Kent and Medway Cancer Collaborative

Systemic Anti-Cancer Therapy Care Pathway

Extravasation

Pathway of Care

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The Kent and Medway SACT governance group have reviewed the NIVAS extravasation toolkit and have agreed to adopt certain elements for use within the KMCC for the treatment of extravasation and these have been incorporated in to the KMCC local guidance.

1.0 INTRODUCTION

Infiltration and Extravasation

Infiltration is the inadvertent leakage of intravenous fluid or medication into extravascular tissue from an intravenous vascular access device, such as a peripheral cannula or central venous catheter. The resulting injury is likely to be minor. If the fluid or medication is a vesicant, the injury would be classed as an extravasation as the risk of tissue damage and serious injury is high. (Atay et al 2023; Gorski et al 2024)

Vesicants are drugs or solutions with the potential to cause serious skin or tissue damage including blistering, ulceration and necrosis (Gorski et al 2024; David et al 2020). There are 4 main groups of vesicant drugs commonly used.

- Chemotherapy agents
- Drugs with non-physiological pH – (high or low pH)
- Vasopressors
- Hyperosmolar solutions

Introduction

Recent data published by NHS Resolution suggests the drugs most commonly responsible for reported infiltration and extravasation injuries within the NHS are the non-chemotherapy vesicant agents (NHSR 2022).

- Infiltration of large volumes of fluid can cause nerve compression and compartment syndrome.
- Other drugs, such as intravenous iron, can cause permanent skin discolouration.
- Extravasation of CT contrast media is also a common complication.

The most serious extravasation injuries are associated with peripherally administered vesicant drugs including antibiotics, antiepileptics and anaesthetic drugs

Taken from NIVAS extravasation toolkit

Extravasation Clinical Lead

Every NHS organisation should appoint an extravasation lead to oversee the implementation and adherence to the extravasation pathway.

This could be a Specialist Nurse or Doctor.

The roles and responsibilities for the extravasation lead should include:

- A thorough knowledge of extravasation and be the organisation lead to promote and implement the extravasation and infiltration tool kit.
- Ensure local guidelines are in place and adhered to.
- Provide regular education and learning events about extravasation and infiltration.
- Ensure compliance with this tool kit.
- Undertake regular audit of practice.
- Lead on serious incident panels associated with extravasation injuries, incidents and claims.
- Ensure reporting is undertaken locally and audited.

Taken from NIVAS extravasation toolkit

At Risk Patient Groups

Paediatrics
Cautious lower limb vascular access
Bandaging of peripheral cannula, obscuring exit site observation during therapy.
Smaller vessel, shorter cannulae.

Altered levels of consciousness and sensation
Patient under sedation or general anaesthetic
Stroke patient with weakened limbs.

Oncology
Intravenous systemic anti-cancer therapy (SACT) is a vesicant and can permanently damage peripheral veins. Some SACT agents can cause tissue damage if extravasation occurs.

Central Venous Access such as peripherally inserted central catheters (PICCs) and implanted intravenous PORTs can reduce the risk of extravasation and offer safe administration for SACT.

Older people
Ageing skin, tissues and veins can be fragile which can increase the risk of extravasation.

Malnutrition and dehydration can also increase the risk of extravasation.

Difficult IV access patient
Obese patients, patients with deep vessels, IV drug users or patients which chronic loss of peripheral veins.

Dementia and delirium.
Patients in this group can be confused and inadvertently manipulate vascular access devices and IV infusion equipment which can lead to extravasation.

Patients in this group can be unable to express painful infusions sites and other signs of extravasation.

Skin associated risks.
Some skin conditions can make visualising vessels for cannulation difficult which can lead to extravasation due to difficulties in peripheral cannulation.

Variations in skin between patient populations, such as darker skin tones and excessive hair on the skin. (Shaikh et al 2022)

Learning Disabilities and Difficulties
Patients in this group can have challenging behaviour, be combative or uncompliant and inadvertently manipulate vascular access devices or IV infusion equipment which can lead to extravasation.

Taken from NIVAS extravasation toolkit

IV catheter related risks

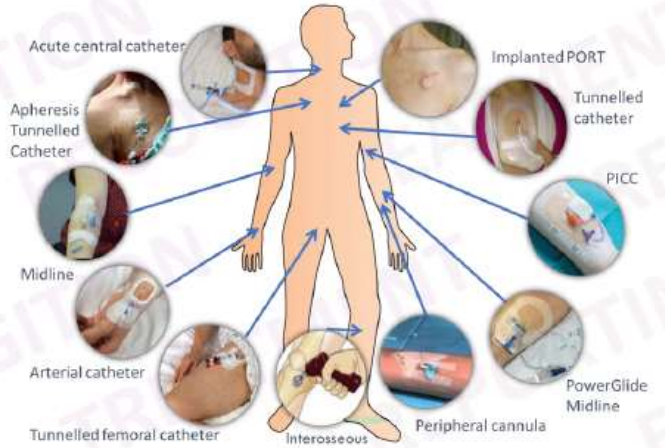
Infiltration and extravasation often results when a problem occurs with a vascular access device (VAD).

This may be because the VAD has been placed in an inappropriate anatomical location where patient movement displaces the device so the tip of the VAD migrates out of the vein into the tissues. Different VADs have different risks and complications associated with them.

All VADs are prone to the formation of fibroblastic sleeves. Fibroblastic cells can grow along the catheter from the point of vessel entry, so that eventually the catheter tip is encased by a closed sleeve of tissue (Cutuli et al 2023; Passaro et al 2021; Rousslang et al 2020).

Consequently, administered fluids flow back along this sleeve to the catheter exit site and potentially infiltrate into subcutaneous tissue to cause extravasation (Pittiruti et al 2023).

Regular flushing of a VAD and line locking can help prevent fibroblastic sleeve formation at the catheter tip (Gorski et al 2024; Meyer et al 2020).



Taken from NIVAS extravasation toolkit

2.0 ONCOLOGY AND RADIOLOGY

Systemic Anti-Cancer Therapy (SACT)

Administration of SACT is a specialist practice. The risk of extravasation is well documented and included in the training for nurses who administer it.

Cancer services within the NHS already practice within locally ratified guidelines, and processes for the prevention and treatment of SACT extravasations should be in place locally.

This toolkit is not intended to replace these guidelines and protocols but aims to add further support to enable cancer services to strengthen their clinical practice.

The process of IV SACT administration practice is transferable to all IV drug administration practice. Learning from SACT services and how they manage extravasation should be part of the process when designing local non-SACT extravasation protocols and guidelines.

Patients receiving IV SACT who have difficult IV access are at risk of extravasation and long-term central venous access devices are considered a safe option.

There are pros and cons for administering SACT via peripheral or central veins. The evidence is clear that it is safer to administer vesicants via a central device, however there are other risks to consider with central venous catheters such as infection and thrombosis.

https://www.england.nhs.uk/cancer/cancer-alliances-improving-care-locally/

Oncology

Recent evidence supports administering anthracyclines via a central venous device. Implanted IV ports followed by PICCs are considered the most suitable. (Baker et al 2023; Thrush et al 2023; Moss et al 2021).

Central Venous Access is considered essential in paediatric SACT administration. (Williams et al 2023).

Vein selection in peripheral SACT administration;

- Use the smallest gauge cannula
- At least two-thirds of the PIVC should reside within the vessel to reduce the risk of PIVC failure
- Avoid areas of flexion
- Danger zones: the wrist & the ACF
- Avoid areas over bony prominences
- Areas with compromised skin (e.g. infection, wounds)
- Avoid compromised veins (e.g. previous venepuncture and/or damage)
- Think vesicants – think bruising.....
- If repeat cannulation is necessary, the principle: Cannulation should start distally and proceed proximally must be adhered to (i.e. always cannulate above the previous failed attempt) (Upton et al 2021)

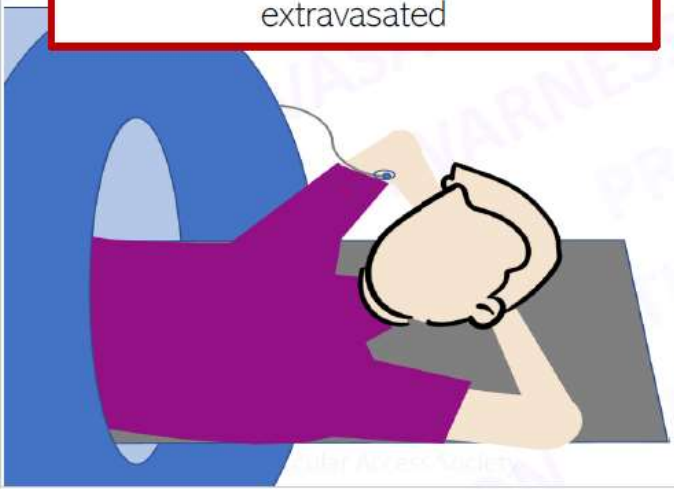
https://www.uksactboard.org/

Taken from NIVAS extravasation toolkit

Radiology

Contrast Media Administration

Cannulae placed in the antecubital fossa may occlude or dislodge when the patient places their arms above their head prior to and during the CT scan due to the catheter bending in the point of flexion.
Compartment syndrome is a risk when large volumes of contrast have extravasated



The Royal College of Radiologists.

- Always flush the cannula after the patient's arm is in the required position.
- Record details of the extravasation incident with a clear management plan.
- Elevate the affected limb and apply ice packs to the affected area
- If symptoms resolve the patient can be allowed home, and the patient supplied with advice and given an appropriate advice leaflet.
- If symptoms do not resolve quickly, admit and observe.
- Skin blistering, paraesthesia, altered tissue perfusion or persistent pain for more than four hours suggests severe injury. In this case seek urgent plastic surgical review.

