INTRAVENOUS 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 damage
- Injuries are classified 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 and requires escalation as per Between The Flags (BTF) : Clinical Emergency Response System (CERS)
- Immediate first aid management for hazardous and cytotoxic 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 and therefore should be closely monitored for behavioural cues suggesting pain or discomfort.
- Peripheral and central vascular access devices should be monitored regularly while in use to assess for signs and symptoms of development of an extravasation injury.
- Early detection is important to minimise damage to surrounding tissue. Throughout the administration of intravenous fluids and medication, request the patient and/or family to monitor the vascular access device site and notify staff immediately if they have any concerns. The vascular device site should also be checked regularly by nursing staff during use.
- For guidance on the most appropriate intravenous device for your patient, please refer to the SCHN Peripheral Intravenous Catheters - Clinical Standard Procedure Document or the SCHN Central Venous Access Device Practice Guideline

Approved by:	SCHN Policy, Procedure and Guideline Committee	
Date Effective:	1st February 2023	**Review Period**: 3 years
Team Leader:	Vascular Access Clinical Nurse Specialist 2	**Area/Dept**: Vascular Access

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CHANGE SUMMARY

- Revised Extravasation grading tool
- Inclusion of a medication list identifying those at high risk
- Link to eVIQ for antidotes.
- **10/02/23:** Minor review.
  - Link to *Appendix B: Intravenous Extravasation Risk: Medication List* added to change summary
  - All documents are able to be printed from auxiliary document page on ePolicy
  - Clarification: In the event of an extravasation of a hazardous drug the initial management should occur as SLAP (Page 8).
- **26/07/23**: Minor review to update locations of Extravasation kits, see Appendix 1.
- **21/08/23**: Minor review. Location of Extravasation kits updated to include OTC and Variety, see Appendix 1.
- **07/12/23**: minor review.
  - Updated image on Appendix B: Intravenous Extravasation Risk: Medication List
  - Amended Appendix F Application of compresses where staff should consult with Medical team for treatment options, and if they are unsure, then consult the on-call pharmacist.

READ ACKNOWLEDGEMENT

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

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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 (Clark et al. 2013).

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: (Simona 2012; Little 2020).

- Scarring around tendons, nerves and joints
- Contracture of affected limb
- Amputation of digits and limbs
- Moderate to severe extravasation injuries have the potential to cause long term pain and tissue damage, increase hospital length of stay and cause significant distress for the patient and family (Simona, 2012).

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

2 Drug Definitions

These definitions can be found at the eVIQ resource page.

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 can cause reactions ranging from pain, erythema, and soft tissue damage, with or without necrosis. These injuries 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. These drugs include Vasoactive medications or Vasopressors, further information regarding these can be found in Appendix C.

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

Cytotoxic/ Hazardous agents may be classified as either irritant, vesicant or neutral agents dependent on the individual drug, review via eviQ

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 or type of vascular device or type of fluid or medication being infused.

Additional risk factors for extravasation include (Clark et. al 2013; Tofani et. al 2012; Moureau 2019):

- Device related factors
  - Length of catheter in vein
  - History of difficult IV access and multiple cannulation attempts
  - Unfavourable insertion site e.g. over area of flexion
  - Poor dressing adherence and securement of the device
  - Port needle dislodgement
  - Retrograde flow on injection secondary to complete fibrin sheath development
  - Catheter damage or breakage
- Patient risk factors
  - Small, fragile veins
  - Communication skills/impaired communication
  - Activity level
  - Neurological or cognitive impairment
- Medication/infusion related factors
  - Irritant or vesicant potential of the drug
  - Drug concentration
  - High flow pressure (e.g. use of infusion pump or syringe driver)
  - Volume of drug/infusion administered
  - Chemical properties of the drug e.g. pH, osmolarity.
  - Repeated administration of irritant or vesicant via the same vein

4 Prevention Strategies

Refer to information regarding administration of hazardous and vesicants:

