

Guideline for the Management of Extravasation

Version History

Version	Date Issued	Brief Summary of Change
1.0	19.03.07	Endorsed by the Governance Committee
1.1	21.08.08	Prepared for review
1.2	09.02.09	Changes made following review by Andrew Stanley
1.3	04.10.10	Discussion at Chemotherapy Network Site Specific Group
1.4	14.11.10	With comments from Andrew Stanley
1.5	31.01.11	Discussion at Chemotherapy Network Site Specific Group and updated by Andrew Stanley
1.6 – 1.8	01 – 04 .11	Various versions for consideration – sent to NSSG April 2011
1.9	05.05.11	Final version by Andrew Stanley for review by the Chemotherapy NSSG and Jeanette Hawkins
2.0	14.06.11	Endorsed by the Governance Committee

Date Approved by Network Governance	June 2011
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Date for Review	June 2014
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Changes since version 1

Part 1 has been added to describe the use of dexrazoxane. The updated version of the Royal Marsden Hospital Manual has been added.

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1 Scope of the Guideline

This guidance has been produced to support the following:

- The prevention of the extravasation of intravenous anti-cancer drugs.
- The early detection of the extravasation of intravenous anti-cancer drugs.
- The treatment of the extravasation of intravenous anti-cancer drugs.

2 Guideline Statement

Statement 2

The Network Site Specific Group has agreed to adopt the Royal Marsden Hospital Manual of Clinical Nursing Procedures 7th Edition; Blackwell Publishing (2008), chapter on extravasation, with the addition of a section on dexrazoxane.

Part 1 is: Detailed guidance on the use of dexrazoxane.

Part 2 is: The Royal Marsden Hospital Manual of Clinical Nursing Procedures 7th Edition; Blackwell Publishing (2008), chapter on extravasation.

These have been adopted as guidelines for the management of extravasation of anti-cancer drugs used in the cancer care setting.

Statement 2

There are a number of drugs included which normally have a three year review. This guideline will be reviewed in between times if new drugs become available.

Part 1 - Detailed Guidance on the Use of dexrazoxane

3 Dexrazoxane

3.1 **DEXRAZOXANE IS NOT RECOMMENDED FOR USE IN CHILDREN. FOR MANAGEMENT OF ANTHRACYCLINE EXTRAVASATION IN CHILDREN USE COOLING AND DMSO.**

3.2 Dexrazoxane (Savene) is the first systemic antidote for the treatment of anthracycline extravasation; it is a cytotoxic drug. Dexrazoxane has two major mechanisms of action:

- a. It inhibits DNA topoisomerase II.
- b. It acts as an iron chelator and thereby reduces iron-dependant free radical oxidative stress associated with anthracycline induced toxicity.

3.3 As a cytotoxic drug disposal and safe handling requirements should be as any cytotoxic drug. Reconstitution needs to be carried out by an oncology pharmacist. It is administered as an intravenous infusion over 1-2 hours, once

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a day for 3 days following extravasation. The first infusion needs to be administered within the first 6 hrs of extravasation. Dosing schedule is as follows:

- **Day one:** dexrazoxane 1000mg/m²
- **Day two:** dexrazoxane 1000mg/m²
- **Day three:** dexrazoxane 500mg/m²
- Maximum single dose is 2000mg

3.4 Site for Administration: Administration should be through a large vein away from the site of extravasation, so as not to cause any further tissue damage due to leakage of another drug. If the other arm cannot be used a site proximal to the area of extravasation should be used. If the extravasation is from a central venous access device (CVAD) the antidote should be given peripherally. If the extravasation is from a PICC line then the opposite arm should be used.

3.5 Prior to Administration: Discontinue any cooling procedures 15 minutes before administration. Do not use DMSO in conjunction with dexrazoxane.

