list-style-type: none"> • Stop the infusion • Notify MO and nurse in charge • Carefully examine site • Assess patient for pain, administer pain relief if required • Aspirate residual drug • Remove the Intravenous access device • Topical application of a warm or cold compress is then applied, depending upon the agent (See Table 1) • Elevate the limb if applicable (See Table 1) • Report all extravasations to the Nurse in charge • Contact Medical Officer(MO) to resite • Inform parents/carers • Document in Patient Notes and complete IIMS report if necessary • Continue hourly observations of site or as clinically indicated 	<ul style="list-style-type: none"> • Stop the infusion • Notify MO and nurse in charge • Carefully examine site • Assess patient for pain, administer pain relief if required • Aspirate residual drug • Remove the Intravenous access device • Topical application of a warm or cold compress is then applied, depending upon the agent. (See Table 1) • Elevate the limb if applicable (See Table 1) • Report all extravasations to the Nurse in charge • Contact MO to resite • Inform parents/carers • Document in Patient Notes and complete IIMS report if necessary • Continue hourly observations of site or as clinically indicated • At CHW: Consider referral to Burns and Plastics Treatment Centre 	<ul style="list-style-type: none"> • Stop the infusion (do not remove or flush the intravenous access device at this stage) • Notify MO and nurse in charge promptly • Carefully examine site • Assess patient for pain, administer pain relief if required • Plastics registrar needs to be consulted and report extravasation to Nurse in charge • Aspirate as much residual drug as possible • Collect IV Extravasation Kit • Topical application of a warm or cold compress is then applied, depending upon the agent. (See Table 1) • Elevate the limb if applicable (see Table 1) • Remove the intravenous access device if ordered to by MO • Photograph the site • Apply dressing as per Plastics team orders • Inform parents/carers • Document in Patient Notes and complete IIMS report • Continue hourly observations of the site or as clinically indicated 	<ul style="list-style-type: none"> • Stop the infusion (do not remove or flush the intravenous access device at this stage) • Notify MO and nurse in charge urgently • Carefully examine site • Assess patient for pain, administer pain relief if required • Plastics registrar needs to be consulted and report extravasation to Nurse in charge • Aspirate as much residual /drug as possible • Collect IV Extravasation Kit • Topical application of a warm or cold compress is then applied, depending upon the agent. (See Table 1) • Elevate the limb if applicable (see Table 1) • Remove the intravenous access device if ordered to by MO • Photograph the site • Apply dressing as per Plastics team orders • Inform parents/carers • Document in Patient Notes and complete IIMS report • Continue hourly observations of the site or as clinically indicated

Appendix 3: Guidance on Management of Extravasation for Specific Drugs

Evidence in the area of extravasation management, for both chemotherapy and non-chemotherapeutic agents is extremely limited and often conflicting, with recommendations (particularly for chemotherapy) based on animal models, case reports and a limited number of small uncontrolled studies.

For drugs not listed in the attached drug table please discuss with medical staff the appropriate management and if necessary they are to contact the pharmacy department, drug information pharmacist or pharmacist on call.

Table 1 below provides guidance on the management of specific drug extravasations, including the use of compresses and specific antidotes where indicated. Management of the injury should be dependent on staging as described in [Appendix 2](#).

Antidotes should only be used under the direction of the Plastics Team

Antidotes for treating extravasation and Directions for Use

The reported benefits of antidotes are conflicting and no antidote has clear validation in clinical trials.

1. Dimethyl sulfoxide (DMSO) 99% solution:

DMSO enhances skin permeability thus facilitating the systemic absorption of the drug. It also has free radical scavenging properties. It may offer antibacterial, vasodilatory, anti-inflammatory, and analgesic effects. It has been shown in prospective studies to limit the course of anthracycline extravasation injuries^{6,7}

Directions:

- Apply a thin layer topically double the affected area with a swab stick. Skin should be dry prior to the application.
- Allow to air dry and do not cover
- Continue to apply THREE- FOUR times a day for 7-14 days
- Avoid contact when applying and by wearing double gloves

2. Hyaluronidase

Hyaluronidase is an enzyme that temporarily decreases the viscosity of hyaluronic acid, the ground substance or intracellular cement of the tissues.

Subcutaneous administration of hyaluronidase increases permeability into the tissues and facilitates absorption of the infiltrated solution by allowing diffusion of extravasated fluid over

a larger area. This minimizes tissue injury through rapid absorption and dilution in tissue fluids.