Online Resources and original guidance.
https://www.rcr.ac.uk/career-development/audit-quality-improvement/auditlive-radiology/contrast-extravasation-in-ct-qsi-ref-xr-513/
https://www.acr.org/-/media/ACR/Files/Clinical-Resources/Extravasation-of-Contrast-Media----Bullet-Points-and-Chapter-Text---FINAL.pdf

Taken from NIVAS extravasation toolkit

3.0 PREVENTION

Safe Peripheral Vascular Access Practice

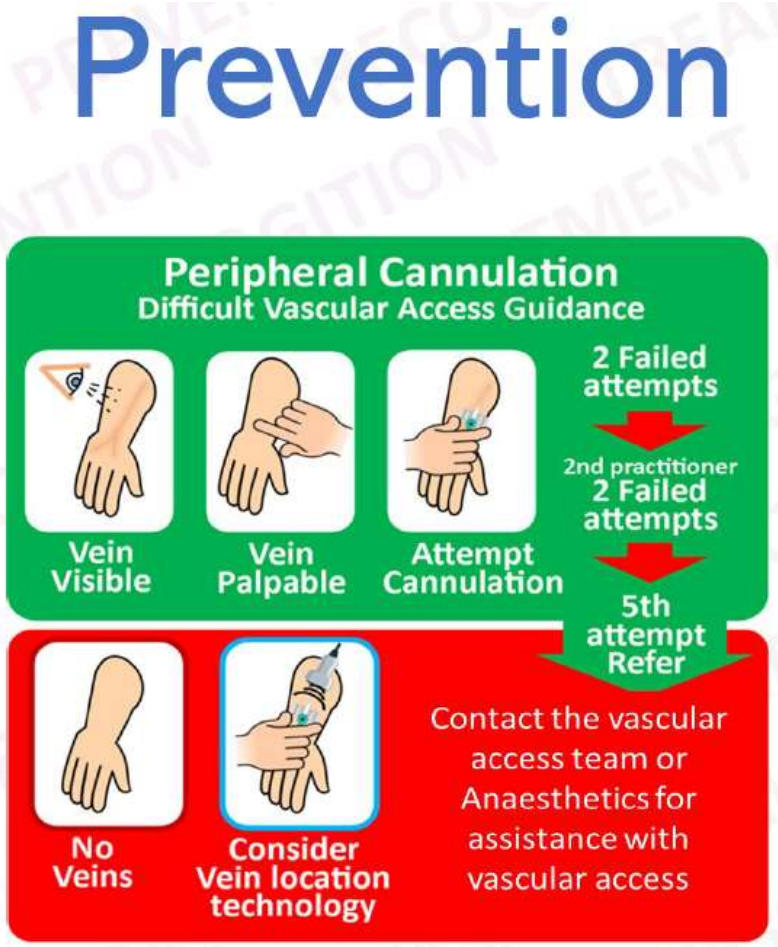
All healthcare professionals involved in the delivery of intravenous therapies and the use of vascular access devices should be aware of the preventative measures associated with infiltration and extravasation, vessel health and preservation and the principles of safe vascular access .

Multiple attempts at placing peripheral intravenous cannulae are painful and distressing to the patient and may damage the vessel and surrounding tissue therefore increase the risk of extravasation (Sweeny et al 2022).

A protocol for difficult IV access patients may reduce complications, improve safety and patient satisfaction (Rodriguez-Calero et al 2020).

A Vascular Access Service Team can take an active role in the prevention of extravasation.

Early escalation should be considered for difficult peripheral cannulation.



Taken from NIVAS extravasation toolkit

Prevention

Cautious IV therapy administration

Prevention of extravasation is imperative as treatment options are limited once the injury has occurred.

Many extravasation injuries are associated with human error and poor infusion practice.

The following actions can help prevent extravasations occurring.

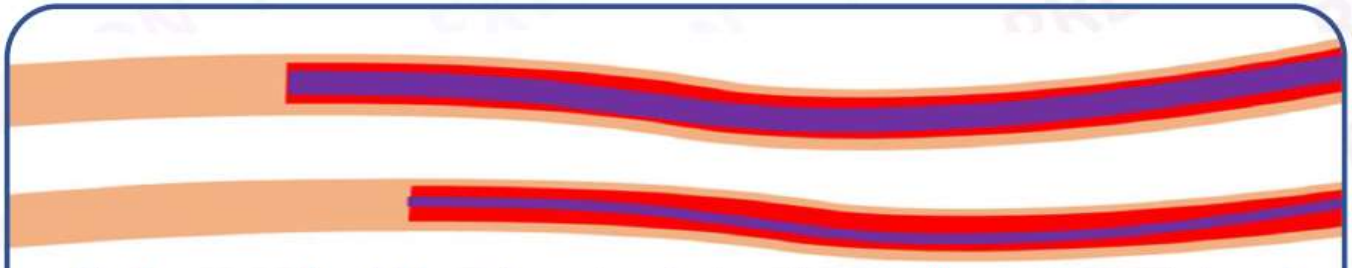
- Extravasation prevention and recognition training for all clinical staff administering IV therapy with regular ongoing updates.
- Creation of a Vascular Access Service Team (VAST) to provide reliable and safe options for vascular access when peripheral cannula are not viable.
- Adopt the Vessel Health and Preservation pathway.
- Advocate the safest way to administer IV therapy, use Medusa, the NHS Injectable Medicines Guide, the medicine information leaflet or the BNF/C or agreed local guidelines.
- Ensure peripheral intravenous cannula (PIVC) are patent by flushing them before use. There should be no resistance, pain or swelling around the cannulation site.
- Training for community services and GPs to help diagnose extravasations.
- Consider the use of infusion technology to reduce the risk of extravasation.

Taken from NIVAS extravasation toolkit

Prevention

Catheter to vessel occupancy

Small diameter vascular access devices can increase turbulent blood flow over the outside of the cannula/catheter and reduce the risk of the catheter rubbing the vessel wall. Ideally a catheter to vessel occupancy of less that 45% is recommended (Spencer and Mahoney 2017; Sharp et al 2015).



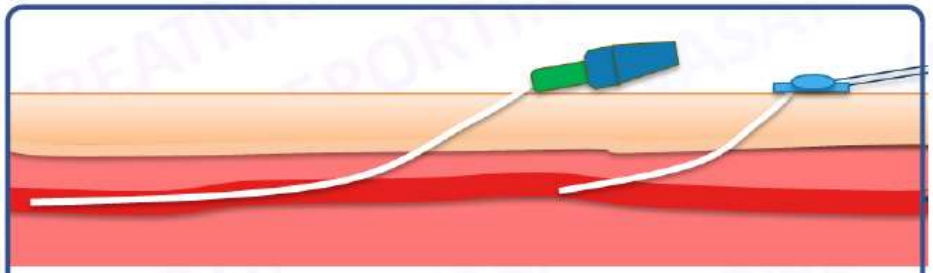
- Preference should be given to placing the smallest size peripheral cannula, either the 24g or 22g, as far down the arm as possible, avoiding points of flexion unless absolutely necessary.
- Cannula size should be selected by the flow rates required and location of device placement. 18g and 20g cannula should be used with caution.
- Vascular access devices should be inspected at least once a shift and flushed at least daily and removed if not working properly or no longer required (Lv and Zhang 2020; Welyczko 2020).

Small cannula nominal flow rates are suitable for most infusion requirements

Taken from NIVAS extravasation toolkit

Prevention

Device length and insertion location



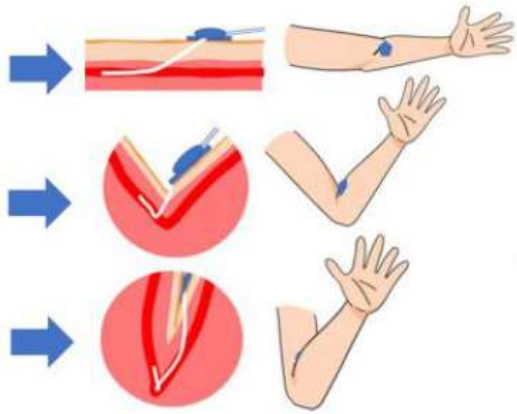
- Small diameter devices increase turbulent blood flow over the cannula and reduce the risk of the catheter rubbing the vessel wall.
- For deeper veins, a longer PIVC may be required.
- If up to 80% of the catheter is sitting in the vessel the catheter tip is far less likely to become dislodged out of the vein.
- Patients who are obese, have loose skin in the arms and those with deep veins are at increased risk of cannula dislodgement.
- Ultrasound guided placement of peripheral cannula can increase the success rate and reduce the risk of dislodgement (Tran et al 2021; Schoch et al 2023)

Peripheral cannula placed in joints and points of flexion are a risk for cannula occlusion leading to infiltration or extravasation.

Cannula is patent in the antecubital fossa when the elbow and forearm are in extension leaving the vessel unobstructed.

Cannula becomes partially occluded when the forearm and elbow are in flexion halfway, there is a risk of infiltration or extravasation, especially with high pressure injections with CT Contrast.

Cannula totally occluded with joint in full flexion. High risk of infiltration or extravasation, especially with high pressure injections with CT Contrast.



Taken from NIVAS extravasation toolkit

Safe intravenous administration technology

Prevention

Using an infusion pump can increase the safety of infusion therapy, especially when administering vesicant drugs however, these devices can also contribute to complications if used incorrectly.

The following checklist can reduce the risk of infusion complications:

- ✓ Use an infusion pump for all vesicant administration.
- ✓ Check the pump pressure alarm setting is set accordingly.
- ✓ Ensure IV giving sets are labelled to identify which drugs are being infused.
- ✓ Ensure compatibility between diluents, infusion solutions and flushing solutions.
- ✓ Check appropriate occlusion alarm levels
- ✓ Ensure a system for checking the programmed infusion rate is in place to avoid fast infusion errors, wrong doses and rates.
- ✓ Infusion sites should be examined regularly to ensure extravasation hasn't occurred.
- ✓ Empower the patient to call for help if they notice a complication.

Taken from NIVAS extravasation toolkit

Prevention

Infusion and vein location technology

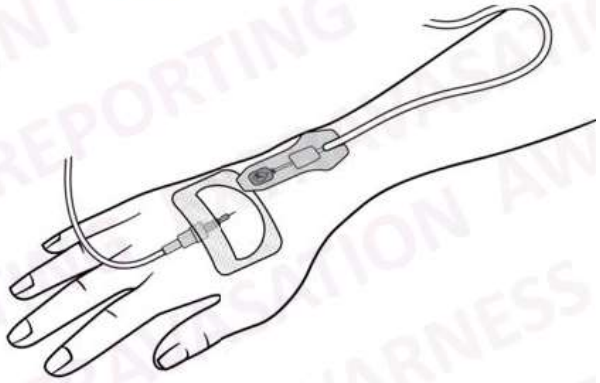
Vein location technology can help with difficult IV access, ensuring the device is placed with one needle stick, reducing patient pain and discomfort.