3.6 When to Administer Dexrazoxane:

- a. Peripheral extravasations; dexrazoxane should only be administered when a positive diagnosis of an anthracycline extravasation has occurred. This is most likely when sufficient volume has extravasated to allow the attending practitioner to palpate the area and feel the 'spongy' nature of the tissues around the site of the cannular tip. The current view is that this represents an extravasated volume of approximately 3mls. Volumes below 3mls or where the attending practitioner is unsure whether an extravasation has occurred should be treated with the application of DMSO and cold compression. Extravasation diagnosed substantially beyond the 6 hour 'window' for treatment recommended by the manufacturer, i.e. up to 9 hours, should be treated with DMSO.
- b. Dexrazoxane is also recommended for any suspected extravasations of anthracyclines from central catheters.

3.7 Subsequent Chemotherapy Treatments: As dexrazoxane is an antidote to anthracyclines and blocks their action the MDT will need to decide whether the course of chemotherapy that the extravasation occurred on needs to be repeated. This will depend on when the extravasation occurred during the administration of the cytotoxic drug, i.e. if not much had been administered the treatment may be repeated, if most of the anthracycline had been administered the patient may progress onto the next course, although dexrazoxane may have blocked the action of that particular dose. Details of what drugs had been successfully delivered must be available for discussion with the oncologist.

- 3.8 Side Effects: Results from clinical trials and case studies indicate that dexrazoxane is a safe and well-tolerated drug. Side effects include those common to most cytotoxic drugs. Those to note are: neutropenia, infection, phlebitis, stomatitis, nausea and vomiting. Dexrazoxane is excreted via the kidneys therefore decreased renal function may increase serum concentrations. Following administration haematological and biochemical monitoring should take place; the regularity will depend on the patient and will need to be clarified with the medical team. The solution contains potassium, therefore potassium levels should be monitored in patients who are at risk of hyperkalaemia.

Reporting see page 14 number 16 of RMH guideline. These incidents should be reported in accordance with the Trust clinical incident reporting procedure for each organisation.

- 3.9 Where is it Stored? Dexrazoxane is stored in pharmacy. It is the responsibility of individual units to ensure access to dexrazoxane is possible within 6 hours of an extravasation.

4 Royal Marsden Hospital Guidance

THE NUMBERING FOR THIS SECTION RESTARTS AS IT IS TAKEN DIRECTLY FROM THE RMH MANUAL

Part 2 - The Royal Marsden Hospital Manual of Clinical Nursing Procedures 7th Edition; Blackwell Publishing (2008), chapter on extravasation

Extravasation of Vesicant Drugs - Definition

Extravasation is a well-recognised complication of intravenous (IV) chemotherapy administration, but in general is a condition that is often under-diagnosed, undertreated and under-reported (Stanley 2002). The incidence of extravasation is estimated to be between 0.5 and 6.0% of cytotoxic drug administration (Kassner 2000; Khan & Holmes 2002; Lawson 2003; Masoorli 2003; Goolsby & Lombardo 2006) with some estimates for peripheral extravasation between 23 and 25% (Roth 2003). CVADs have decreased the incidence of extravasation but it can still occur, usually as a result of a leaking or damaged catheter, fibrin sheath formation (Mayo 1998) or a port needle dislodgement (Schulmeister 1998). The incidence estimated is up to 6% with ports (Masoorli 2003). However, whilst the incidence is lower, the severity of the injuries is far greater as detection tends to occur later (Kassner 2000; Stanley 2002; Polovich *et al.* 2005). Even when practitioners have many years of experience, extravasation of vesicant agents can occur and is an extremely stressful event, but is not in itself an act of negligence (Weinstein 2007). Early detection and treatment are crucial if the consequences of an untreated or poorly managed extravasation are to be avoided (Figure 12.3). These may include:

- Pain from necrotic areas
- Physical defect
- The cost of hospitalization and plastic surgery
- Delay in the treatment of disease
- Psychological distress

Litigation: nurses are now being named in malpractice allegations, and extravasation injuries are an area for concern (Dougherty 2003; Masoorli 2003; Roth 2003; Weinstein 2007).

1 Prevention of Extravasation

The nurse's focus should be on safe intravenous technique and implementing strategies to minimize the risk (Weinstein 2007). This includes the following strategies.

