Chemotherapy extravasation guideline

written by:	WOSCAN Cancer Nursing and Pharmacy Group
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Contents

Introduction

Aims of this guideline

- To provide evidence-based guidance or best practice in the absence of evidence, on all aspects of extravasation to promote a consistent approach across the West of Scotland.
- To educate staff on early preventative measures to reduce the risk of extravasation.
- To provide clear referral and investigative pathways for patients with suspected or actual extravasations presenting in the West of Scotland.
- To encourage prompt and appropriate treatment of extravasation to minimise the risk of serious tissue damage and optimise patient outcomes in relation to quality of life.
- To assist with appropriate patient selection for treatment.
- To inform and educate multidisciplinary staff regarding referral and management of extravasation.
- To encourage staff to involve patients in the early identification of this potentially disabling condition.

Scope

This guideline is applicable to all areas within West of Scotland Cancer Network (WOSCAN) that deliver chemotherapy.

Responsibilities

- It is the responsibility of each health board area to appoint a lead to ensure that all staff administering intravenous cytotoxic chemotherapy are appropriately trained and their competency maintained according to local hospital policy as set down in HDL(2005)29.
- Trained staff should be familiar with the policy and know the contents of and location of the extravasation kit.
- Trained staff are responsible for regular checks of the extravasation kits and expired or used kits should be returned to pharmacy for replacement.

All potential extravasations should be treated as a medical emergency

Definitions

Extravasation	The inappropriate or accidental infiltration of chemotherapy into the subcutaneous tissue or subdermal tissues surrounding the administration site. These injuries range from less significant erythematous reactions to skin sloughing and necrosis. Whilst extravasation is possible with any intravenous injection it is only considered to be problematic with compounds known to have irritant or vesicant properties. The onset of symptoms may occur immediately or several days to weeks after administration. If left undiagnosed or inappropriately treated, necrosis and functional loss of tissue and limb concerned may ensue.
Vesicant	A drug which has corrosive properties and has the potential to cause tissue destruction if extravasated. Varying degrees of pain, oedema, erythema, blistering and necrosis may occur. Vesicants are further divided into two groups. When extravasated, non-DNA binding agents (vinblastine, vinorelbine, vincristine) are inactivated or quickly metabolised and follow the normal healing process whereas DNA binding agents (epirubicin, mitomycin, doxorubicin, daunorubicin, idarubicin) remain in the tissues resulting in long-term injury.
Exfoliant	A drug capable of causing inflammation and shedding of skin but less likely to cause tissue death.
Irritant	This has the potential to cause pain, aching, tightness and phlebitis with or without inflammation, rarely progressing to tissue breakdown.
Inflammitant	Drug with the potential to cause mild to moderate inflammation and flare in local tissues.
Neutral	Drugs which cause very little or no tissue damage when extravasation occurs.
Venous flare reaction	Associated with anthracyclines (doxorubicin, epirubicin, daunorubicin). Presents as local urticaria, and streaking erythema, although blood return remains good. Pain is rare. This reaction is transient and usually resolves within 1 – 2 hours.
Vessel irritation	Aching and tightness occurs along the vein. Seen with drugs such as vinorelbine and dacarbazine. Applying warmth to dilate the vein can relieve this. Blood return is usually intact although erythema or redness may be present.
Venous shock	Rapid administration or the administration of very cold drugs can cause the muscle wall of the vein to go into spasm. Blood return may be lost. Heat can help to relax and dilate the vein.

Classification of cytotoxic drugs

Drugs can be classified according to their potential to cause serious necrosis when extravasated: from neutral drugs which are expected to cause the least damage through to vesicant drugs which may cause tissue necrosis and ulceration on extravasation.