At SCHN see: Hazardous and Cytotoxic Medications - Administration and Handling

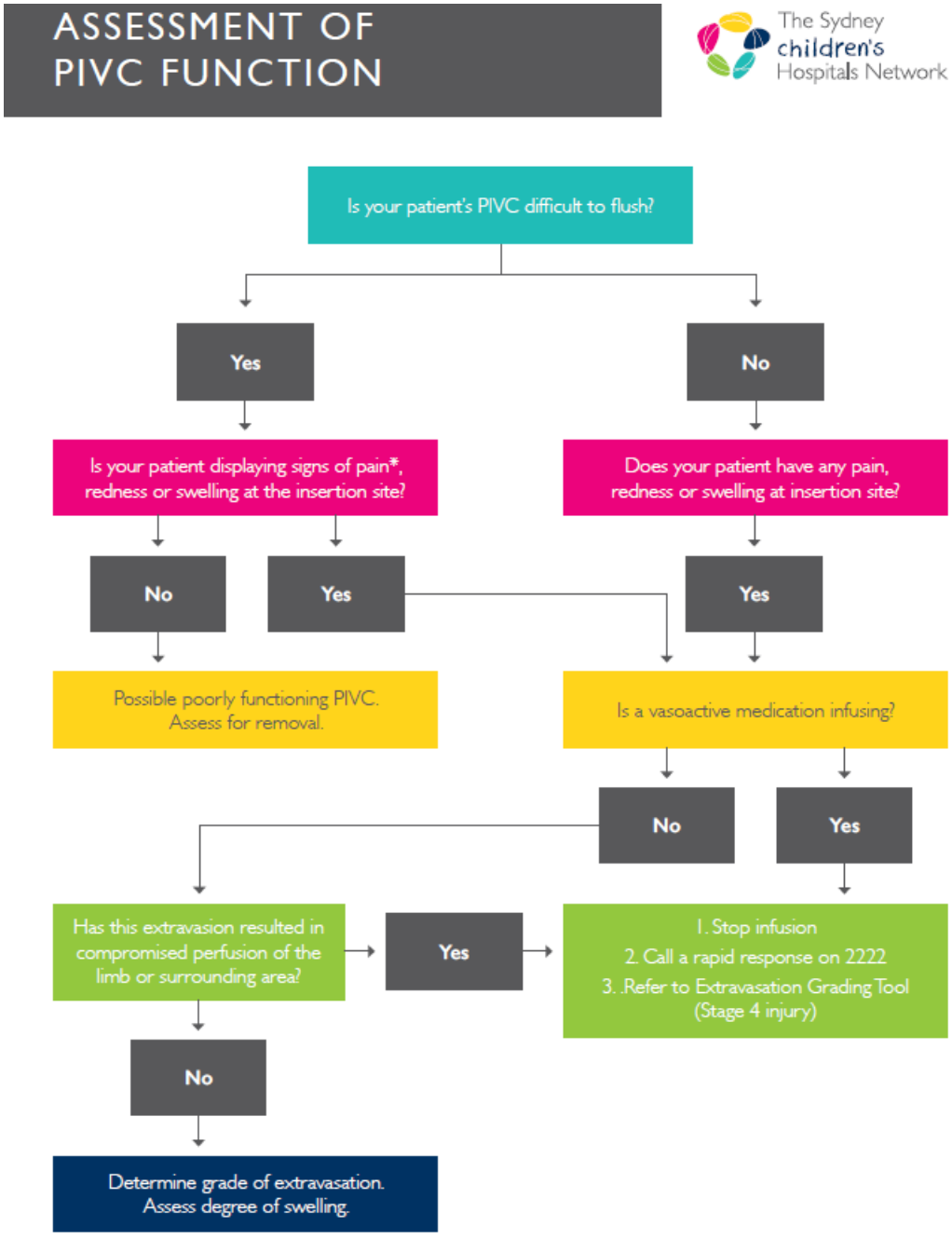
Ensure appropriate vascular access device choice and maximise first insertion success and escalate patients with difficult IV access in accordance with the SCHN Peripheral Intravenous Catheters - Clinical Standard

- Identify and implement prevention strategies for patients considered to be at high risk of developing an extravasation injury
- Avoid vascular access device insertion over areas of flexion if possible e.g. antecubical fossa.
- Ensure the vascular access device is patent, in the correct position and suitable for administration of a vesicant prior to administration.
- Comply with:
  - Intravenous Fluid Management – CHW
  - Intravenous Fluid and Electrolyte Therapy - SCH
- Clinical staff must complete the recommended education and training prior to the use of vascular access devices, administration of intravenous medications and fluids and administration of high risk medications.
- Consider the insertion of a central venous access device (CVAD) where appropriate, to avoid administering irritant or vesicant solutions via a peripheral venous access device for an extended period of time. This is to reduce the risk of phlebitis, thrombosis and the risk of extravasation.
- Infuse solutions as per the Paediatric Injectable Medicines Handbook
- Ensure the vascular access device is dressed using a sterile, transparent semi-permeable dressing and secured in accordance with the Central Venous Access Devices (CVAD) and the SCHN Peripheral Intravenous Catheters - Clinical Standard and ensure adequate ability to visualise the vascular access device insertion site.
- Ensure regular flushing of vascular access devices to assess and maintain patency including prior to the administration of vesicant and non-vesicant medications and intravenous fluids
- Ensure patency of vascular access device before beginning infusion by ensuring the device flushes without pain or resistance (also obtaining blood return if administration is via a CVAD). If device occlusion is encountered, cease the infusion and refer to the assessment of PIVC function decision tree or the Central Venous Access Devices (CVAD) practice guideline for recommended management of impaired vascular access device function.
- Undertake regular assessment of peripheral IV and CVADs as per the Central Venous Access Devices (CVAD) and the SCHN Peripheral Intravenous Catheters - Clinical