2. Monitoring the Site

Confirming venous patency by flushing with 0.9% sodium chloride solution with at least 5–10 ml prior to administration of vesicants and frequent monitoring thereafter (Goolsby & Lombardo 2006; Weinstein 2007). Checking blood return after every 2–5 ml is recommended but cannot be relied upon as the key sign when giving a bolus

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injection, and monitoring the site every 5–10 minutes for any swelling (Weinstein 2007).

3. Location of the Device

The most appropriate site for the location of a peripheral cannula is considered to be the forearm (Schrijvers 2003; Weinstein 2007). However, a large straight vein over the dorsum of the hand is preferable to a smaller vein in the forearm (Weinstein 2007). Siting over joints should be avoided as tissue damage in this area may limit joint movement in the future. It is also recommended that the antecubital fossa should never be used for the administration of vesicants because of the risk of damage to local structures such as nerves and tendons (Hayden & Goodman 2005; Weinstein 2007; Gabriel 2008). Avoid venepuncture sites in limbs with impaired circulation, sclerosis, thrombosis or scar formation. Also avoid cannulation below a recent venepuncture site (Goolsby & Lombardo 2006).

4. Patients at Risk

Patients who are at increased risk of extravasation (Box 12.2) should be observed more closely and cared for with extra caution.

Box 12.2 Patients at Risk of Extravasation

- Infants and young children.
- Elderly patients.
- Those who are unable to communicate, e.g. sedated, unconscious, confused, language issues.
- Those with chronic diseases, e.g. cancer, peripheral vascular disease, superior vena cava (SVC) syndrome, lymphoedema.
- Those on medications: anticoagulants, steroids.
- Those who have undergone repeated intravenous cannulation/venepuncture.
- Those with fragile veins or who are thrombocytopenic.

* Polovich *et al.* 2005; Hayden & Goodman 2005; Sauerland *et al.* 2006.

Sequence of Drugs (Table 12.3)

Vesicants should be given first (Kassner 2000; Hayden & Goodman 2005; Goolsby & Lombardo 2006). Reasons for this include:

1. Vascular integrity decreases over time.
2. Vein is most stable and least irritated at start of treatment.
3. Initial assessment of vein patency is most accurate.
4. Patient's awareness of changes more acute (Weinstein 2007).

Table 12.3 Drug sequencing – rationale for administering vesicant drugs first or last (Stanley 2002; Weinstein 2007).

Vesicants First		Vesicants Last	
1	Vascular integrity decreases over time	1	Vesicants are irritating and increase vein fragility
2	Vein is most stable and least irritated at start of treatment	2	Venous spasm may occur and mask signs of extravasation
3	Initial assessment of vein patency is most accurate		
4	Patient's awareness of changes more acute		

5. Types of Devices

The use of steel needles is associated with a greater risk of extravasation and should be discouraged and a plastic cannula should be used instead (Schrijvers 2003; Polovich *et al.* 2005; Sauerland *et al.* 2006). Vesicants should be given via a newly established cannula wherever possible (Dougherty 2005; Goolsby & Lombardo 2006) and consideration should be given to changing the cannula site after 24 hours (Hayden & Goodman 2005). However, if the fluid runs freely, there is good blood return and there are no signs of erythema, pain or swelling at the site, there is no reason to inflict a second cannulation on the patient (Weinstein 2007). Consideration should be given to a CVAD if peripheral access is difficult.

6. Method of Administration

Many vesicants must be given as a slow bolus injection, often via the side arm of a fast-running intravenous infusion of a compatible solution, e.g. doxorubicin or epirubicin via an infusion of 0.9% sodium chloride. If repeated infusions are to be given then a CVAD may be more appropriate (Stanley 2002; Weinstein 2007).

7. Skill of the Practitioner

Correct choice of device and location, the ability to use the most appropriate vasodilatation techniques, early recognition of extravasation and prompt action come from ensuring only skilled and knowledgeable practitioners administer vesicant drugs and/or insert the vascular access device (Schrijvers 2003; Dougherty 2005; Goolsby & Lombardo 2006; Sauerland *et al.* 2006). Successful cannulation at the first attempt is ideal, as vesicants have been known to seep into tissues at a vein entry site of a previous cannulation (Gault & Challands 1997; Perdue 2001). This also includes accessing a port as it is vital that the correct selection of needle is made and that the device is secured adequately (Camp Sorrell 2005).