Neutrals	Inflammitants	Irritants	Exfoliants	Vesicants
Alemtuzumab	Azacitidine	Arsenic trioxide	Cisplatin	Amsacrine
Bevacizumab	Bortezomib	Carboplatin	Daunorubicin – Liposomal	Busulfan
Bleomycin	Fluorouracil	Etoposide	Docetaxel	Camustine
Cetuximab	Methotrexate	Irinotecan	Doxorubicin – Liposomal	Chlormethine (Mustine)
Cladribine	Raltitrexed	Teniposide	Mitoxantrone	Dacarbazine
Clofarabine			Oxaliplatin	Dactinomycin
Crisantaspase			Topotecan	Daunorubicin
Cyclophosphamide				Doxorubicin
Cytarabine				Epirubicin
Fludarabine				Idarubicin
Gemcitabine				Mitomycin
Ifosfamide				Paclitaxel
Melphalan				Streptozocin
Nelarabine				Treosulfan
Pemetrexed				Vinblastine
Pentostatin				Vincristine
Rituximab				Vindesine
Thiotepa				Vinorelbine
Trastuzumab				

Prevention of extravasation

Various factors need to be considered if the risk of extravasation is to be minimised.

Staff

- All personnel responsible for administering chemotherapy must be appropriately trained and their competency maintained as part of their Professional Development Plan.
- All personnel responsible for administering chemotherapy must be trained in measures to help prevent extravasation.
- All staff administering IV chemotherapy must be able to recognise and manage an extravasation incident.

Patient

The patient is usually the first to be aware of problems with administration due to a stinging or burning sensation or pain. Patient education and co-operation is therefore imperative to ensure early recognition and prompt reporting.

It is also important to be aware of patients who are at an increased risk of extravasation.

- Patients with altered circulation or smaller veins (Raynaud's disease, diabetes, peripheral vascular disease). These patients may not experience the pain that can accompany extravasation.
- In patients with SVCO (superior vena cava obstruction) the elevated venous pressure can cause leakage at the cannula site.
- Elderly patients who have fragile veins and skin.
- Patients with altered mental status (unconscious, sedated, confused, mentally impaired) may be unable to report discomfort or stinging around the cannulation site.
- Patients who have had multiple courses of chemotherapy may have thrombosed vessels.
- It has been suggested that concurrent medication (vasodilators, antiplatelet therapy, steroids, diuretics, analgesics) may increase the risk by a variety of mechanisms (increasing blood flow and local bleeding, suppression of the inflammatory response, reduce pain sensation).
- Agitated or confused patients may interfere with the cannula and dislodge it from the vein.
- Patients with communication difficulties may not be able to report early symptoms of pain.

Cannulation site

Careful selection of a new and appropriate site is essential to minimise the risk of extravasation and limit the damage to tissues should an incident occur.

- Administration of cytotoxics using a peripheral site should be via a recently sited cannula.
- Local warming may help to dilate the veins and aid cannulation.
- Winged steel infusion devices must not be used for infusion of vesicant drugs or for infusional chemotherapy. Flexible cannulae should be used.
- Cannulation must be avoided over joints. The inner wrist, anticubical fossa and the dorsum of the foot must not be used.
- Avoid cannulation near sites of previous radiation or surgery. This prevents radiation recall injury and avoids sites of existing tissue damage or fibrosis.
- Avoid, where possible, cannulating on the side of mastectomy or lymph node clearance or where lymphoedema is present. This limb will have impaired circulation and reduced venous flow will allow intravenous solutions to pool and leak around the site of cannulation.
- The risk of extravasation injury is increased by multiple attempts at venepuncture; the secured intravenous site must be proximal to previously attempted venepuncture sites.
- Complete a venous access assessment tool at each cycle of chemotherapy to document the location and condition of the site. The insertion of a PICC or a central line may be appropriate in patients with poor access or those receiving multiple courses of vesicant drugs.
- Ensure cannula is securely fixed with a transparent dressing. Opaque dressings should be not be used.
- Never cover the cannula site with a bandage; the site of needle entry should be visible at all times.

Administration via peripheral lines

- The patency of an intravenous site should be verified prior to chemotherapy administration and regularly throughout. Observe for erythema and swelling and frequently check for blood return. Resite if unsatisfactory.
- Ask the patient to report any sensation of burning or pain at the infusion site, being extra vigilant in patients with added risk factors.