Ultrasound

Using real time ultrasound for vascular access is the safest way to ensure the best placement of the device. Ultrasound location of the vein, assessing the vein health and placing the device in real time reduces the risk of cannula malposition.

Infrared vein lights

These devices shine an infrared light onto the skin highlighting the veins below. They give a limited visualisation of the veins in 2D.

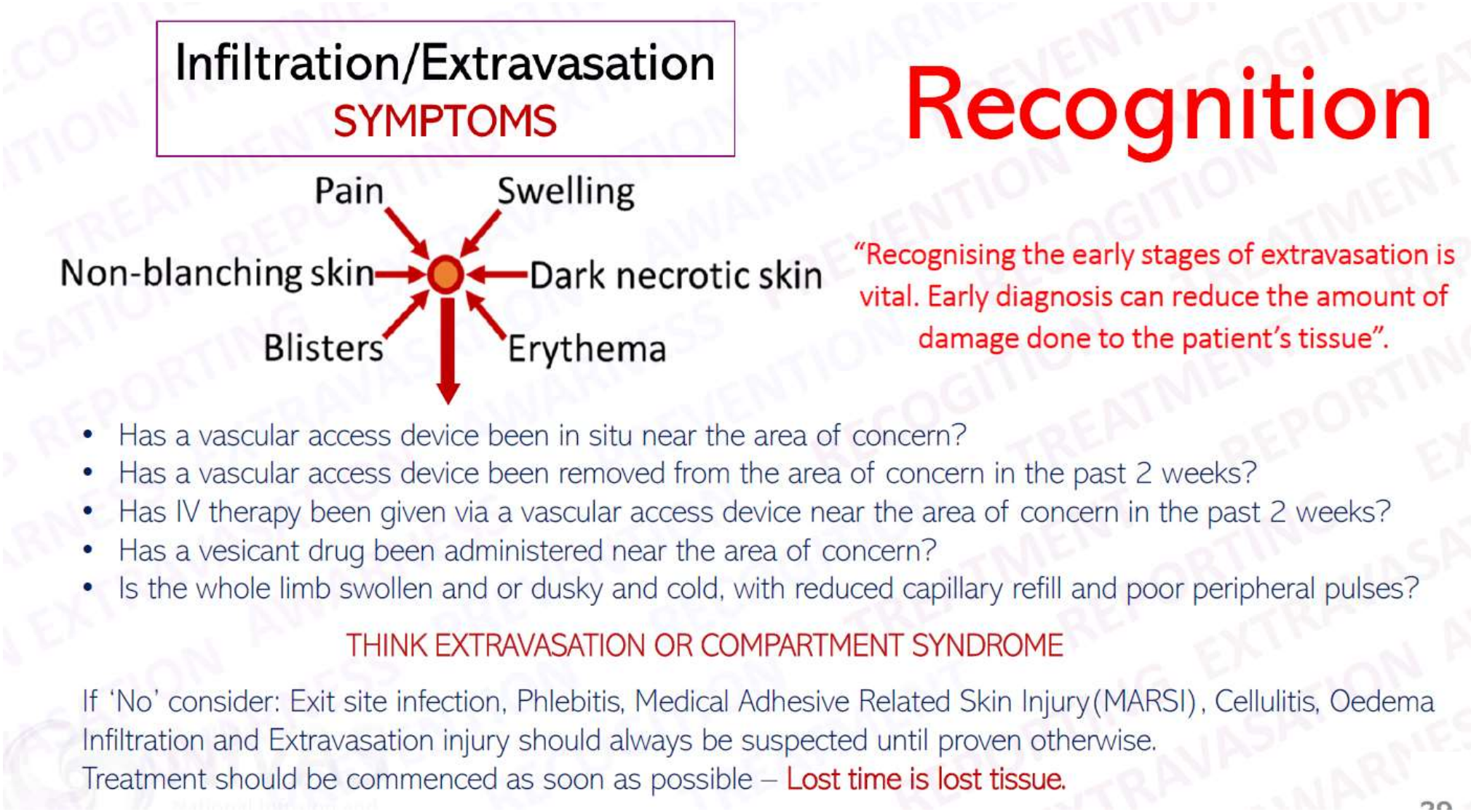


Safe Infusion Site Technology

Infusion monitoring technology is available which uses visible and near-infrared light to measure tissue changes surrounding the PIVC alerting clinicians to the early stages of extravasation.

Taken from NIVAS extravasation toolkit

4.0 RECOGNITION



Taken from NIVAS extravasation toolkit

Suspected or Confirmed Extravasation

Recognition

STOP THE INFUSION

Try to aspirate the device
Reassure patient
Call for Help
Manage pain

- Stop administration - Leave vascular access device in situ and attempt aspiration.
- Leave device in place until discussion with plastic surgical team, remove after 1 hour when safe to do so if not required for antidote or washout.
- Chemotherapy extravasations - refer to local cancer network guidance.
- Identify vesicant involved and check for antidote.
- Mark outline of extravasation injury with skin marker and document incident in patient record.
- Medical photography to record injury.
- Complete incident report and arrange follow up.

Taken from NIVAS extravasation toolkit

Alternative complications and symptoms

Recognition

Characteristic	Flare Reaction	Vessel Irritation	Venous Shock	Extravasation
Presenting Symptoms	Itchy blotches or hives; pain and burning sensation	Aching and tightness in vessel	Muscular wall of the blood vessel in spasm	Pain and burning 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		Erythema around area of needle or around the venepuncture site
Timing	Appears suddenly and dissipates within 30–90 minutes	Appears within minutes after injection. Colouration may only appear later in the process	Appears right after Injection	Symptoms start to appear immediately after injection, symptoms evolve
Swelling	Usually	Usually		Occurs often; lasts for several days
Blood return	Usually, but not always	Usually, but not always	Often absent	Usually absent or sluggish

Taken from NIVAS extravasation toolkit

Evolving Injury – Timescale

Recognition

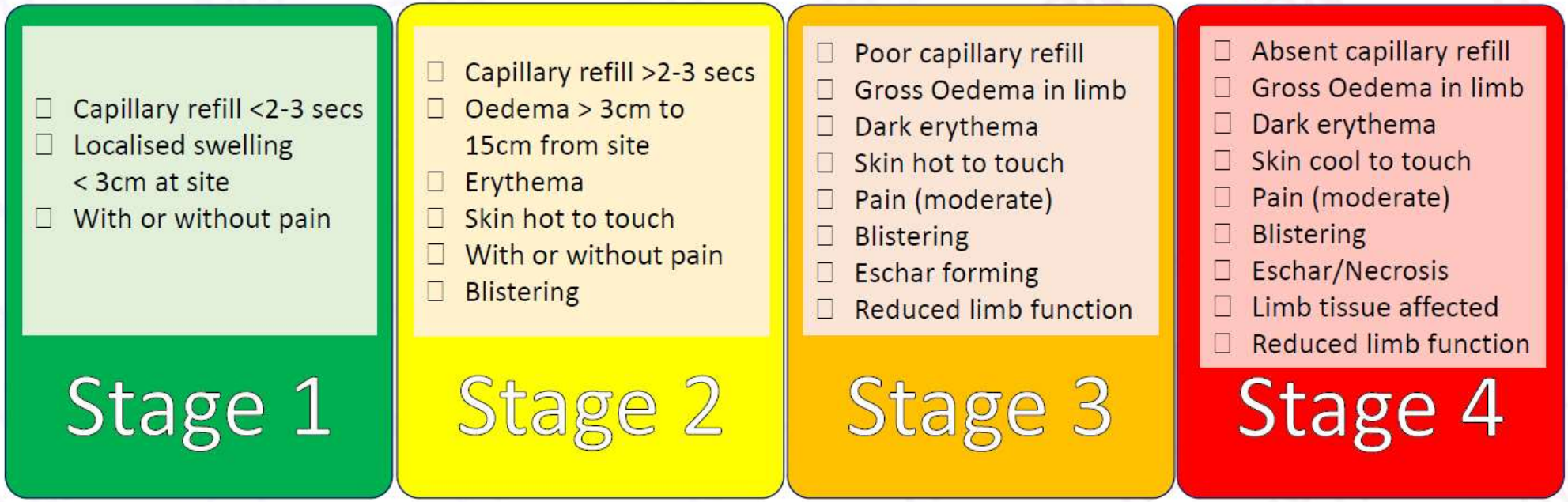
Extravasation injury timescale	
During Administration	• Blood return unable to aspirate blood. • Noticeable swelling at cannulation site due to infiltration • Burning and aching in cannulation/injection site.
Within 24hrs after extravasation	• Pain and burning sensation at injection site during or after infusion. • Erythema at cannulation/injection site. • Swelling localised around cannulation/injection site. • Small fluid filled blister can develop.
Up to 2 weeks after extravasation	• Non-blanching erythema extending around the cannulation/injection site. • Affected area hot and painful to touch. • Fluid filled blisters may have extended. • Swelling in the distal part of the affected limb.
Up to 4 weeks after extravasation	• Non-blanching dark erythema with dusky margins at the cannulation/injection site. • Affected area painful, hot and/or swollen. • Fluid filled blisters may still be present. • Areas of eschar developing with deeper areas of tissue necrosis. • Wound evolving.
Over 4 weeks after extravasation	• Non-blanching dark erythema with dusky margins around wound • Pain and swelling in affected limb. • Areas of eschar present with deeper areas of tissue necrosis. • Wound not improving without surgical intervention.

(Kim et al 2020; Ong and Van Gerpen 2020)

Taken from NIVAS extravasation toolkit

Recognition

Extravasation Injury Staging



Stage 1 assessment and close monitoring
Stage 2 requires treatment action.
Stage 3 and 4 are clinical emergency and requires urgent action.