8. Patient Information

Patients should be informed of the potential problems of administering vesicants and the possible consequences of extravasation (Stanley 2002; Sauerland *et al.* 2006; Weinstein 2007). Adequate information given to patients will ensure early recognition and co-operation as patients are the first to notice pain. The patient should be urged to report immediately any change in sensation such as burning or stinging (Goolsby & Lombardo 2006).

9. Drugs Capable of Causing Tissue Necrosis

Before administration of vesicant cytotoxic drugs the nurse should know which agents are capable of producing tissue necrosis. The following is a list of examples of those in common use:

Group A Drugs	Group B Drugs
Vinca alkaloids	Amsacrine
Vinblastine	Carmustine (concentrated solution)
Vindesine	Dacarbazine (concentrated solution)
Vinorelbine	Dactinomycin
Vincristine	Daunorubicin
Vinflunine	Doxorubicin
Paclitaxel	Epirubicin
	Idarubicin
	Mithramycin
	Mitomycin C
	Mechlorethamine
	Streptozocin

If in any doubt, the drug data sheet should be consulted or reference made to a research trial protocol. Drugs should not be reconstituted to give solutions which are higher than the manufacturer's recommended concentration, and the method of administration should be checked, e.g. infusion, injection.

A variety of vesicant non-cytotoxic agents in frequent use are also capable of causing severe tissue damage if extravasated. Examples include:

Group A Drugs	Group B Drugs
Calcium chloride	Aciclovir
Calcium gluconate	Amphotericin
Phenytoin	Cefotaxime
Hypertonic solutions, e.g. sodium chloride >0.9%	Diazepam
Sodium bicarbonate (>5%)	Ganciclovir
Glucose 50%	Potassium chloride (>40 mmol/l)
	Mannitol

This potential hazard should always be remembered. The actions listed in this procedure may not be appropriate in all these instances. Drug data sheets should always be checked and the pharmacy departments should be consulted if the information is insufficient, regarding action to take if a vesicant drug extravasates.

10. Signs and Symptoms of Extravasation (see Table 12.4)

Extravasation should be suspected if:

1. The patient complains of burning, stinging pain or any other acute change at the injection site, although this is not always present (Hayden & Goodman 2005). This should be distinguished from a feeling of cold, which may occur with some drugs, or venous spasm which can be caused by irritation usually accompanied by pain described as an achiness or tightness (Hayden & Goodman 2005). Any change of sensation warrants further investigation (Goolsby & Lombardo 2006).
2. Swelling is the most common symptom (Polovich *et al.* 2005). Induration or leakage may also occur at the injection site. Swelling may not always be immediately obvious if the patient has the cannula sited in an area of deep subcutaneous fat, in a deep vein or if the leak is via the posterior vein wall (Dougherty 2005).
3. Blanching of the skin occurs (Comerford *et al.* 2002). Erythema can occur around the injection site but this is not usually present immediately (Hayden & Goodman 2005). It is important that this is distinguished from a 'flare' reaction (Polovich *et al.* 2005).
4. Blood return is one of the most misleading of all signs particularly related to peripheral devices. In peripheral devices, if blood return is sluggish or absent this may indicate lack of patency or incorrect position of the device. However if no other signs are apparent this should not be regarded as an indication of a non-patent vein, as a vein may not bleed back for a number of reasons and extravasation may occur even in the event of good blood return (Hayden & Goodman 2005). Any change in blood flow should be investigated (Hayden & Goodman 2005; Weinstein 2007). In CVADs there should always be blood return and if this is absent steps should be followed in order to be able to verify correct tip and needle position or resolve a fibrin sheath (see Figure 45.1).

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5. A resistance is felt on the plunger of the syringe if drugs are given by bolus (Vandergrift 2001; Stanley 2002).
6. There is absence of free flow when administration is by infusion, once other reasons have been excluded, e.g. position (Vandergrift 2001; Stanley 2002).

Note: one or more of the above may be present. If extravasation is suspected or confirmed, the injection or infusion must be stopped immediately and action must be taken (Polovich *et al.* 2005; Infusion Nurses Society 2006; Weinstein 2007).