- Wherever possible, vesicant drugs should be given first and by slow IV push via the side-arm port of a fast running infusion of compatible fluid.
- If a vesicant drug is recommended to be given by intravenous infusion it is preferable to administer it via a central line. Where this is not possible, extra vigilance is required when administering peripherally.
- In general, peripheral vesicant infusions should not be administered using an infusion pump. There are a few vesicants (eg dacarbazine and paclitaxel) which may be administered as peripheral infusions via a pump, as long as there is frequent close supervision of the patient's IV site. A full risk assessment should be done when considering whether to administer vesicant drugs using an infusion pump.
- Irritant drugs should be sufficiently diluted and given at the appropriate rate.
- Patients with intravenous infusions in progress should not be allowed off the ward.
- It is good practice to document the rate of administration, verification of patency and patient's response when administering chemotherapy.

Administration via central lines

- For slow infusion of high-risk drugs, a central line or PICC line should be used.
- Extravasations can also occur with central venous catheters. Reasons include; dislodging of the access needle, venous thrombosis, fibrin sheath formation and catheter breakage.
- Blood should be aspirated prior to administration of chemotherapy to ensure the line is correctly located in the vein.
- A bolus of sodium chloride 0.9% or glucose 5% should be infused to ensure free flow and absence of discomfort or swelling.
- A vesicant should infuse in over at least 10 minutes.
- Flush well with appropriate solution in between drugs using either sodium chloride 0.9% or glucose 5% depending on drug compatibility.

Detection of extravasation

Extravasation should be suspected if one or more of the following is observed during or immediately after the injection:

- The patient complains of burning, stinging pain or any other acute change at the injection site. (This should be distinguished from a feeling of cold which can occur with some drugs). With central lines the patient may experience an altered sensation at the site or along the chest wall, neck and shoulder. It is important to listen to the patient.
- Induration, swelling or leakage at the injection site.
- Erythema at the injection site. However there may be redness, 'nettle rash' or weal with Doxorubicin / Epirubicin or Dexamethasone which is a rare but normal reaction
- No backflow of blood (if found in isolation, this should not be regarded as an indication of a non-patent vein.)
- Resistance is felt on the syringe plunger during administration.
- The free flowing infusion slows or stops.
- An infusion is not flowing freely.
- Check for flare reactions and venous spasm.

General principles for the treatment of extravasation

- When extravasation occurs, prompt action is required to prevent any further infiltration and minimise tissue damage.
- The extravasation kit contains the equipment and information necessary to manage a suspected or actual extravasation but medical staff should be immediately informed.
- Leaving the cannula / central line in place allows residual drug in the tissues to be aspirated.
- Consideration should always be given to the prescription of analgesia.

Peripheral lines

- The extravasated area should be marked with a soft tipped pen to enable the size of the area to be evaluated at follow up visits.
- The limb is elevated to minimise swelling.
- Gentle movement of the affected limb should be encouraged to maintain mobility.
- Photographs are generally taken with extravasation of all vesicants and may be taken with other agents depending on the volume of fluid infiltrated and the severity of the skin reaction.

Central lines

- Early referral to medical staff is essential. Although the incidence of extravasation from central lines is lower than that from peripheral lines, the severity of the injury may be greater. This is due to later detection and possible leakage of larger volumes of fluid.
- X-Rays are taken to determine the position of the central line tip.
- Photographs should always be taken.
- Treatment depends on whether extravasation was in superficial or deeper tissues and should be decided upon by a specialist on an individual patient basis.
- In general, an extravasation in the superficial tunnelled section should be managed in the same way as a peripheral extravasation. An extravasation in the deep tissues may require to be surgically managed.

Application of heat or cold to the area

For each drug, there is a recommendation to either apply heat or cold to the extravasation site. The logic behind these recommendations is as follows:

Heat This will cause vasodilation, increasing drug distribution and absorption and thus aiding in the dispersal of the drug from the injury site. Heat is used in non-DNA binding drug extravasations.

Cold This will cause vasoconstriction and minimise the spread of the drug from the initial injury allowing time for local vascular and lymphatic systems to disperse the agent. Cold is used in DNA binding drug extravasations.