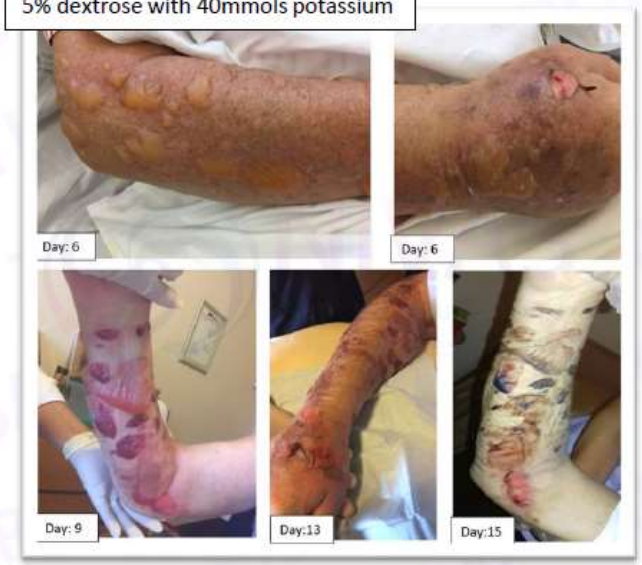
(Based on: Pathomjaruwat et al 2021, Kim et al 2020, Alexander 2020, Ong and Van Gerpen 2020)

Taken from NIVAS extravasation toolkit

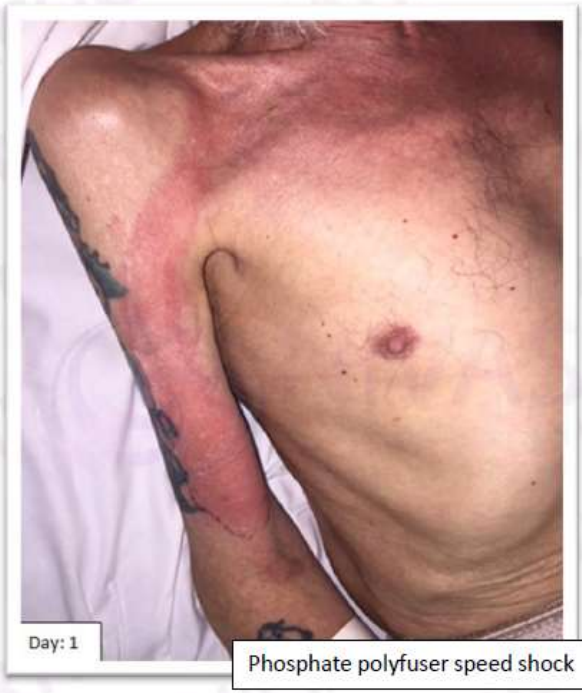
Recognition

Extravasation Injuries

5% dextrose with 40mmols potassium

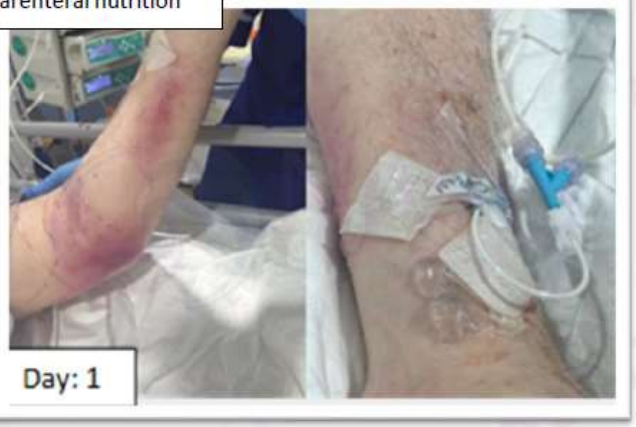


Vancomycin



Acyclovir

Parenteral nutrition



Taken from NIVAS extravasation toolkit

Compartment syndrome

Recognition

Compartment syndrome is a serious condition caused by bleeding or swelling within an enclosed bundle of muscles. This can occur when injectable infusions are inadvertently administered either rapidly or over a period of time because the vascular access device is not sited correctly in a vessel. Compartment syndrome is an emergency and should be dealt with as such, an urgent surgical review should be sought for any patient who may have a compartment syndrome as they may require an emergency fasciotomy (Savage et al 2023). Patients having rapid administration of CT contrast, infusions concealed under drapes during surgery and infusions where the occlusion alarm has been increased are among the highest group of patients at risk of compartment syndromes (Stefanos et al 2023 Kim and Kim 2020). Close monitoring of all infusions and vascular access devices in peripheral veins should be undertaken to reduce the risk.

Symptoms can include:

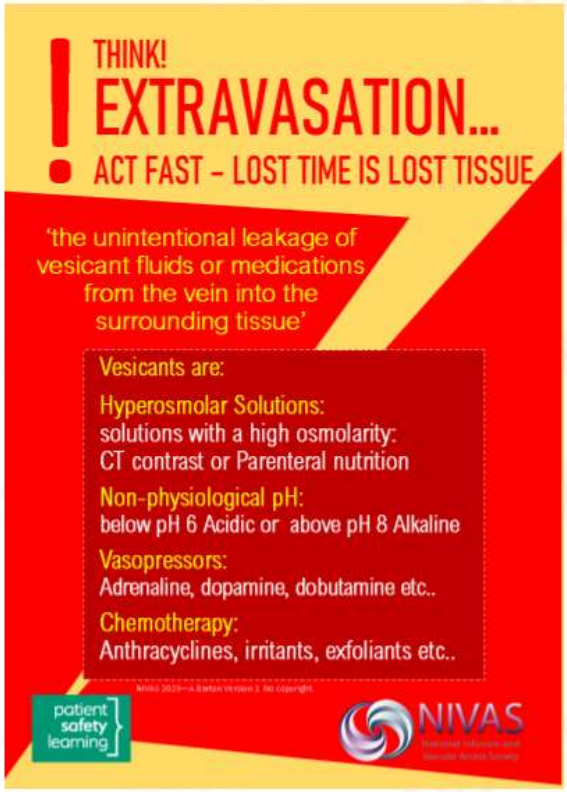
- Loss of pulse in affected limb
- Swollen limb
- Intense pain, especially when the muscle is stretched
- Tenderness in the affected area
- Tightness in the muscle
- A tingling or burning sensation, numbness or weakness in affected limb (these are signs of permanent damage) (Osborn and Schmidt 2021)

Act fast if compartment syndrome suspected

- ✓ Treat as an emergency
- ✓ Urgent surgical review
- ✓ CT imaging to confirm
- ✓ Urgent fasciotomy may be indicated.

Taken from NIVAS extravasation toolkit

THINK! EXTRAVASATION... ACT FAST – LOST TIME IS LOST TISSUE



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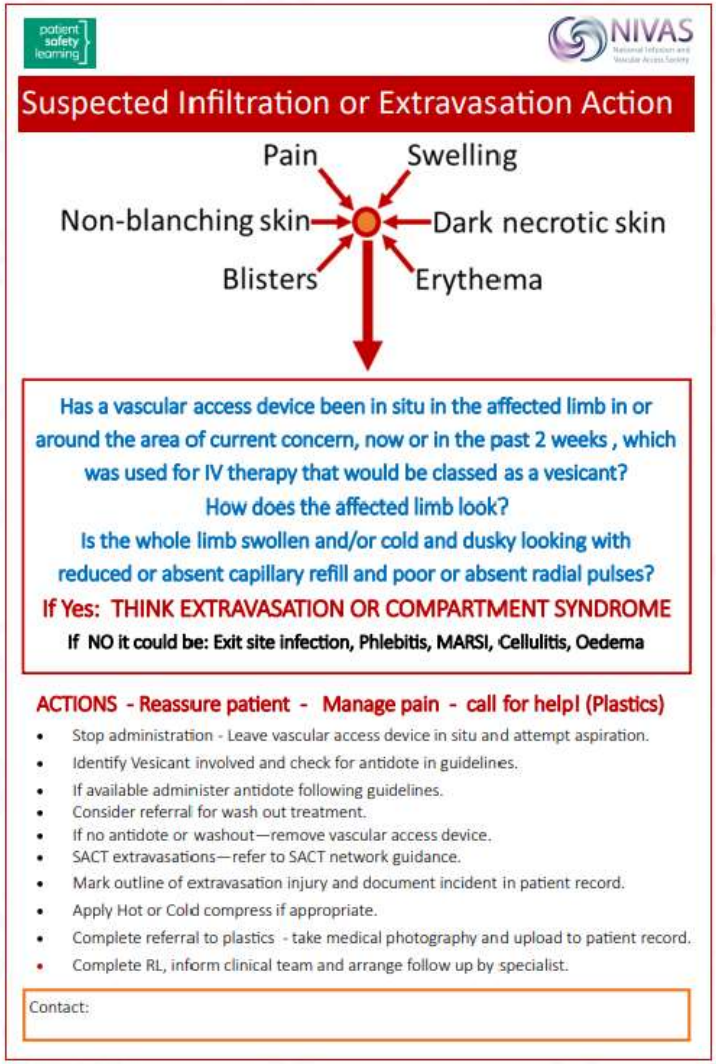
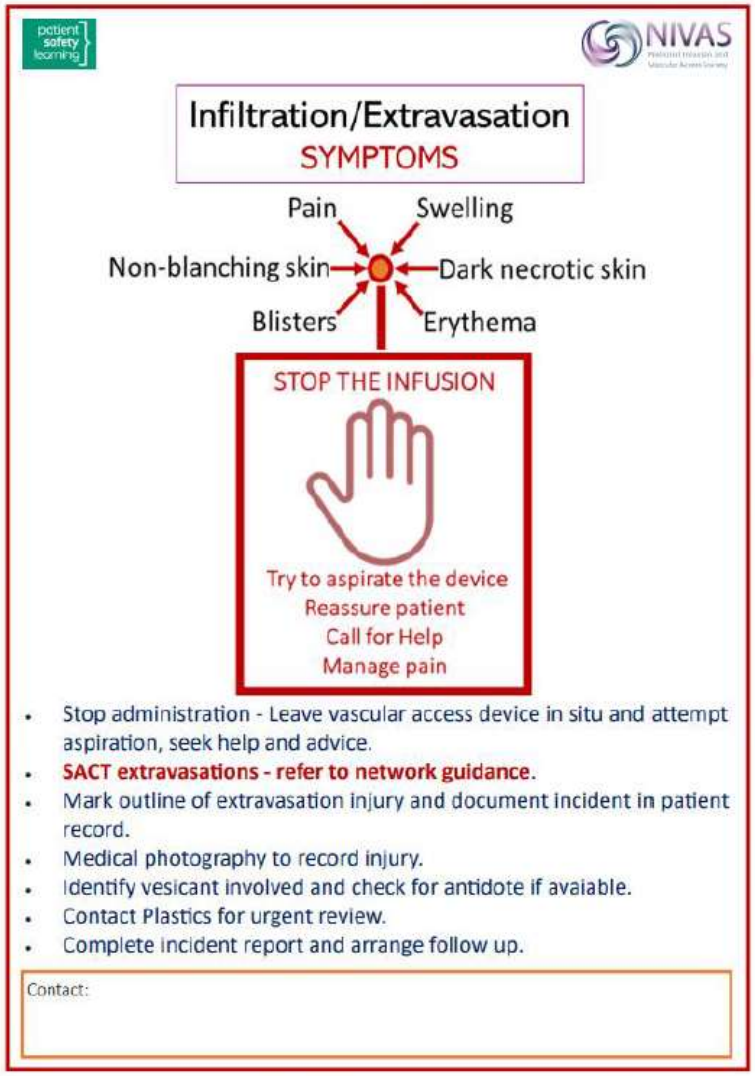
THINK! EXTRAVASATION...