Table 12.4 Nursing assessment of extravasation versus other reactions (*Polovich et al. 2005; Weinstein 2007*)

Assessment parameter	Flare reaction	Venous irritation	Extravasation	
			Immediate manifestations, i.e. during drug administration	Delayed manifestations, i.e. from 24 hours after extravasation
Pain	None	Aching, throbbing sensation along vein and in the limb	Severe stinging or burning pain (not always present). This can last from minutes to hours and will eventually subside. Occurs during drug administration at the device site and surrounding areas	Can continue following extravasation or start within 48 hours
Redness	Immediate blotches or tracking along the vein. This will subside within 30–45 minutes with or without treatment (usually steroid cream)	Vein may become red or darkened	Not always present immediately: more likely to see blanching of the skin. As area becomes inflamed redness will appear around the device site	Later occurrence
Swelling	Unlikely	Unlikely	May occur immediately but may not always be easy to identify immediately	Usually within 48 hours
Blood return	Usually present	Usually present but may require application of heat to improve blood return	Inability to obtain blood return (peripheral or central) but blood return may be present throughout	
Ulceration	Unlikely	Unlikely	Unlikely	Can occur within 48–96 hours but may take 3–4 weeks to develop
Others	Urticaria	None	Change in quality of the infusion or pressure on the syringe	Local tingling and sensory deficits

11. Management of Extravasation

The management of extravasation of chemotherapy agents is controversial and there is little documented evidence of efficacy. Until recently, no antidote has received clear validation in controlled clinical trials and no randomized trials managing cytotoxic extravasation in humans have been completed (Bertolli 1995). Some studies performed on animals have demonstrated both effective and ineffective treatments but extrapolation from animals to humans is limited (Polovich *et al.* 2005; Wickham *et al.* 2006). Other studies have been small with low numbers of patients. Another problem is that it is often difficult to ascertain whether any extravasation has actually occurred (Weinstein 2007). Therefore recommendations are based on more consistent experimental evidence, cumulative clinical experience from available case reports and uncontrolled studies and empirical guidelines (Bertolli 1995). Drugs where there is evidence of effective management include: anthracyclines (Rudolph & Larson 1987), vinca alkaloids (Bertolli 1995), computed tomography (CT) contrast media (Federle *et al.* 1998) and paclitaxel (Bertolli *et al.* 1997).

The management of extravasation involves several stages including the following.

Stage 1: stopping infusion/injection and aspirating the drug

It appears that most authors are agreed that aspirating as much of the drug as possible, as soon as extravasation is suspected, is beneficial (Rudolph & Larson 1987; Vandergrift 2001; Polovich *et al.* 2005; Weinstein 2007) and can help lower the concentration of the drug in the area (Goolsby & Lombardo 2006). However, withdrawal is only immediately possible during bolus injections, as an infusion would need to be stopped and a syringe attached in an attempt to aspirate. Aspiration may be successful if extravasation presents itself as a raised blister, but may be unsuccessful if tissue is soft and soggy (CP Pharmaceuticals 1999; Stanley 2002). It may help to reduce the size of the lesion (Vandergrift 2001). In practice it may achieve little and often distresses the patient (Gault & Challands 1997). The likelihood of withdrawing blood (as suggested by Ignoffo & Friedman 1980) is small and the practitioner may waste valuable time attempting this which could lead to delay in the rest of the management procedure.

Stage 2: removing device

Some clinicians advocate that the peripheral vascular access device be left in situ in order to instil the antidote via the device and into the affected tissues (Kassner 2000; Stanley 2002; Weinstein 2007). However, others recommend that the peripheral device should be removed to prevent any injected solution increasing the size of the affected area (Rudolph & Larson 1987; CP Pharmaceuticals 1999; Vandergrift 2001). There appears to be no research evidence to support either practice.