Flush-out technique

- This treatment can be carried out either under local or general anaesthetic. If the treatment is to be carried out under local anaesthetic, 5-10mls of 1% lidocaine should be injected into the subcutaneous space both beneath the area of extravasation and around it.
- Once anaesthetised, five or six small stab incisions around the area of extravasation injury are made. This provides sufficient access to the affected subcutaneous tissue. The subcutaneous tissue containing the extravasated drug is then flushed out using an infiltration cannula , commonly used in liposuction, and 500mls of saline or compound sodium lactate (Hartmann's solution), injecting 20-30mls at a time, through each incision, and allowing it to drain out of the other incisions.
- After the flush out a layer of Jelonet and Betadine soaked gauze is applied to the wound and the limb wrapped in a padded bandage and elevated for twenty-four hours. The stab incisions are allowed to close spontaneously.
- In seriously debilitated patients, for example those with neutropenia, a short course of prophylactic antibiotics is recommended.
- Patients requiring flush-out should be referred to a plastic surgeon. There should be a local policy in place detailing how to access and refer to the plastic surgeons.
- The flush-out technique should be performed as soon as possible after the extravasation has occurred and ideally within 6 hours of the incident (Giunta 2004). There may be benefit in the flush-out technique up to 24 hours after the extravasation but it is expected that efficacy reduces over time (Gault 1993).

Pharmacological management of extravasation

Corticosteroids

The local injection of dexamethasone or hydrocortisone in the treatment of extravasation is controversial. It is argued that inflammation is not prominent in the aetiology of tissue necrosis, that subcutaneous and intradermal steroids may induce ulcers in high doses and their effectiveness is not proven. Alternatively it is suggested that steroids would suppress the local inflammation caused by tissue trauma that occurs during the treatment process. This guideline does not advocate the use of subcutaneous steroids. Topical hydrocortisone 1% may reduce non-specific inflammation with minimum damage to the infiltrated area and surrounding tissue.

Antidotes

The reported benefits of the use of antidotes are conflicting and no antidote has clear validation in clinical trials. Only three antidotes are advocated in this policy. They are used only in vesicant or large volume extravasations. The use of an antidote requires a doctor's prescription.

- Hyaluronidase is an enzyme responsible for degrading hyaluronic acid and by this mechanism enhances the systemic uptake of the infiltrated cytotoxic. It is routinely used with vinca-alkaloids and its use has been advocated with other agents such as paclitaxel. It is unlikely to cause harm to surrounding tissue. Its use in extravasation injuries is unlicensed.
- Dimethylsulfoxide (DMSO) enhances skin permeability thus facilitating the systemic absorption of the vesicant drug. It has also free radical scavenging properties. Topical DMSO has been shown in prospective studies to limit the course of anthracycline extravasation injuries. It should be applied with a cotton bud to the extravasated area. Air-drying is required as DMSO may cause blisters if occluded. Care should be taken to avoid contact with undamaged tissue. The optimal scheduling and duration for the use of DMSO is unclear and recommendations have been made on available evidence. DMSO use in the treatment of extravasation is unlicensed.
- Sodium thiosulphate is thought to have a direct inactivation effect on chlormethine (mustine). It has few side effects but requires to be administered by subcutaneous injection in a 'pin cushion' fashion. Its use is unlicensed.

- The drug dexrazoxane (Savene®) is licensed for use in anthracycline extravasations. It has not been included in this guideline as it has not been approved for use in Scotland by the Scottish Medicines Consortium. There is currently insufficient evidence to compare its efficacy against the flush out technique.

Summary of management of peripheral extravasation

The following recommendations also apply to extravasations resulting from the tunnelled section of a central line.