The enzyme has an almost immediate onset of action and 24 to 48 hour duration of effect on the "tissue cement."

The enzyme must be used promptly, i.e., within 60 minutes of the infiltration, since the potential for tissue damage increases with the duration of exposure to extravasated fluid.

Allergic reactions, usually manifested as urticaria, occur rarely; otherwise, clinical reports emphasize minimal or lack of toxicity. The enzyme should not be injected into cancerous, infected or acutely inflamed areas since there is a potential for disseminating infection or increasing the invasiveness or metastasis of neoplasms.⁸⁻¹⁴

Directions:

- Reconstitute 1500 IU vial with 1mL water for injection to produce 1500 IU/mL then further dilute to a final volume of 10mL (=150units/mL)
- After cleansing the infiltration site and surrounding area administer up to five injections of 0.2mL (30 units) subcutaneously or intradermally into the extravasation site using the pin Cushion Technique (use a 25-gauge needle). The needle should be changed after each injection. Contact the Plastics team for specific instructions for neonatal administration.
- The TOTAL DOSE required is VARIABLE and should be discussed with the Plastics team. The usual TOTAL dose is 150units.
- Swelling is usually significantly decreased within 15 to 30 minutes following hyaluronidase administration
- Hyaluronidase has been used to prevent tissue injury due to infiltration of hyperosmotic agents, in the acute management of phenytoin extravasation and high or low osmolality contrast medium.¹⁵

Hyaluronidase is not for intravenous administration.

3. Sodium Thiosulphate 25%:

Sodium thiosulphate is thought to have a direct inactivation or neutralization effect on chlormethine (mechlorethamine or mustine), and can chemically inactivate cisplatin.^{6,7}

Directions:

- Presentation: 10mL ampoule.
- Prepare solution 1/6M from 25% solution by mixing 1.6mL with 8.4mL water for injection [WFI] or 0.9% sodium chloride.
- Inject 2 mL into IV cannula for each 100 mg of cisplatin extravasated.
- Perform subcutaneous injections with a 25 gauge needle 3 - 4 times clockwise around the site.
- Repeat subcutaneous dosing. As per medication order

5. Phentolamine (Regitine®)

Phentolamine is an alpha-adrenoceptor blocker (vasodilator), which also has a direct action on vascular smooth muscle. It antagonizes the effect of alpha adrenergic drugs by reversing vasoconstriction, allowing the drug to be absorbed.¹⁶

Directions:

- Presentation: 10mg vials.
- Requires refrigeration
- The recommended dose of phentolamine is 5 to 10 mg, diluted in 10- to 15-mL sodium chloride 0.9%, injected with a fine hypodermic needle into the area of extravasation (defined by its cold, hard and pale appearance) s/c using pin cushion technique.
- Phentolamine should be administered within 12 hours of the infiltration; however, it is preferable to treat the injury as soon as possible. Phentolamine has been used successfully to prevent tissue injury due to infiltration of vasoconstricting agents listed in [Table 1](#).^{8,17-19}