Stage 3: applying hot or cold packs

Cooling appears to be a better choice, with the exception of the vinca alkaloids and some non-cytotoxic drugs, than warming (Bertolli 1995; CP Pharmaceuticals 1999). Cold causes vasoconstriction, localizing the extravasation and perhaps allowing time for local vascular and lymphatic systems to contain the drug. It should be applied for

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15–20 minutes, 3–4 times a day for up to 3 days (Gault & Challands 1997; CP Pharmaceuticals 1999; Polovich *et al.* 2005). Heat promotes healing after the first 24 hours by increasing the blood supply (Polovich *et al.* 2005; Weinstein 2007). It also decreases local drug concentration, increasing the blood flow which results in enhanced resolution of pain and reabsorption of local swelling.

Stage 4: use of antidotes

A number of antidotes are available, but again there is a lack of scientific evidence to demonstrate their value and so the role of antidotes is still not clear (Polovich *et al.* 2005). There appear to be two main methods: (i) localize and neutralize (using hyaluronidase) (CP Pharmaceuticals 1999); and (ii) spread and dilute (using an antidote) (Stanley 2002). Administration of antidotes if not via the cannula is by the pincushion technique; that is, instilling small volumes around and over the areas affected using a small gauge (25) needle towards the centre of a clock face. The procedure causes considerable discomfort to patients, and if large areas are to be tackled analgesia should be considered (Stanley 2002).

Hyaluronidase is an enzyme which breaks down hyaluronic acid, a normal component of tissue 'cement' and helps to reduce or prevent tissue damage by allowing rapid diffusion of the extravasated fluid and promoting drug absorption (Few 1987). The usual dose is 1500 IU (Bertolli 1995; Vandergrift 2001). It should be injected within 1 hour of extravasation, ideally through the intravenous device delivering the enzyme to the same tissue (Gault & Challands 1997; Vandergrift 2001; Stanley 2002; Weinstein 2007). NB. Hyaluronidase increases the absorption of local anaesthetic. Therefore if local anaesthetic has been applied to the area, e.g. Ametop gel prior to cannulation, within 6 hours of extravasation, then the patient should be monitored for signs and symptoms of systemic anaesthesia such as increased pulse rate and decreased respirations and the doctor informed immediately (BMA/RPSGB 2008).

Corticosteroids have long been advocated as a treatment for anthracycline extravasation in reducing inflammatory components, although inflammation is not a prominent feature of tissue necrosis (Camp Sorrell 1998) and they appear to have little benefit. Data now discourages the use of locally injected steroids, as there is little evidence to support their use (Bertolli 1995; Gault & Challands 1997; Wickham *et al.* 2006). However, given as a cream they can help to reduce local trauma and irritation (Stanley 2002).

Dimethyl sulfoxide (DMSO) is a potent free radical scavenger that rapidly penetrates tissues when applied topically (Bertolli 1995). Reports on the clinical use of topical DMSO show it is effective and well tolerated in extravasation (Bertolli 1995). However, this is based on a high dose (95%) and only 50% is easily available in the UK (Stanley 2002). Side-effects from DMSO include itching, erythema, mild burning and a characteristic breath odour (Bertolli 1995).

Recently dexrazoxane, a topoisomerase II catalytic inhibitor, used clinically to minimize the cardiotoxicity of doxorubicin, has been tested in animal models and a small number of patients for its use in extravasation. It is given IV 3–6 hours after the extravasation and it appears to reduce the wound size and duration with

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anthracyclines. The triple dosage appears to be more effective than a single dose (Langer *et al.* 2000; El Saghir *et al.* 2004). A consensus group (Jackson *et al.* 2006) have developed recommendations for the use of dexrazoxane:

1. For anthracycline extravasations resulting from peripheral administration, the site expert or team should be consulted in order to determine whether the use of dexrazoxane is indicated.
2. Absolute indications are if the peripherally extravasated volume exceeds 15 ml and in the event of a central venous extravasation.

Finally, granulocyte macrophage-colony stimulating factor (GM-CSF) is a growth factor and has been found effective in accelerating wound healing and inducing formation of granulation of tissue (Ulutin *et al.* 2000; El Saghir *et al.* 2004).

Stage 5: elevation of limb

This is recommended as it minimizes swelling (Rudolph & Larson 1987) and movement should be encouraged to prevent adhesion of damaged areas to underlying tissue (Gabriel 2008).