General treatment instructions

1. **Stop infusion and disconnect the drip**
2. **Try to aspirate the extravasated drug by connecting a clean syringe to the venflon/cannula and drawing back.**
3. **Collect extravasation kit and inform doctor of extravasation**
4. **Mark the extravasated area with a pen and remove cannula**
5. **Follow drug specific management recommendations**
6. **Elevate limb and administer pain relief if required**
7. **Give patient information sheet and arrange follow up**

Neutrals

Alemtuzumab
Bevacizumab
Bleomycin
Cetuximab
Cladribine
Clofarabine
Crisantaspase
Cyclophosphamide
Cytarabine
Fludarabine
Gemcitabine
Ifosfamide
Melphalan
Nelarabine
Pemetrexed
Pentostatin
Rituximab
Thiotepa
Trastuzumab

1. Follow general treatment instructions.
2. Firmly apply a heat pack to the extravasated area for 20 minutes every 6 hours for the first 24 hours.

In large volume extravasations where the patient is experiencing discomfort due to swelling, the following may be considered:

1. Dispersal of the drug can be facilitated by the use of subcutaneous hyaluronidase (1500 units in 1ml water for injection), injected around the area of the injury.
2. Gently massage the area to facilitate dispersion. Apply heat and compression to assist natural dispersal of the drug.

Inflammitants

Azacitidine
Bortezomib
Fluorouracil
Methotrexate
Raltitrexed

1. Follow general treatment instructions.
2. Firmly apply a cold pack to the extravasated area for 30 minutes every 4 hours for the first 24 hours.
3. When the initial inflammatory reaction has subsided, a warm compression may be used to aid the dispersal of any residual fluid.
4. Apply topical hydrocortisone cream 1% every 6 hours for up to 7 days or as long as erythema continues.

Irritants

Arsenic trioxide
Carboplatin
Etoposide
Irinotecan
Teniposide

1. Follow general treatment instructions.
2. Firmly apply a cold pack to the extravasated area for 30 minutes every 4 hours for the first 24 hours.
3. Apply topical hydrocortisone cream 1% every 6 hours for up to 7 days or as long as erythema continues

   For Carboplatin extravasations, when the initial inflammatory reaction has subsided, a warm compression may be used to aid the dispersal of any residual fluid.

Exfoliants

Cisplatin
Docetaxel
Oxaliplatin

1. Follow general treatment instructions
2. Firmly apply a heat pack to the extravasated area for 20 minutes every 6 hours for the first 24 hours
3. Apply topical hydrocortisone cream 1% every 6 hours for 7 days or as long as erythema continues.

   In large volume extravasations where the patient is experiencing discomfort due to swelling, dispersal of the drug can be facilitated by the use of subcutaneous hyaluronidase (1500 units in 1ml water for injection) injected around the area of injury. Gently massage the area to facilitate dispersal.

Topotecan

1. Follow general treatment instructions
2. Firmly apply a cold pack to the extravasated area for 30 minutes every 4 hours for the first 24 hours.
3. Apply topical hydrocortisone cream 1% every 6 hours for 7 days or as long as erythema continues.

Exfoliants

Daunorubicin – Liposomal
Doxorubicin – Liposomal
Mitoxantrone

1 Follow general treatment instructions

2 Firmly apply a cold pack to the extravasated area for 30 minutes every 4 hours for the first 24 hours

For extravasations of <5ml, apply topical hydrocortisone cream 1% every 6 hours for up to 7 days or as long as erythema continues.

For extravasations of >5ml

a Daunorubicin – Liposomal and Doxorubicin – Liposomal – alternate topical DMSO and 1% hydrocortisone cream every 2 hours in the first 24 hours, starting 8 hours after the extravasation, and then four times daily thereafter for up to 14 days.

DMSO should be applied with a cotton bud or gauze swap and left to air-dry. The skin should not be covered to prevent blistering occurring.

b Mitoxantrone – alternate topical DMSO and 1% Hydrocortisone cream every 3 hours for 5 to 7 days.

DMSO should be applied with a cotton bud or gauze swap and left to air-dry. The skin should not be covered to prevent blistering occurring.

Vesicants

Amsacrine
Dacarbazine
Dactinomycin
Daunorubicin
Doxorubicin
Epirubicin
Idarubicin
Mitomycin
Streptozocin

1 Follow general treatment instructions.

2 Firmly apply a cold pack to the extravasated area for 30 minutes every 4 hours for the first 24 hours.

For extravasations of <5ml, alternate topical DMSO and 1% hydrocortisone cream every 2 hours in the first 24 hours then every 3 hours for the next 7-10 days.