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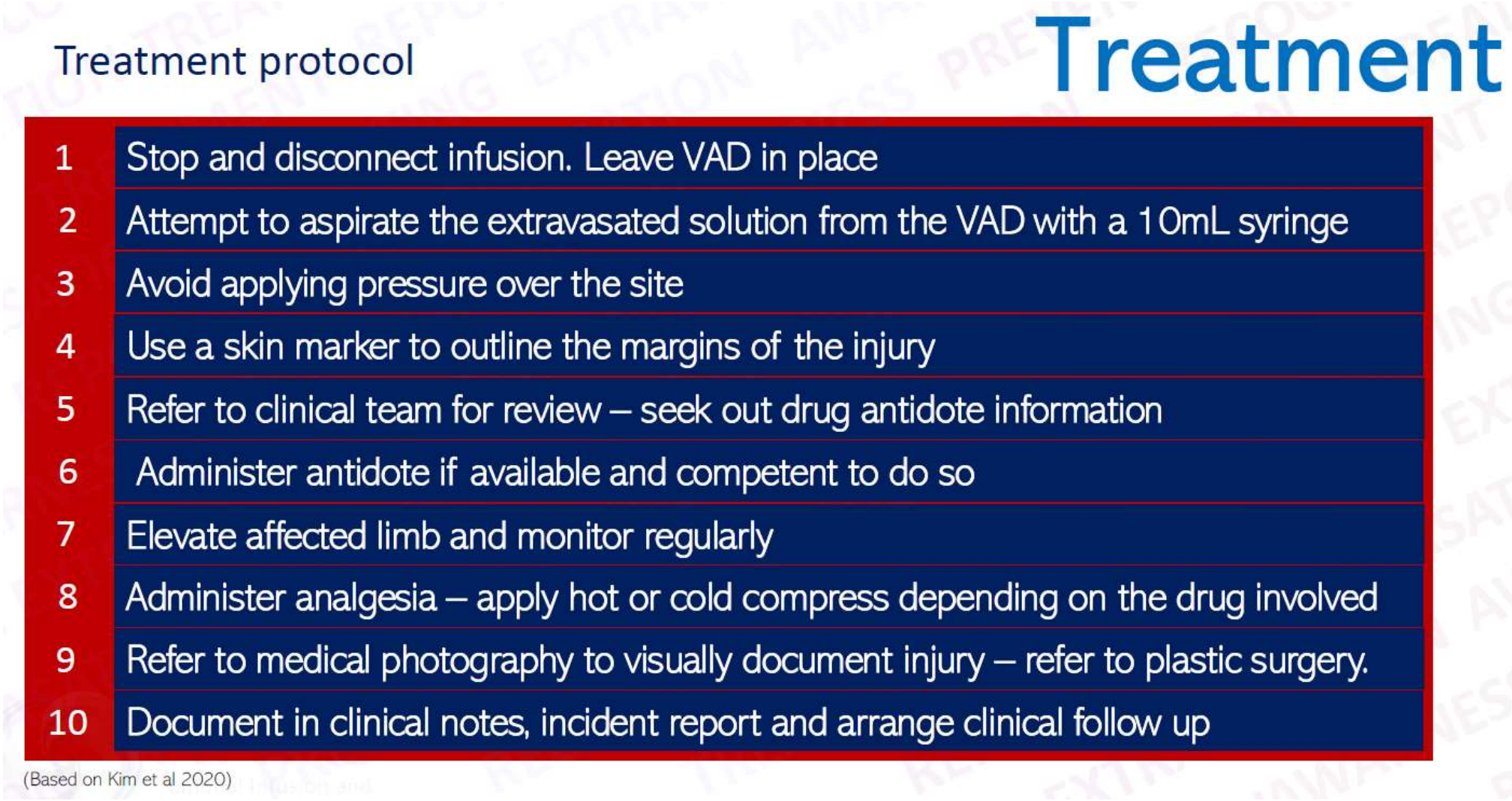
5.0 TREATMENT



Taken from NIVAS extravasation toolkit

Treatment Protocols

Treatment

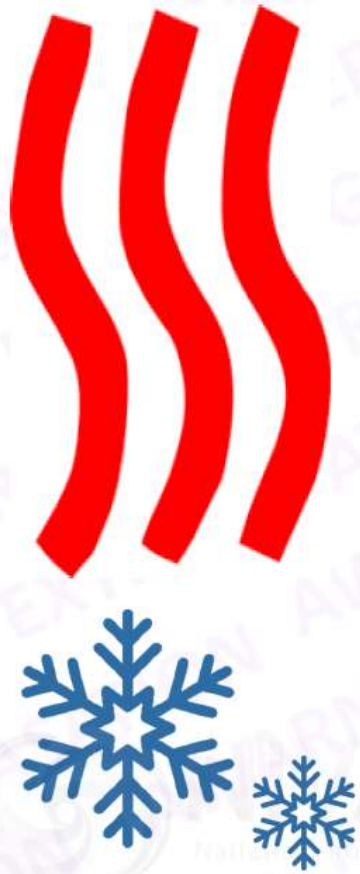
	Definition	Therapy	Comments	Examples
Osmolarity	High >600 mOsm/L Low <200 mOsm/L 200–500 mOsm/L physiological (290 mOsm/L)2	Warm compresses; possibly hyaluronidase Physiological: cold compresses when dispersion/dilution is not indicated	Osmolarity over 600mOsm/L increases the risk of damage. High osmolarity over 1000mOsm/l can cause significant tissue damage.	▶ Parenteral nutrition (PN) ▶ Infusion fluids such as mannitol 10%, and Glucose12.5% or more, etc. ▶ Contrast fluids ▶ Electrolyte solutions (Potassium solutions) ▶ Calcium Chloride 10%
pH	Low <5.0 High >9.0 Range considered 'physiological': 5.0–9.01 Physiological (7.4)	Warm compresses; possibly hyaluronidase Physiological: cold compresses when dispersion/dilution is not indicated	Extreme pH <2 and >11 are thought to cause most damage Closer to 7.4 means lesser damage Alkaline solutions are more likely to cause damage than acidic solutions	Alkaline ▶ Phenytoin ▶ Co-trimoxazole ▶ Dantrolene ▶ Thiopental ▶ Trometamol ▶ Aciclovir ▶ Phenobarbital Acidic ▶ Vancomycin ▶ Amiodarone ▶ Doxycycline ▶ Esmolol ▶ Glucose,
Vasopressor	N/A	Warm compresses; phentolamine	Do not use cold compresses because of additional vasoconstriction	▶ Terlipressin ▶ Desmopressin ▶ Dobutamine ▶ Dopamine ▶ Phenylephrine ▶ Dopamine ▶ Adrenaline ▶ Noradrenaline

(adopted from Smolders et al 2020)

Taken from NIVAS extravasation toolkit

Treatment

HOT & COLD compress



- Cold compresses are recommended for extravasation of all irritant and vesicant drugs except vinca alkaloids (vincristine, vinblastine, vinorelbine), epipodophyllotoxins (etoposide), oxaliplatin, and vasopressors, as cold worsens tissue ulceration caused by these drugs.
- Cold compresses cause vasoconstriction, limiting the spread of the extravasated drug. Additionally, cold reduces local inflammation and pain.
- Warm compresses are preferred for extravasation of specific drugs including vinca alkaloids, etoposide, vasopressors, and oxaliplatin to increase local blood flow and enhance drug removal
- Apply compresses for 20 to 60 minutes 3 or 4 times daily for the first 24 to 72 hours after extravasation occurs.
- Where possible a temperature regulated, electric warmer could be used with a disposable single use cover.
- Care should be taken to ensure warm compresses are not too hot and cold compresses are not too cold to avoid further tissue damage. Cold compresses from the freezer should not be directly applied to the skin.

(Smolders, 2021; Hadaway 2007)

Taken from NIVAS extravasation toolkit

Hyaluronidase subcutaneous injectable antidote

Treatment

- Hyaluronidase is used in managing the extravasation of vesicants.
- Hyaluronidase is an enzyme which breaks down hyaluronic acid (HA). It increases vascular permeability and temporarily disrupts the extracellular matrix, promoting diffusion of substances through tissues.
- Hyaluronidase increases tissue permeability, rapidly dispersing extravasated chemicals, which reduces the risk of skin necrosis and overall morbidity.
- Hyaluronidase should only be used if specifically indicated (see vesicant drug profiles in resources) or used in the saline flush-out technique.

BNF indications and dose: Hyaluronidase for treatment of extravasation by local infiltration Adult:

hyaluronidase 1500units reconstitute in 1mL water for injection or in sodium chloride 0.9% and infiltrate into affected area by subcutaneous injection as soon as possible after extravasation.

- **Contra-Indications: not for intravenous administration**; not to be used to enhance the absorption and dispersion of dopamine and/or alpha-adrenoceptor agonists

(Hadaway 2007; Sharma and Lahiri 2021).

Taken from NIVAS extravasation toolkit

Management Overview

Treatment

- ☑ Ensure referral to specialist - usually plastic surgery or orthopaedic surgery.
- ☑ Cover the area with a sterile silicone/absorbent dressing. (foam silicone dressings work very well).
- ☑ Manage pain and consider limb elevation if appropriate.
- ☑ Consider Occupational Therapy and Physiotherapy referral for long term management if limb movement is affected.
- ☑ Document affected limb pulses, wound margins and skin condition.
- ☑ Complete progress documentation in patients record including clinical photography.
- ☑ Consider counselling referral for emotional and psychological support.
- ☑ Arrange follow up after 24hrs, 72hrs then weekly until resolved.
- ☑ Consider duty of candour letter and escalate to the patient safety team.