Stage 6: surgical techniques

Some centres suggest that a plastic surgery consultation be performed as part of the management procedure in order to remove the tissue containing the drug. Surgical intervention is recommended, especially if the lesion is greater than 2 cm; there is significant residual pain 1–2 weeks after extravasation, or there is minimal healing 2–3 weeks after injury despite local therapeutic measures (Goolsby & Lombardo 2006). Liposuction or a flush-out technique can remove extravasated drug without resorting to excision and skin grafting. A liposuction cannula can be used to aspirate extravasated material and subcutaneous fat. If there is little subcutaneous fat, e.g. preterm infants, then the saline flush-out technique is recommended, particularly if done within the first 24 hours. It has been suggested as a less traumatic and cheaper procedure than surgery. Four small stab incisions are made and large volumes of 0.9% sodium chloride are administered which flush out the extravasated drug (Gault & Challands 1997). Management of large extravasations from CVADs is usually by surgical intervention and washout of affected tissues.

12. Extravasation Kits

The use of extravasation kits has been recommended in order to provide immediate management (Khan & Holmes 2002; Hayden & Goodman 2005). Kits should be assembled according to the particular needs of individual institutions. They should be kept in all areas where staff are regularly administering vesicant drugs, so staff have immediate access to equipment (Gabriel 2008). The kit should be simple to avoid confusion, but comprehensive enough to meet all reasonable needs (Stanley 2002) (see Procedure guidelines: Extravasation management: peripheral cannula, below). Instructions should be clear and easy to follow, and the use of a flow chart enables staff to follow the management procedure in easy steps (Figure 12.4).

13. Mixed Vesicant Extravasation

Consideration should be given to the management of mixed vesicant drug extravasation in terms of which drug to treat with which antidote. It has been recommended to act in accordance with the drug which possesses the most deleterious properties (How & Brown 1998).

14. Informing the Patient

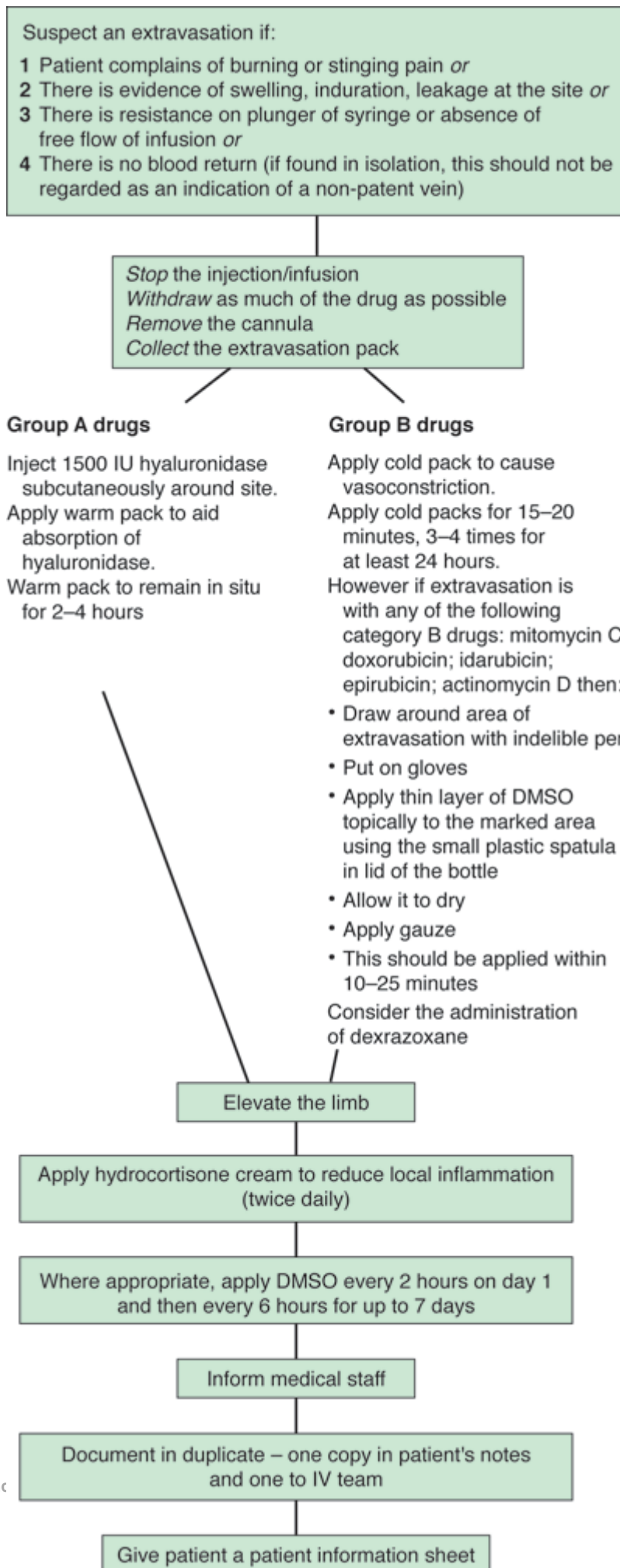
Patients should always be informed when an extravasation has occurred and be given an explanation of what has happened and what management has been carried out (McCaffrey Boyle & Engelking 1995). An information sheet should be given to patients with instructions of what symptoms to look out for and when to contact the hospital during the follow-up period (Gabriel 2008).