DMSO should be applied with a cotton bud or gauze swap and left to air-dry. The skin should not be covered to prevent blistering occurring.

For extravasations of >5ml use the flush-out technique according to local procedure

Vesicants

Paclitaxel
Vinblastine
Vincristine
Vindesine
Vinorelbine

1. Follow general treatment instructions.
2. Firmly apply a heat pack to the extravasated area for 20 minutes every 6 hours for the first 24 hours.

   For extravasations of <5ml, infiltrate the site with 1500 units of hyaluronidase in 1ml water for injection. Inject subcutaneously at several areas around site. Gently massage area to facilitate dispersion.

   For Paclitaxel extravasations, follow this with application of 1% hydrocortisone cream every 6 hours for 7 days.

   For extravasations of >5ml refer for flush-out technique according to local procedure

Busulfan
Carmustine
Treosulfan

1. Follow general treatment instructions.
2. Firmly apply a cold pack to the extravasated area for 30 minutes every 4 hours for the first 24 hours.

   For extravasations of <5ml, apply topical 1% hydrocortisone cream every 6 hours for up to 7 days or as long as erythema continues.

   For extravasations of >5ml refer for flush-out technique according to local procedure

Chlormethine (Mustine)

1. Follow general treatment instructions.
2. Firmly apply a cold pack to the extravasated area every 4 hours for the first 24 hours.

   For extravasations of <5ml, infiltrate the area subcutaneously with 1-3ml sodium thiosulphate 3%. Introduce a further 100mg hydrocortisone to the infiltrated area. Apply topical hydrocortisone cream 1% every 6 hours for up to 7 days or as long as erythema continues.

   (A 3% solution of sodium thiosulphate can be prepared from the commercially available 50% solution by following these directions: Dilute 1.2ml of 50% sodium thiosulphate to 20ml with water for injection.)

   For extravasations of >5ml refer for flush-out technique according to local procedure.

Non-pharmacological management of extravasation

Heat application

Application of heat causes vasodilation, increases drug distribution and absorption and decreases local drug concentrations. It aids the dispersal of vinca-alkaloids and other non-vesicant induced injuries where "spread and dilute" treatment is required. Heat should never be used for doxorubicin-induced injury. This increases the cellular uptake of doxorubicin, increasing cytotoxicity. Where heat is advocated, it is recommended to use a heat pack on the extravasated area for 20 minutes every 6 hours.

Topical cooling

Topical cooling diminishes pain and discomfort at the extravasation site and causes vasoconstriction, localising the extravasated vesicant and allowing time for the agent to be dispersed by local vascular and lymphatic systems. Decreasing the blood supply decreases the metabolic demand of the affected and at risk tissue slowing drug uptake. It also changes the fluidity of the cellular membrane making the cells less sensitive to the damaging effects of the drug. This approach should not be used for vinca-alkaloid induced injuries as it is shown to increase ulcer formation. Where cooling is advocated, it is recommended to use a cold pack on the extravasated area for 30 minutes every 4 hours.

Heat and cold sources should not be applied directly to the skin. A piece of dry gauze should be placed as a protective barrier between the skin and heat / cold source.

Surgery

Referral to a plastic surgeon is indicated when, despite conservative treatment, the extravasation injury progresses to ulceration. Wide excision with use of grafts may be indicated. Earlier surgical intervention (flush out technique) is recommended for large volume vesicant extravasations.

Extravasation kit

Location

Extravasation kits are available in areas designated for the administration of cytotoxic chemotherapy. Should chemotherapy be administered out with these areas (in exceptional cases only and after full assessment of clinical risk involved), an extravasation kit should be made available.

Contents

1x10	Hyaluronidase 1500iu injection
1x15g	Hydrocortisone 1% Cream
5x10ml	Sodium Chloride 0.9% injection
5x10ml	Sterile water for Injection
1x100ml	Dimethylsulfoxide (DMSO) 50% or 97%
	Needles 25G & 21G
	Syringes 5ml &10ml
	Alcowipes
	Cotton wool balls, cotton buds
	Sterile gauze
	Soft tipped pen

In addition, if chlormethine (mustine) is used, the kit should contain sodium thiosulphate injection.