Taken from NIVAS extravasation toolkit

6.0 CLASSIFICATION OF DRUGS & TREATMENT

Drug pH Equivalents

Stomach Acid	1.5 – 2.0	Glucagon pH: 2.5-3
Cola	2.5	Vancomycin pH 2.4 – 4.5
Vinegar	2.9	Gentamycin pH 3 – 5.5
Orange Juice	3.5	Glyceryl trinitrate pH: 3.5-6.5
Coffee	5.0	Metoclopramide pH: 3-5
Healthy Skin	5.0	Amiodarone pH: 3.5-4.5
Urine	6.0	Glucose 5% pH: 4-4.2
Pure Water	7.0	Chlorpheniramine pH: 4-5.2
Human Saliva	6.5 – 7.5	Potassium pH: 4
Blood	7.3-7.5	0.9% Saline solution pH: 7
Sea Water	7.7-8.5	Tazocin pH: 5-7
Baking Soda	8.4	Aminophylline pH: 8.8-10
Hand Soap	9.0-10.0	Frusemide pH: 8.7-9.3
Bleach	12.5	Acyclovir pH: 10-11
		Phenytoin pH: 12

It is safer to administer vesicant drugs into a central vein.

Non-vesicant drugs and solutions can be administered via a peripheral vascular access device sited in a peripheral vein.

Vesicants

Hyperosmolar Solutions:

Solutions with a high osmolarity above 600 mOsm/L

Non-physiological pH:

Acidic pH below 5 or Alkaline pH above 9

Vasopressors:

Such as adrenaline, noradrenaline and dopamine.

Chemotherapy:

Anthracyclines

Studies suggest that hyperosmolar solutions above 600 mOsm/L; (normal range 285-310) (Pittiruti et al 2023 Manrique-Rodríguez et al 2021), extremely acidic or basic pH(<5 or >9), cytotoxic and vasoconstrictive drugs are associated with a higher risk of subsequent leakage and tissue damage when given peripherally (Couissi et al 2023; David et al 2020).

Taken from NIVAS extravasation toolkit

According to their potential to cause serious necrosis when administered outside of the vein, known as extravasation or infiltration.

Vesicants*	TX	Exfoliants*	TX	Irritants	TX	Inflammitants	TX	Neutrals	TX
Amsacrine	A	Liposomal Daunorubicin	B	Bendamustine	A	Fluorouracil	A	Alemtuzumab	D
Cabazitaxel	A	Docetaxel	C	Carboplatin	A	Methotrexate	C★	Asparaginase	D
Carmustine	A	Liposomal Doxorubicin	C	Cisplatin (if extravasation has occurred during infusion	C	Raltitrexed	A	Bevacizumab	D
Cisplatin (If extravasation is noted post 24 hours)	A	Mitoxantrone	A	Dexrazoxane	A			Bleomycin	D
Dacarbazine	A	Oxaliplatin	C	Etoposide	A			Bortezomib	D
Dactinomycin	A	Topotecan	A	Irinotecan	A			Cetuximab	D
Daunorubicin	B							Cladribine	D
Doxorubicin	B							Cyclophosphamide	D
Epirubicin	B							Cytarabine	D
Idarubicin	B							Eribulin	D
Mitomycin	A							Fludarabine	D
Paclitaxel	C							Gemcitabine	D
Streptozocin								Ifosfamide	D
Treosulfan								Ipilimumab	D
Vinblastine	C							Melphalan	D
Vincristine	C							Pemetrexed	D
Vindesine	C							Pentostatin	D
Vinflunine	C							Rituximab	D
Vinorelbine	C							Trastuzumab	D

Definitions:	
***Vesicants**	Drugs which are capable of causing pain, inflammation and blistering of the local skin, underlying flesh and structures, leading to tissue death and necrosis.
***Exfoliants**	Drugs which are capable of causing inflammation and shedding of the skin, but less likely to cause tissue death.
Irritants	Drugs which are capable of causing inflammation, irritation or pain at site of extravasation, but rarely cause tissue breakdown.
Inflammitants	Drugs which are capable of causing mild to moderate inflammation and flare in local tissues.
Neutrals	Inert or neutral compounds that do not cause inflammation or damage.
★	Only if large volume of drug has extravasated
TX	Treatment

7.0 EXTRAVASATION TREATMENT

Table 1: Approximate volume of material extravasated in relation to diameter of the injury and the level of intervention which may be appropriate

Volume	Approximate Diameter*	Management
0.1ml to 1.25ml	Up to 17mm	Watch and Wait
1.25ml to 2.5ml	17 to 30mm	Topical low impact interventions
Greater than 2.5ml	Greater than 30mm	Full blown no holes bared interventions
* If diameter is measured within 15minutes of the acute extravasation so that minimal tissue diffusion will have occurred. Measurement should not include the inflamed surrounding tissue see Note B. above		

Immediate action following an extravasation

Step 1
Stop and disconnect infusion. Leave the cannula in place

Step 2
Identify extravasated cytotoxic drug

Step 3
▪ Leaving the cannula in place, try to gently aspirate as much extravasated solution as possible and safely dispose of any aspirated cytotoxic drug. ▪ Record volume removed in patient records. ▪ Avoid manual pressure over the extravasated area. ▪ Remove cannula ▪ Mark with an indelible pen an outline of the extravasated area ▪ Take a photograph as soon as possible

Step 4
Notify medical staff. Start specific treatment plans as soon as possible

Step 5
<u>Please follow instructions on next page according to classification of drug 5:</u> **A, B, C or D please see Classification of drugs on attached page**
Follow step 5 on next page before moving onto step 6

Step 6
Elevate the limb. Administer analgesia if necessary, document.

LOCALISE

A) Localise; Cytotoxics requiring COLD pack

- Cold pack and DMSO (Avoid alcohol compress) Apply dry cold compress for 20 minutes 4 times daily for 1-2 days
- Apply a thin layer of 98% DMSO solution** to extravasated area using applicator provided. Contact with skin should be minimised as can cause blistering of the skin. Once DMSO dries apply 1% hydrocortisone cream and 30 minutes cold compression. Should be repeated as above every 2 hours for the first 24 hours

NEUTRALISE

B) Neutralise; Anthracyclines requiring Savene

- Consider Savene (Dexrazoxane) for **Anthracyclines** **(Do not apply DMSO)**
- Inform patient the need to apply cold pack for 15-20 minutes 3-4 times daily for up to 3 days
- Give patient follow up leaflet

DILUTE AND DISPERSE

C) Cytotoxics requiring WARM pack

- Inject 1500 iu hyaluronidase (in 1ml water for injection via pincushion s/c injections in 0.1 – 0.2ml volumes around the site
- Apply warm pack to aid absorption of hyaluronidase

Warm pack to remain in situ for 2-4 hours

NEUTRAL DRUGS

D) Apply dry cold compression

*Please note that Cisplatin should be treated as an irritant immediately if extravasation has occurred during infusion. If extravasation is noted post 24 hours of infusion then treat as vesicant.

** If DMSO 98% solution is unavailable the 50% solution can be used as an alternative. The use of DMSO in extravasation is unlicensed.

Please refer to local Dexrazoxane (Savene) Policy in addition to the algorithm below.

Do not use DMSO with Dexrazoxane (Savene)

For Adult Patients Only if treating with Dexrazoxane (Savene)

An extravasation has occurred?

Stop administering SACT immediately

Was it Doxorubicin; Epirubicin; Idarubicin or Daunorubicin?

Inform Senior Nurse / Sister

YES

NO

Follow extravasation process **B**

Follow extravasation process **A, C** or **D**

Is it within 6 hours of Anthracyline administration

NO

Refer to consultant/ Refer to Plastic/ Referral Pathway

YES

Discontinue all administration of chemotherapy

Apply cold pack to area

Do not apply DMSO

Refer patient for possible DEXRAZOXANE infusion

Considerations for prescriber

1. Dexrazoxane not recommended in patients with hepatic or renal impairment (CrCl<40ml/min) or in combination with live attenuated vaccines or with phenytoin
2. Discuss and explain to patient
   - **a)** Side effects of drug
   - **b)** Requirement for 3 days treatment
   - **c)** Need to re-treat with chemotherapy
3. Obtain patient's consent
4. Prescribe as follows:-
   Day 1: 1000mg/m²
   Day 2: 1000 mg/m²
   Day 3: 500 mg/m²

If BSA more than 2m², Day 1 and 2 doses should not exceed 2000mg;
Day 3 dose should not exceed 1000mg.

Considerations for person administering

a) Collect reconstituted Dexrazoxane from pharmacy

b) Stop cold pack 15 minutes prior to administration

c) Attempt to cannulate patient in opposite arm (if peripheral extravasation).
If evidence lymphoedema or unable to use opposite arm discuss with consultant

d) Initiate administration as soon as possible and within 6 hours of extravasation

e) If the patient is receiving scalp cooling consider continuing during Dexrazoxane infusion.

Post administration

- Do not administer any of the remaining chemotherapy
- Check Dexrazoxane infusion site for phlebitis or site pain
- Patient's own medical team to be informed
- Referral to plastic surgeon for assessment within one week of the event
- Monitor patient's FBC and U&E's

Patient Name:		**D.O.B:**	
Consultant:		**Hospital No:**	
Chemotherapy Regime:			
Address:			
Height		m	**Allergies:**
Weight		kg	
BSA		m^2	

	Drug	Dose	Route	Administration details	Prescriber sig. & date	Date given	Time given	Sig. of nurse
Day 1	***Ondansetron**	8mg	PO	***if not given prior to extravasation**				
	***Dexamethasone**	8mg	PO	***if not given prior to extravasation**				
	Dexrazoxane 1000mg/m² (Max 2000mg)	mg	IV	**In 500ml of buffered diluent (provided with Savene) Infused over 1-2 hours**				
Day 2	***Ondansetron**	8mg	PO	***if not given prior to extravasation**				
	***Dexamethasone**	8mg	PO	***if not given prior to extravasation**				
	Dexrazoxane 1000mg/m² (Max 2000mg)	mg	IV	**In 500ml of buffered diluent (provided with Savene) Infused over 1-2 hours**				
Day 3	***Ondansetron**	8mg	PO	***if not given prior to extravasation**				
	***Dexamethasone**	8mg	PO	***if not given prior to extravasation**				
	Dexrazoxane 1000mg/m² (Max 2000mg)	mg	IV	**In 500ml of buffered diluent (provided with Savene) Infused over 1-2 hours**				

Date		**Location:**	
Confirmed by:		**Pharmacist:**	

8.0 DELAYED PRESENTATION OF EXTRAVASATION AND PLASTIC SURGERY REFERRAL - EAST GRINSTEAD

For extravasations presenting beyond the treatment window of DMSO or dexrazoxane (Savene), patients should have a face to face review and staff should contact plastic surgery when there are concerns over tissue necrosis.