Appendix 4: eviQ Chemotherapy Extravasation Flow Chart⁴

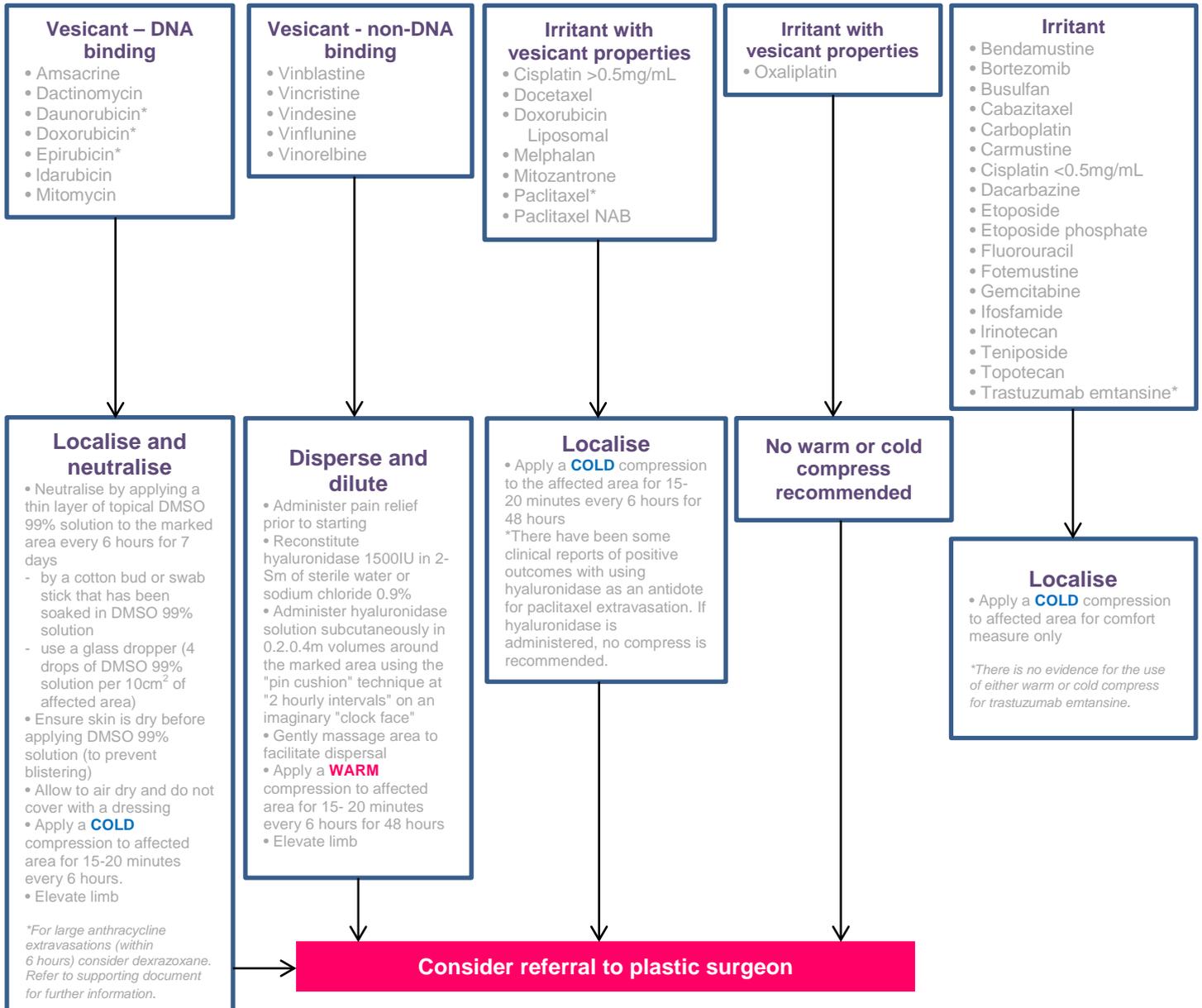
Your nearest extravasation kit is located at:

STOP: the injection or Intravenous infusion immediately

LEAVE: the venous access device (VAD) in place

ASPIRATE: any residual drug from VAD

PLAN: call for assistance notify medical officer, pharmacist or a senior nurse, collect the extravasation kit, assess the affected area, trace with a marker pen, photograph the area, remove the IV cannula or port needle, do not apply pressure, initiate appropriate drug specific management measures as per table below



- Complete Antineoplastic Drug Extravasation Assessment Tool and incident form as per individual institutional guidelines
- Referral for an urgent surgical review should be discussed and organised if appropriate
- Educate patient and provide information with appropriate treatment guidelines including signs and symptoms to monitor for and when to present to emergency.
- Arrange patient follow-up appointments to ensure extravasation is reviewed regularly – ranging from hours to weekly – based upon agent extravasated and degree of extravasation.
- Replace items in the extravasation kit including replacement drugs from pharmacy if required
- Please refer to supporting document – Extravasation Management for a comprehensive list of references used to develop this flowchart.

Table 1

If an extravasation injury has occurred with any of the drugs listed below, stop infusion immediately and contact the Team/Nurse in charge immediately. For further information for handling extravasation of hazardous drugs refer to [EviQ](#)⁴.