- A cold source (crushed ice, flexible cold pack) should be available on the ward.
- A heat source (hot water bottle, flexible hot pack) should be available on the ward.
- Classification of cytotoxic drugs and extravasation algorithms.
- Green card.
- Extravasastion / Infiltration Report Form.

Maintenance

- The extravasation kits are maintained by the pharmacy department.
- Nursing staff are responsible for the monthly checking of the trays.
- Expired and used kits should be returned to pharmacy for replacement.

Documentation and information

Patient information

- In the event of an extravasation the patient should be counselled appropriately.
- The patients should be provided with the WOSCAN patient information sheet on extravasation to reinforce home management of the extravasation site
- Patient should be clear on dates of return visits for review of the injury.

Documentation

It is important that a complete and accurate history of the extravasation and the follow up visits is documented. This aids both the management of the injury and the regular audit of administration practice. The Green Card Scheme is a national, anonymised and confidential scheme designed to collate data and statistics on the number of incidents according to drug category, treatment methods, antidotes used and outcome of events. It also provides information on the efficacy of certain treatments.

- The incident should be documented using the Extravasation Report Form. Photographs of the affected area should be included if appropriate, this aids management and follow up. The form should be filed in the patient's notes.
- The audit form in the extravasation pack should be completed to keep a record of all extravasations and their outcomes.
- Other incident reporting procedures should be followed according to local policy.
- Fill in appropriate details on Green Card.

Follow-up and long term management

- Patients' progress should be closely followed after suspected extravasation to allow appropriate further action to be taken.
- Generally, observation and documentation (clinical notes, report form, green card) of the injury should be on a daily basis for the first few days and then extended to a weekly follow up on a planned basis. Patients should be assessed for pain, erythema, mobility, skin changes and necrosis.
- For extravasations of drugs in lower categories (i.e Neutrals), after initial review the patients can be assessed as deemed appropriate depending on the volume of fluid infiltrated and the severity of the reaction.
- DNA binding vesicants may recycle locally and produce progressive necrosis and slough. Areas of extensive blistering or ulceration, progressive induration and erythema or persistent, severe pain are indications for surgical assessment and possible excision of injured tissue. Surgical intervention should not be delayed.
- Sterile dressings should be applied to sites that are blistered or necrotic to prevent infection.
- Ulcerated sites require specialist referral.
- Appropriate analgesia should be prescribed.
- Patients who have experienced an extravasation injury and still require further courses of chemotherapy should be monitored closely for recall reactions. Incomplete cellular repair after the first injury combined with additional damage during the subsequent injections may see a reactivation of skin toxicity and an exacerbation of the initial tissue damage. This phenomenon is said to be more common with anthracyclines but has been observed with paclitaxel and mitomycin.

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WOSCAN cancer nursing and pharmacy group

Sandra White (Chair)
Consultant Nurse in Cancer, NHS Ayrshire and Arran

Joanne Robinson
Senior Pharmacist – Oncology, NHS Forth Valley

Elaine Barr
Clinical Educator, Beatson West of Scotland Cancer Centre

Joyce McDermid
Macmillan Principal Pharmacist, NHS Ayrshire and Arran

Carol King
Clinical Nurse Specialist Haemato-Oncology, Victoria Infirmary & Southern General Hospital, Glasgow.

Lynne Summers
Haemato-oncology Nurse Specialist, Royal Alexandria Hospital, Paisley

Michelle Welsh
Oncology Clinical Nurse Educator, RHSC Yorkhill.

Kirsty Crozier
Macmillan Nurse Specialist for Haematology/Oncology, Hairmyres Hospital

With help from:

Mr Arap Rae
Consultant Plastic Surgeon, Glasgow Royal Infirmary

Sarah Syme
Head of Medical Photography, NHS Ayrshire and Arran

Design Omnis Partners, Cumbernauld