Standard guidelines and complete the recommended documentation of vascular access devices.

- Ensure vascular access devices are assessed for removal when no longer clinically required

5 The assessment of PIVC function: Decision tree



Immediate Management of a Hazardous Drug Extravasation

This can be found on The Extravasation management page on EVIQ

- 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 an extravasation of a hazardous drug the initial management should occur as SLAP

STOP the injection or intravenous infusion immediately.

LEAVE the vascular access device in place.

ASPIRATE any residual drug from the vascular access device using a sterile syringe.

PLAN

- **CALL** **for assistance:** notify medical officer, pharmacist and/or a senior nurse
- **COLLECT** the extravasation kit – Refer to Appendix A
- **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
- **PHOTOGRAPH** the area – Refer to SCHN Clinical Images Policy
- **ADMINISTER** pain relief if indicated
- **INITIATE** appropriate drug specific management measures as per protocol
- **REMOVE** the vascular access device or Port needle once instructed by treating team. Do not apply pressure. If a central venous access device is in situ this should remain in position - refer to a medical officer for further instructions
- **REFER** to a plastic surgeon if indicated

6 Extravasation Grading and Management of Non Hazardous Drugs

EXTRAVASATION GRADING TOOL

All PIVC sites need to be reviewed hourly and whenever any concerns are voiced by the child and/or their carer.

When reviewing PIVC sites, clinicians should look for signs of pain, swelling, redness or difficulty when flushing the PIVC.

When assessing the site and grading an extravasation injury please use the following table. An injury is graded based on the worst observation or symptom. The colours used in the table align with the Between the Flag escalation principles.

	Signs/ symptoms	Who to call	Nursing management
Stage 0	• Nil pain, swelling or redness • PIVC patent and easy to flush	N/A	• Continue hourly observations
Stage 1 All extravasation of vasoactive medicine must be treated as a stage 4	• Pain present at site • PIVC difficult to flush • Mild swelling, only to immediate PIVC site. • Area of swelling less than 30%	• Inform parents/carers • Contact the admitting team • Inform nurse in charge	• Stop the infusion • Carefully examine site using the touch, look, compare tool for observation • Remove PIVC • Assess for pain use developmentally appropriate pain assessment tool • Elevate the limb • Continue hourly observations of site as clinically indicated • Document in eMR and complete an incident report
Stage 2 All extravasation of vasoactive medicine must be treated as a stage 4	**Signs of stage 1 and:** • Swelling noted above and/or below site • If measured area of swelling less than 30% • Redness • 1-2 second capillary return below site	• Inform parents/carers • **Clinical Review 2222** for review by admitting team or follow escalation procedures in ED/ ICU • Inform nurse in charge	• Stop the infusion • Carefully examine site • Assess patient for pain, administer pain relief if required • Aspirate residual drug if possible then remove PIVC • Elevate the limb • Continue hourly observations of site as clinically indicated, observe for potential skin breakdown • Document eMR and complete a wound management chart and an incident report
Stage 3 All extravasation of vasoactive medicine must be treated as a stage 4	**Signs of stage 2 and:** • Moderate swelling • Swelling measuring at 30% or greater • Blanching Redness • Skin cool to touch • Blistering	• Inform parents/carers • **Clinical Review 2222** for review by admitting team or follow escalation procedures in ED/ ICU and inform nurse in charge. • Request plastics consult from team	• Stop the infusion • Aspirate residual drug if possible • Elevate the limb • Remove any additional restrictive securing tape (e.g. securing arm board) but keep PIVC in place if possible • Carefully examine site • Collect IV Extravasation Kit • Assess patient for pain, administer pain relief if required • Continue hourly observations of the site and circulation observations of the affected limb as clinically indicated. • Document eMR and complete a wound management chart and an incident report • Photograph the site. Refer to SCHN Clinical Images Policy
Stage 4 **Please note** All extravasation of vasoactive medicine must be treated as a stage 4	**Signs of stage 3 and:** • Significant swelling • Decreased capillary return distal to PIVC site • Skin breakdown and/or blistering • Decreased pulse distal to site	• Inform parents/carers • **Stage 4 Extravasation injuries are a medical emergency and require immediate review by Rapid Response** • Inform nurse in charge • Ensure admitting team contacts the Plastics Team as soon as a Stage 4 Extravasation Injury is identified	• Stop the infusion, attempt aspiration, do not remove or flush the intravenous access device • Elevate the limb if applicable • Remove any additional restrictive securing tape (e.g. securing arm board) but keep PIVC in place if possible • Carefully examine site • Collect IV Extravasation Kit • Assess patient for pain, administer pain relief if required • Continue hourly observations of the site and circulation observations of the affected limb as clinically indicated. • Document eMR and complete a wound management chart and an incident report • Photograph the site. Refer to SCHN Clinical Images Policy