Drug Name	Category	Neutral / Irritant / Vesicant	Warm/Cold Compress	Antidote	Comments
Acetazolamide	Non-hazardous	Vesicant		No consensus or recommendation available	
Aciclovir	Non-hazardous	Vesicant	Cold compress	No consensus or recommendation available	
Actinomycin D	Hazardous	Vesicant	Cold compress	Dimethyl sulfoxide (DMSO) 99% solution ²⁰ Every 2 hours	
Adrenaline	Non-hazardous	Vesicant ²⁰	Warm compress	Phentolamine ^{8,16-19,21}	Ischemic necrosis secondary to local vasoconstriction can result from extravasation. ^{8,22-25}
Amsacrine	Hazardous	Vesicant	Cold compress	Dimethyl sulfoxide (DMSO) 99% solution	Apply compress 15-20 minutes four times daily for 48 hours
Aminophylline	Non-hazardous	Vesicant	Warm compress	No consensus or recommendation available	
Amiodarone	Non-hazardous	Irritant	Cold compress	No consensus or recommendation available	
Arsenic Trioxide	Hazardous	Non-Irritant (Neutral)	Not indicated	Not indicated	
Asparaginase (Colaspase/Leunase and Erwinia)		Non-Irritant (Neutral)	Not indicated	Not indicated	

Drug Name	Category	Neutral / Irritant / Vesicant	Initial First Aid	Antidote	Comments
Azathioprine	Hazardous	Irritant		No consensus or recommendation available	
Benzylpenicillin	Non-hazardous	Irritant		No consensus or recommendation available	
Bevacizumab	Hazardous	Non-Irritant (Neutral)	Not indicated	Not indicated	
Bleomycin	Hazardous	Non-Irritant (Neutral)	Not indicated	Not indicated	
Bortezomib	Hazardous	Irritant	Cold compress for comfort only	Not indicated	
Busulfan	Hazardous	Irritant	Cold compress	Not indicated	
Calcium Chloride	Non-hazardous	Vesicant	Warm compress	No consensus or recommendations available	Hypertonic solutions may cause prolonged depolarization and contraction of pre- and post-capillary smooth muscle sphincters, leading to tissue injury and ischemia 8,15,22,25-30
Calcium gluconate	Non-hazardous	Vesicant	Warm compress	No consensus or recommendation available	Soft tissue calcification (subcutaneous calcinosis) caused by extravasation. ¹³
Carboplatin	Hazardous	Irritant	Cold compress	Not indicated	
Carmustine	Hazardous	Irritant	Cold compress	Not indicated	May induce hyperpigmentation
Cefotaxime	Non-hazardous	Vesicant	Cold compress	No consensus or recommendations available	

Drug Name	Category	Neutral / Irritant / Vesicant	Initial First Aid	Antidote	Comments
Ceftriaxone	Non-hazardous	Unclassified	Cold compress (optional)	No consensus or recommendation available	Can cause phlebitis, pain, induration at injection site ¹³
Cidofovir	Hazardous	Non-Irritant (Neutral)	Cold compress	Not indicated	
Cisplatin <0.5mg/mL	Hazardous	Irritant	Cold compress for comfort only	Not indicated	Cisplatin extravasation treatment is only indicated for large volume extravasations (>20mL) of a concentrated solution (>0.5mg/mL). ³⁴
Cisplatin ≥0.5mg/mL	Hazardous	Irritant with vesicant properties	Cold compress	Not indicated	Apply compress 15-20 minutes four times daily for 48 hours. Doses of sodium thiosulfate for newborns and infants have not been established.
Cladribine	Hazardous	Non-Irritant (Neutral)	Not indicated	Not indicated	
Clarithromycin	Non-hazardous	Irritant	Cold compress	No consensus or recommendation available	
Clofarabine	Hazardous	Non-Irritant(Neutral)	Warm compress ³⁶	Not indicated	
Contrast	Non-hazardous	Vesicant	Warm compress	Treatment should be individualized if the extravasated volume is between 5 mL and 20 mL. ²⁶ Hyaluronidase can be considered if large volume contrast extravasation. ¹⁵ For ionic contrast media extravasation >20mL, surgical	Hypertonic solutions (e.g., radio contrast media) may cause prolonged depolarization and contraction of pre- and post-capillary smooth muscle sphincters, leading to tissue injury and ischemia. ^{7,15,22,25-30} Hyperosmolar solutions (e.g., conventional ionic contrast media) exert osmotic pressure, and may result in compartment syndrome if infiltration occurs ^{8,15,26}