After peripheral or central extravasation of any vesicant or exfoliant, seek advice from the Lead Chemotherapy Nurse or Day Services Manager regarding an urgent referral to a plastic surgeon at The Queen Victoria Hospital East Grinstead.

A referral to the plastic surgeons should be made within one week following administration of dexrazoxane given for anthracycline extravasation.

NB The flush out technique is not routinely used in Kent.

Please see Appendix 1 for referral process.

9.0 DOCUMENTATION

12.1 Complete local Trust incident reporting form.

12.2 Medical photograph must be taken.

12.3 Fully document the extravasation on SACT drug extravasation documentation form Part 1 and Part 2 (Appendix 4) and file the patient's notes. Attach to Datix form.

12.4 Complete green card.

12.5 If plastic referral taken place please ensure all relevant documentation is completed.

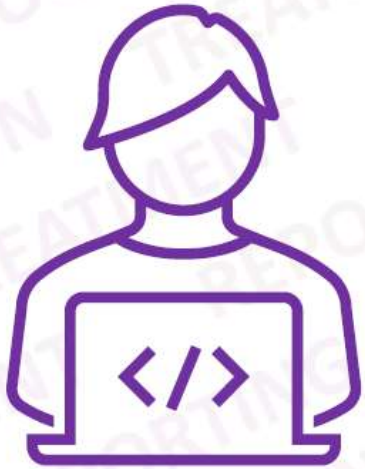
12.6 If required ensure patient has all follow up appointments and documentation.

12.7 All incidents will be discussed via the local trust chemotherapy governance meetings and shared across the Kent & Medway collaborative via the Chemotherapy Group meeting.

Incident Reporting

- ✓Standardised extravasation and infiltration reporting.
  - Nationally
  - Locally
  - Regionally
- ✓Dedicated category: Intravenous Therapy Injury.
  - Extravasation – drug or fluid involved
  - Infiltration – drug or fluid involved
  - Compartment Syndrome
- ✓Drug/Intravenous fluid involved
- ✓Infusion pump device
- ✓Stage / injury level.
- ✓Vascular Access Device (VAD) involved – central or peripheral.
- ✓Level of harm.
- ✓Serious incident.
- ✓Escalation and follow up plan
- ✓Duty of Candour letter.

Reporting



NHS organisations need to set up categories in their incident reporting systems to capture IV complications including extravasation and infiltrations injuries

Taken from NIVAS extravasation toolkit

10.0 PATIENT FOLLOW UP / PATIENT INFORMATION

Patient Follow-up Post Extravasation

Follow-up

- The severity of tissue damage can increase in the days or weeks after the initial injury.
- Extravasation injures should be followed up by the plastic surgical team and the referring clinical team.
- Discharge planning should include extravasation injury follow up.

24hrs
Day 3
Day 7
Weekly

- Review and redress injury daily for 3 days then weekly
- Document progress with clinical photography
- Observe for signs of infection, non-blanching skin and skin necrosis
- Discuss with speciality and wound care team if required to manage evolving wound
- Ensure patient has a point of contact to telephone and is given information to access help

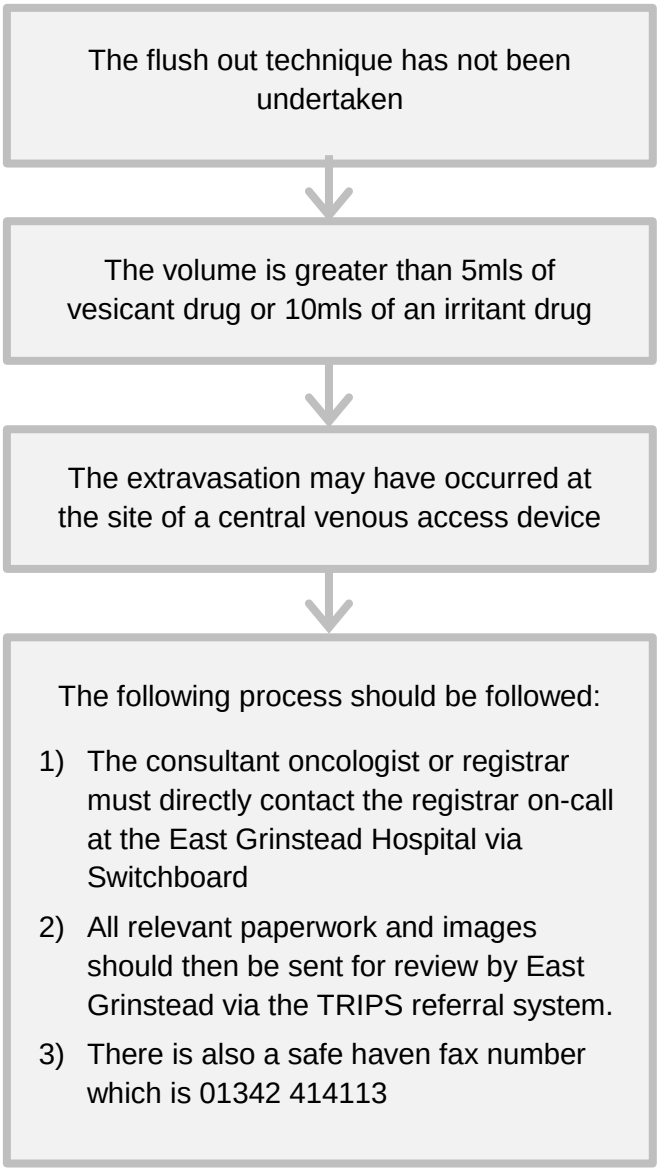
Taken from NIVAS extravasation toolkit

- All patients should be provided with both verbal and written information following an extravasation Appendix 3

11.0 APPENDIX 1

Staff should liaise with their individual Trust to access local or national training.

It is recommended that the patient be referred for plastic surgery opinion and review if the following applies:



12.0 APPENDIX 2

Contents of Extravasation Kit

- Patient Information Sheet
- Extravasation Documentation Sheet
- Referral to plastic surgeon via consultant / registrar
- Hyaluronidase 1500 units (1 ampoule)
- Hydrocortisone Cream 1% labelled – apply as directed
- Sterile Water for injection 10mls x 2
- Sterets / Alcowipes x 4
- Syringe 3ml x 4
- Safety Needles: Green 21g x 4, Orange 25g (from ward), Blue 23g (from ward)
- Filters needles from Pharmacy if required
- Hot pack
- Cold pack
- Indelible marking pen

13.0 APPENDIX 3

Patient Information Sheet on Extravasation

What is Extravasation?
Extravasation is the leakage (or accidental infiltration) of drugs outside of the vein and into the surrounding tissues. This can lead to an immediate painful reaction and may, with some drugs, result in local tissue damage. You may have noticed pain, stinging, swelling or other changes to the skin at the site of drug administration, or the nurse may have noticed that the drug was not flowing in easily.

Why did this happen?
Extravasation is a rare but known complication of intravenous chemotherapy. It is impossible to prevent this even though we take all possible precautions. The important thing is that it has been detected and treated.

Why is Extravasation a problem?
It can lead to pain, stiffness and tissue damage.

What treatment have I received to prevent tissue damage?
The nurse has given you the recommended treatment for the extravasation. Although this will help to minimise the change of developing further problems, you will need to keep checking the area every day.

Checking the area
Once a day, check the area for the following:

- Has the area changed colour or increased in redness?
- Is the area blistering, peeling or flaking?
- Is the area more uncomfortable?
- Is the pain making it difficult for you to exercise the arm or hand?

What else do I need to do?

- Gently exercise the affected arm or hand.
- Take mild painkillers if required.
- Do not apply any other lotions, creams or ointments unless you have been instructed to do so by a doctor or nurse.
- Do not expose the area to strong sunlight.
- Avoid wearing tight clothing around the affected area.
- Protect the affected area when bathing (or having a shower) so that it does not get wet.

When should I contact you?
If you answered **YES** to any of the questions in the checklist above, or if you have any other concerns, then you should contact us.

Who should I contact?
If it is within hours…….. (each day unit document their outpatient times).

Contact Number ……
If it is outside of these hours (even at night time)
Contact Number …….

It is important that you contact the nurse if you have any of the above symptoms or feel the affected area has deteriorated. The nurse will provide advice and if necessary contact your doctor.