This document is able to be printed from Extravasation Grading Tool, auxiliary document

7 Documentation of Extravasation Injuries

7.1 Handing Over

Ensure the following information is included when handing over the injury:

- Where is the vascular access device inserted?
- What was infusing?
- How much was infusing (approximately)?
- How is the perfusion above and below the injury site?
- What stage is the injury?
- How much swelling is present?
- What damage to the skin integrity has occurred?
- What first aid/ nursing interventions have been initiated?

7.2 Documentation

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
- % of extravasation swelling and amount of fluid if known
- 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.
- Enter this as an incident into ims+ and record the incident number in the medical records

8 Discharge Planning

- Discharge plan including need for follow up of dressings/ wound management 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.

Appendix A: Extravasation Kit

- Extravasation kit - recommended contents
- These Kits can be located in the flowing places:
  - Camperdown Ward
  - CICU
  - C2W
  - C2N
  - Oncology Treatment Centre (OTC)
  - Variety Ward
  - Pharmacy
  - Afterhours Drug Cupboard
- If any items are used or if products or drugs have expired, replacement should be arranged through Pharmacy.

Appendix B: Intravenous Extravasation Risk: Medication List

Intravenous Extravasation Risk

This is an estimate of risk for phlebitis or local tissue injury due to extravasation from any intravenous infusion device.
For Treatment of Extravasation, Refer to SCHN Extravasation Management Guideline
This does not apply in situations of emergency medical treatment.
If a medication is not on this list, please contact Pharmacy for information

No intravenous infusion or injection is "safe"
Extravasation of any IV medication or fluid may result in serious harm, including compartment syndrome, causing ischaemia and loss of tissue or permanent loss of limb function.

Red
Higher Risk

Aciclovir
Alprostadil
Amiodarone
Ascorbic Acid
Caffeine citrate
Calcium (all salt forms)
Diazoxide
Doxycycline
Epoprostenol
Esmolol
Fluorescein
Foscarnet
Glucose > 12.5%
Iron (all salts)
Isoprenaline
Mannitol
Promethazine
Potassium ≥ 40 mmol/L (all salt forms)
Sodium bicarbonate ≥ 3%
Sodium chloride ≥ 3%
Sodium nitroprusside
TPN
Vasopressors (see appendix)
All Cytotoxic / hazardous medications

Yellow
Intermediate Risk

Acetazolamide
Alteplase
Amikacin
Arginine
Atropine
Ciprofloxacin
Clonazepam
Cyclizine
Glucose 10% to ≤ 12.5%
Dantrolene
Diazepam
Digoxin
Diphenhydramine
Droperidol
Erythromycin
Flucloxacillin
Glyceryl Trinitrate
Glycopyrronium Bromide
Hydralazine
Lorazepam
Magnesium (all salt forms)
Midazolam
Milrinone
Morphine
Mycophenolate
Neostigmine
Neuromuscular Blocking Agents
Ondansetron
Phenobarbital
Phenytoin
Potassium < 40 mmol/L (all salt forms)
Propofol
Protamine
Quinine
Radiographic contrasts
Sulfamethoxazole / Trimethoprim (Bactrim)
Tetracosactide
Thiopental sodium
Vancomycin
Zinc

All medicines containing propylene glycol (excipient)