Drug Name	Category	Neutral / Irritant / Vesicant	Initial First Aid	Antidote	Comments
				drainage within 6 hours should be considered.	
Co-trimoxazole	Non-hazardous	Unclassified	Cold compress	No consensus or recommendation available	
Cyclophosphamide	Hazardous	Non-Irritant (Neutral)	Not indicated	Not indicated	
Cytarabine	Hazardous	Non-Irritant (Neutral)	Not indicated	Not indicated	
Dacarbazine	Hazardous	Irritant	Cold compress	Not indicated	Protect exposed skin from light
Dactinomycin	Hazardous	Vesicant	Cold compress	Dimethyl sulfoxide (DMSO) 99% solution	Apply compress 15-20 minutes four times daily for 48 hours. Do not apply heat, it may worsen injury. Protect site from heat and sunlight.
Daunorubicin	Hazardous	Vesicant	Cold compress	Dimethyl sulfoxide (DMSO) 99% solution	Apply compress 15-20 minutes four times daily for 48 hours. Do not apply heat, it may worsen injury. Protect site from heat and sunlight. Corticosteroids worsen toxicity; Do not use.
Daunorubicin Liposomal	Hazardous	Irritant with vesicant properties	Cold compress	No recommended antidote	
Diazepam	Non-hazardous	Vesicant (Irritant)	Cold compress	No consensus or recommendation available	

Drug Name	Category	Neutral / Irritant / Vesicant	Initial First Aid	Antidote	Comments
Digoxin	Non-hazardous	Vesicant	Cold compress	No consensus or recommendation available	
Dobutamine	Non-hazardous	Irritant	Warm compress	Phentolamine ^{8,16-19,21}	
Dopamine	Non-hazardous	Irritant	Warm compress	Phentolamine ^{8,16-19,21}	Ischemic necrosis secondary to local vasoconstriction can result from extravasation of sympathomimetic agents including dobutamine, dopamine, epinephrine, metaraminol, and norepinephrine ^{8,22-25}
Doxorubicin	Hazardous	Vesicant	Cold compress	Dimethyl sulfoxide (DMSO) 99% solution	Elevate site of extravasation Protect site from heat and sunlight. Corticosteroids worsen toxicity; Do not use.
Doxorubicin Liposomal	Hazardous	Irritant with Vesicant properties	Cold compress	<i>No recommended antidote</i> Do NOT use DMSO 99% solution	Apply compress 15-20 minutes four times daily for 48 hours.
Droperidol	Non-hazardous	Vesicant	Cold compress (optional)	No specific antidote	
Epirubicin	Hazardous	Vesicant	Cold compress	Dimethyl sulfoxide (DMSO) 99% solution	Apply compress 15-20 minutes four times daily for 48 hours.
Erythromycin	Non-hazardous	Irritant	Cold compress	No consensus or recommendation available	

Drug Name	Category	Neutral / Irritant / Vesicant	Initial First Aid	Antidote	Comments
Esmolol	Non-hazardous	Vesicant	Cold compress (optional)	No consensus or recommendation available	
Etoposide	Hazardous	Irritant	Cold compress for comfort only	Not indicated	
Etoposide Phosphate	Hazardous	Irritant	Cold compress for comfort only	Not indicated	
Fludarabine	Hazardous	Non-Irritant (Neutral)	Not indicated	Not indicated	
Fluorouracil	Hazardous	Irritant	Cold compress	Not indicated	
Foscarnet	Non-hazardous	Irritant	Cold compress	No consensus or recommendation available	
Ganciclovir	Hazardous	Non-Irritant (Neutral)	Not indicated	Not indicated	
Gemcitabine	Hazardous	Irritant	Cold compress for comfort only	Not indicated	Phlebitis and pain not to be confused with extravasation
Glucose	Non-hazardous	Irritant	Warm compress	No consensus or recommendation available	Hypertonic solutions may cause prolonged depolarization and contraction of pre- and post-capillary smooth muscle sphincters, leading to tissue injury and ischemia. 8,15,22,25-30
Hypertonic saline (>5%)	Non-hazardous	Vesicant	Warm compress	No consensus or recommendation available	

Drug Name	Category	Neutral / Irritant / Vesicant	Initial First Aid	Antidote	Comments
Idarubicin	Hazardous	Vesicant	Cold compress	Dimethyl sulfoxide (DMSO) 99% solution	Apply compress 15-20 minutes four times daily for 48 hours. Elevate site of extravasation Corticosteroids worsen toxicity
Ifosfamide	Hazardous	Irritant	Cold compress (optional)	Not indicated	
Irinotecan	Hazardous	Irritant	Cold compress for comfort only	Not indicated	
Iron sucrose (venofer)	Non-hazardous	Vesicant	Cold compress	No consensus or recommendation available	
Mannitol	Non-hazardous	Vesicant	Cold compress		
Melphalan	Hazardous	Irritant with Vesicant properties ^{20,34}	Cold compress	No recommended antidote	Apply compress 15-20 minutes four times daily for 48 hours. Elevate site of extravasation
Metaraminol	Non-hazardous	Irritant	Warm compress	Phentolamine ^{8,16-19,21}	Ischemic necrosis secondary to local vasoconstriction can result from extravasation of sympathomimetic agents including dobutamine, dopamine, epinephrine, metaraminol, and norepinephrine ^{8,22-25}
Methotrexate	Hazardous	Non-Irritant (Neutral)	Not indicated	Not indicated	