14.0 APPENDIX 4

Cytotoxic Drug Extravasation Documentation Form (Part 1)

Patient Name:	Date of Birth:	Patient Contact Number:
Ward:	Hospital Number:	Consultant:

Extravasation Details	
Date & Time:	Chemotherapy Regimen:
Name of Drug(s) Extravasated:	Approximate Volume Extravasated:
Description of Extravasation at Initial Evaluation	
IV Site appearance:	Diameter of Extravasation:
Venous access device used (and gauge):	Location of IV access:
Was a pump being used:	Patient complained of:
☐ Yes ☐ No	

Patient Signs Noted (Describe)		
Inflammation ☐	Lack of Blood Flow ☐	Flow Rate Slowing ☐
Swelling ☐	Pain ☐	Other ☐

Initial Treatment of Extravasation		
Describe Initial Treatment (i.e. cold/hot pack, antidote etc)		
Were other treatments prescribed (e.g. topical preparation, analgesia?)		
Doctor Informed:	By Whom:	Date & Time:

Further Additional Interventions			
Referral	**Date**	**Action**	
Surgical Referral			
Dermatology Referral			
Plastic Surgery Referral			
Photograph if required		Filed in:	

Patient Information			
Info sheet given and follow up plan explained		Date:	Nurse:

Extravasation Documentation			
Form Completed By:		Date:	
Trust Form Completed By:		Date:	

Cytotoxic Drug Extravasation Documentation Form (Part 2)

Follow Up Flow Chart for Suspected Extravasation

Patient Name:	Hospital Number:	Ward:
Date & Time of Extravasation:	Name of Drug Extravasated:	

Follow Up (To score, refer to grading scale below)									
***Day**	1	3	5	7	14	21	28	35	42
Date									
Call / Visit									
Skin Colour									
Skin Temperature									
Skin Integrity									
Oedema									
Mobility									
Pain									
Fever									
Nurse Initials									
May be omitted if signs and symptoms of extravasation resolved									

Grading Scale	0	1	2	3	4
Skin Colour	Normal	Pink	Red	Blanched area surrounded by red	Blackened
Skin Integrity	Unbroken	Blistered	Superficial skin loss	Tissue loss & exposed subcut tissue	Tissue loss & exposed bone/muscle with necrosis crater
Skin Temperature	Normal	Warm	Hot		
Oedema	Absent	Non-pitting	Pitting		
Mobility	Full	Slightly limited	Very limited	Immobile	
Pain	Grade using a scale of 0-10; where 0 = no pain and 10 = worst pain				
Fever	Normal	Elevated			

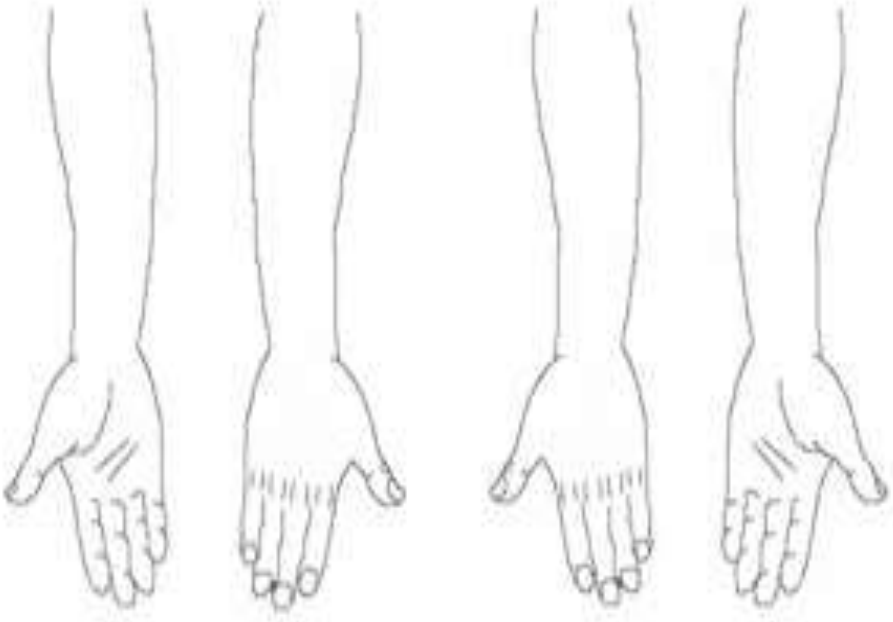
***The days for follow-up are a guide only and do not substitute professional assessment and judgement. They will vary depending on the severity of the extravasation. The first 48hrs were the most important**

To be used in conjunction with the nursing and medical notes.

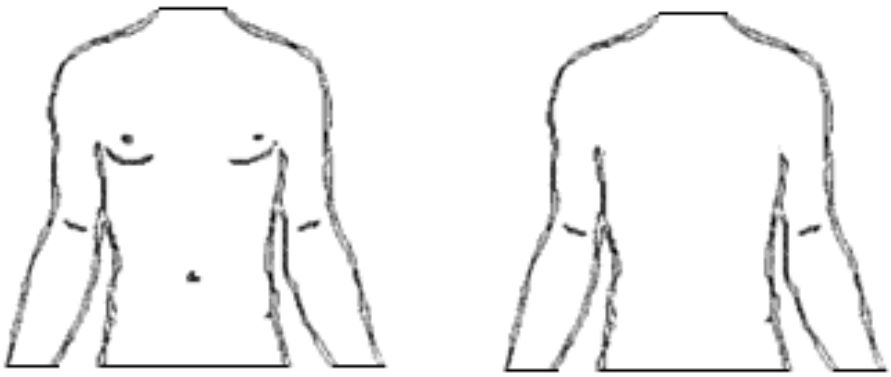
Site of Extravasation

Please mark the location of the extravasation with an X

HANDS AND FOREARM



BODY



15.0 REFERENCES

- http://bopawebsite.org/publications/view/national-extravastion-protocol-for-cancer-chemotherapy 30.08.12
- SELCN Cytotoxic Extravasation Guidelines version 3.1 2012
- The Sherlock 3CG Tip confirmation system for placement of peripherally inserted central catheter (MTG24)
- The Royal Surrey Website www.royalsurrey.nhs.uk/chemo-extravasation
- NIVAS extravasation toolkit https://nivas.org.uk/

16.0 GLOSSARY

Acronyms in common usage throughout KMCC documentation

BNF	British National Formulary
BOPA	British Oncology Pharmacist Association
CNB	Cancer Network Board
COSHH	Control of substances hazardous to health regulations.
CYP	Children & Young People (in relation to the IOG)
DCCAG	Diagnostic Cross Cutting Advisory Group
DOG	Disease Orientated Group (NSSG/TSSG/TWG)
DVH	Darent Valley Hospital
DGT	Dartford and Gravesham NHS Trust
EK	East Kent
EKHUFT	East Kent Hospitals University Foundation Trust
EPS	Electronic Prescribing System
FP10(HNC)	Prescriptions issued by hospital doctors for dispensing in the community
GP	General Practitioner
HoP	High Level Operational Policy
IOSC	Improving Outcomes: A Strategy for Cancer
IV	Intravenous
K&C	Kent & Canterbury Hospital, Canterbury, (EKHUFT)
KMCC	Kent & Medway Cancer Collaborative
KMCRN	Kent & Medway Cancer Research Network
KOMS	Kent Oncology Management System
LSESN	London & South East Sarcoma Network
MFT	Medway Foundation Trust
MTW	Maidstone & Tunbridge Wells NHS Trust
NHS	National Health Service
NMP	Non-medical prescriber
NPSA	National Patient Safety agency
NOG	Non Surgical Oncology Group *(Permanent oncologist sub group of the DOGs with a specific responsibility for chemo/rad pathways and advice to the DOG, Network and GEOGRAPHICAL LOCATIONs on new drugs)*
PoC	Pathway of Care *(Network agreed disease site specific clinical guidelines)*
QEQM	Queen Elizabeth the Queen Mother Hospital, Margate (EKHUFT)
QoL	Quality of life
QSIS	Quality service information system
QST	Quality Surveillance Team
RAT	Research and Trial Group *(Permanent sub-group of the DOGs with a specific responsibility for taking forward the clinical trials agenda)*
RMH	Royal Marsden Hospital
RNOH	Royal National Orthopaedic Hospital
SACT	Systemic Anti-Cancer therapy
SACT regimen	Systemic Anti-cancer prescription on the electronic prescribing system
SACT protocol	Systemic Anti-cancer protocol on KMCC website

TTO	Treatment to take home
QVH	Queen Victoria Foundation Trust Hospital East Grinstead
UCLH	University College Hospital London
WHH	William Harvey Hospital, Ashford (EKHUFT)
WK	West Kent

17.0 DOCUMENT ADMINISTRATION

Document Title	Systemic Anti-Cancer Therapy Care Pathway – Extravasation Pathway of Care
Authors	Carolyn Maynard, Charlotte Wadey, Christine Handy, Marie Payne, Ruth O'Brien, E Parry
Agreed as "Fit for Publication" by	Members of the KMCC Chemotherapy forum and Nursing Sub Group

Enquiries:	Caroline Waters - KMCC Network Pharmacist
Date of Next Review:	

Revision History			
Date of revision	New Version Number	Nature of Revision	Confirmation of Accuracy by
23/01/09	V0.1	Re-written Network guidelines	Sabah Boulebadd
26/02/09	V0.2	Inclusion of DMSO agreed by Nursing/Pharmacy Sub-group	Bryony Neame
08/04/09	V0.3	Words 'chemotherapy, cytotoxic, monoclonal' etc. changed to 'systemic anti-cancer therapy' to reflect NCEPOD report	Bryony Neame
11/05/09	V0.4	Amendments as suggested by Dr. Waters	Bryony Neame
01/06/09	V1	Wording changes made as suggested by Kent Oncology Centre systemic anti-cancer therapy staff. No operational changes	Bryony Neame
09/2011	V2	Document reviewed and updated by group to reflect latest national guidance and recent advances in antidotes.	Network Chemotherapy Nursing group
31/07/2013	V3	Replaced links as not working – document not reviewed	Network Chemotherapy Nursing group
2016	V4	Complete revision – new guidance written	Charlotte Wadey and members of the KMCC Chemotherapy Group & Nursing Sub- Group.
Jan-May 2018	V4.1-v4.2	Review by KMCC Nursing Group – treatment algorithm and instructions for	Principal autrhors: R O'Brien, C Wadey, C Maynard, E Parry

		nurses (p1-0-11) simplified. Additions to classification of drugs list p12. Page number added One of drug classification tables removed (duplicated) – table with treatment included. Appendix 3 added to 13.1 Appendix 1 – remove reference to UKONs and replace with comment about Trust / national training	
June 2018	V5	Published following consultation via email with KMCC chemotherapy group	
Feb 2021	V5.1 -5.1.1	Reviewed by Jan Christie and discussed at chemo group 11.02.21 V5.1.1 glossary updated by M.Archer Reformatted by R Patel	Updated by J. Christie
April 2021	V6	Published following Chemo group meeting and virtual consultation period.	C.Waters, J.Christie
July 2022	V6.1	Reviewed by C.Water/M.Archer Discussed at chemo group and updated: Changes to section 9	
July 2022	V6.2	Section 10 and 11 updated	M.Archer/C.Waters
September 2022	V6.2.1	Reviewed at Chemo/EP group. Section 11 reworded.	M.Archer KMCC Chemo/EP group
September 2022	V7	Published	APPROVED AT CHEMO/EP group
November 2024-Feb 2025	V7.1-V7.3.1	Addition of NIVAS Extravasation Toolkit Guidance as per SGG decision. Reformatting	SGG meeting C. Waters R. Patel M. Archer
March 2025	V8	Published	Approved by SGG