Green
Lower Risk

Acetylcysteine
Aminophylline
Amphotericin B Liposomal
Ampicillin
Benzylpenicillin
Cefazolin
Cefotaxime
Clindamycin
Compound Sodium Lactate (Hartmann's) Solution
Defibrotide
Glucose <10%
Fentanyl
Fluconazole
Flumazenil
Fosphenytoin
Furosemide
Gentamicin
Haloperidol
Hyoscine Butylbromide
Indometacin
IV Immunoglobulin (IVIG)
Labetalol
Lacosamide
Lidocaine (lignocaine)
Linezolid
Nimodipine
Omeprazole
Pamidronate
Pantoprazole
Pentamidine
Piperacillin / Tazobactam
Rifampicin
Sodium chloride < 3%
Valproate Sodium

Appendix C: Vasoactive medications: Vasopressors:

Extravasation of a vasopressor causes swelling and local hypothermia, followed by purple discolouration and extreme pain. The resulting necrosis may require aggressive tissue debridement, grafting or amputation.

For the purpose of extravasation management, vasopressors include:

Medication	Antidote for extravasation	Other management
Adrenaline (epinephrine)	**Phentolamine** Dilute 5 to 10 mg in 10–20 mL of sodium chloride 0.9% and give multiple intradermal injections across the area. May be administered up to 12 hours after injury; preferable to treat as soon as possible	Warm compress Elevation of area if possible **DO NOT use ice/cold compress** Urgent referral to Plastics Team required
Noradrenaline (norepinephrine)		
Dopamine		
Dobutamine		
Phenylephrine		
Argipressin (vasopressin)		
Metaraminol		
Methylene blue		

Appendix D: eviQ Chemotherapy Extravasation Flow Chart

Extravasation management - immediate management flow chart

Appendix E: Antidote Guidance

Extravasation management: antidote guidance

Appendix F: 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.

Compresses are never applied on infants less than 12 months

Do not apply compresses directly to the skin.

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. Test the hot-pack before applying to ensure it is not too hot. Wrap in light towel before placing heat pack to the required area.

Caution: Heating in the microwave is not recommended as settings can vary and one area of the heat pack may be significantly hotter than another.

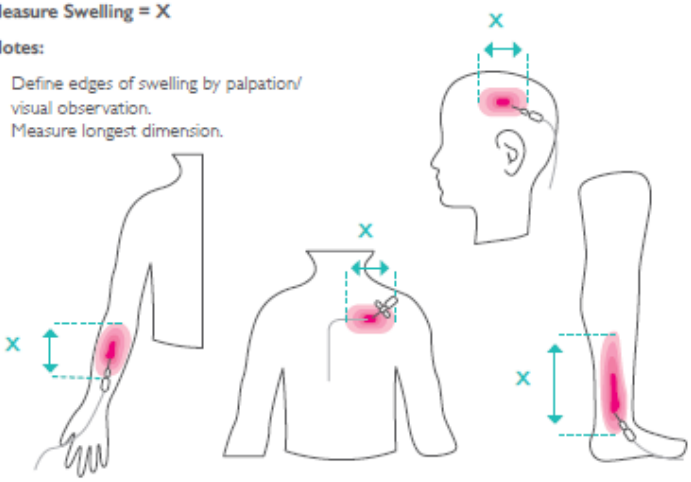
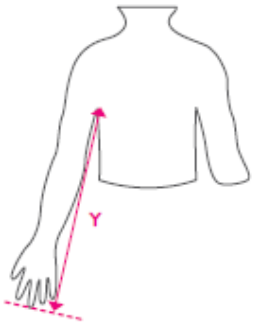
Apply a warm or cool compress to affected area for 15-20 mins every 6 hours for a maximum of 48 hours. While using compresses, it is important to maintain vigilant monitoring of the patients skin for marked increase in redness, swelling, pain, and oedema.

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

Staff should consult the medical team caring for the patient if unsure of the treatment option and/or contact the on-call pharmacist.

Appendix G: Assessment of Swelling

If swelling is observed, the amount of swelling can be measured using the following tool:

Step 1	**Measure Swelling = X** **Notes:** • Define edges of swelling by palpation/ visual observation. • Measure longest dimension. 
Step 2	**Measure arm length = Y** This is a baseline measure to determine approximate surface area and does not necessarily correlate with the site of insertion **Y = Axilla to tip of longest finger** • For Y measure arm length regardless of site of extravastion. • Arm length is a convenient way to approximate surface area/body size. The measure (Y) is not intended to be calculated using a leg or any other body part and is independent of the site of PIVC insertion. 
Step 3	**Calculate swelling percentage** X/Y x 100 = ____ %

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