Drug Name	Category	Neutral / Irritant / Vesicant	Initial First Aid	Antidote	Comments
Mitomycin C	Hazardous	Vesicant	Cold compress	Dimethyl sulfoxide (DMSO) 99% solution	Apply compress 15-20 minutes four times daily for 48 hours. Protect extravasation site from heat and sunlight. Delayed injuries from Mitomycin have been documented at sites distant from the site of extravasation
Mitozantrone	Hazardous	Irritant with Vesicant properties	Cold compress	No recommended antidote	Apply compress 15-20 minutes four times daily for 48 hours.
Noradrenaline	Non-hazardous	Vesicant	Warm compress	Phentolamine ^{8,16-19,21}	
Omeprazole	Non-hazardous	Irritant		No consensus or recommendation available	
Oxaliplatin	Hazardous	Irritant with Vesicant Properties	No warm or cold compress recommended	No recommended antidote	Early administration of corticosteroids may be beneficial to decrease inflammation
Paclitaxel	Hazardous	Irritant with Vesicant properties	Cold compress	There have been some clinical reports of positive outcomes with using hyaluronidase. If hyaluronidase is administered no compress is recommended	Apply compress 15-20 minutes four times daily for 48 hours. Elevate site of extravasation
Phenobarbitone	Non-hazardous	Irritant	Cold compress	No consensus or recommendation available	

Drug Name	Category	Neutral / Irritant / Vesicant	Initial First Aid	Antidote	Comments
Phentolamine	Non-hazardous	Irritant	Cold compress	No consensus or recommendation available	
Phenytoin	Non-hazardous	Vesicant	Warm compress	Hyaluronidase	
Potassium Chloride (>40mmol/L)	Non-hazardous	Vesicant	Warm compress	No consensus or recommendation available	Hypertonic solutions may cause prolonged depolarization and contraction of pre- and post-capillary smooth muscle sphincters, leading to tissue injury and ischemia. 8,15,22,25-30
Promethazine	Non-hazardous	Irritant	Cold compress	No consensus or recommendation available	
Sodium Bicarbonate	Non-hazardous	Vesicant	Warm compress	No consensus or recommendation available	
Teniposide	Hazardous	Irritant	Cold compress for comfort only	Not indicated	Elevate site of extravasation
Thiopentone	Non-hazardous	Vesicant	Cold compress	No consensus or recommendation available	
Thiotepa	Hazardous	Non-Irritant (Neutral)	Not indicated	Not indicated	
Topotecan	Hazardous	Irritant	Cold compress for comfort only	Not indicated	
Treosulfan	Hazardous	Irritant with vesicant properties			

Drug Name	Category	Neutral / Irritant / Vesicant	Initial First Aid	Antidote	Comments
TPN	Non-hazardous	Vesicant	Warm compress	Hyaluronidase ²⁰	Hyperosmolar solutions (e.g. parenteral nutrition and conventional ionic contrast media) exert osmotic pressure, and may result in compartment syndrome if infiltration occurs ^{8,15,26}
Vancomycin	Non-hazardous	Irritant	Cold compress	No consensus or recommendation available	
Vinblastine	Hazardous	Vesicant	Warm compress	Hyaluronidase	Apply compress 15-20 minutes four times daily for 48 hours. Corticosteroids and topical cooling worsen toxicity.
Vincristine	Hazardous	Vesicant	Warm compress	Hyaluronidase	Apply compress 15-20 minutes four times daily for 48 hours. Corticosteroids and topical cooling worsen toxicity.
Vindesine	Hazardous	Vesicant	Warm compress	Hyaluronidase	Apply compress 15-20 minutes four times daily for 48 hours. Phlebitis and pain not to be confused with extravasation.
Vinorelbine	Hazardous	Vesicant	Warm compress	Hyaluronidase	Apply compress 15-20 minutes four times daily for 48 hours. Phlebitis and pain not to be confused with extravasation Corticosteroids and topical cooling worsen toxicity.

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