15. Wound Management

Damage will be affected by the site, amount of drug, concentration of the agent and if it binds to DNA or not (Polovich *et al.* 2005). Ulceration may occur over a period of days to weeks and extravasation wounds may be complicated by tissue ischaemia related to endothelial damage (Naylor 2005). The type of injury will dictate the type of dressing. Assessment of the wound should include position and size of the wound, amount and type of tissue present, amount and type of exudate, and extent and spread of erythema (Naylor 2005).

16. Documentation and Follow Up

An extravasation must be reported and fully documented as it is an accident and the patient may require follow-up care. (NMC 2005; RCN 2005). Information may also be used for statistical purposes, for example collation and analysis using the green card scheme devised by St. Chad's Hospital, Birmingham (Stanley 2002). Statistics on the incidence, degree, causes and corrective action should be monitored and analysed (Infusion Nurses Society 2006). Finally, it may be required in case of litigation, which is now on the increase (Dougherty 2003; Masoorli 2003).



Figure

Equipment

To assist the nurse, an extravasation kit should be assembled and should be readily available in each ward/unit.

It contains:

1. Gel packs x 2 : one to be kept in the fridge and one available for heating (an electric heating blanket can be used whilst pack is heating).
2. Hyaluronidase 1500 IU/2 ml sterile water.
3. Hydrocortisone cream 1% 15 g tube x 1.
4. 2 ml syringes x 1.
5. 25 G needles x 2.
6. Alcohol swabs.
7. Documentation forms.
8. Copy of extravasation management procedure.
9. Patient information leaflet.

Procedure

	Action	Rationale
1	Explain and discuss the procedure with the patient.	To ensure that the patient understands the procedure and gives his/her valid consent (DH 2002a: C; NMC 2008b: C).
2	Stop injection or infusion <i>immediately</i> , leaving the cannula in place.	To minimize local injury. To allow aspiration of the drug to be attempted (Polovich <i>et al.</i> 2005: C; RCN 2005: C).
3	Aspirate any residual drug from the device and suspected extravasation site.	To minimise local injury by removing as much drug as possible and only attempt if appropriate. Subsequent damage is related to the volume of the extravasation, in addition to other factors (Polovich <i>et al.</i> 2005: C; RCN 2005: C).
4	Remove the cannula.	To prevent the device from being used for antidote administration (Rudolph & Larson 1987: E).
5	Collect the extravasation pack and take it to the patient.	It contains all the equipment necessary for managing extravasation (Stanley 2002: E; Dougherty 2005: E).

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Group A Drugs:	
Draw up hyaluronidase 1500 IU in 1 ml water for injection and inject volumes of 0.1–0.2 ml subcutaneously at points of the compass around the circumference of the area of extravasation.	This is the recommended agent for group A drugs. The warm pack speeds up absorption of the drug by the tissues (Bertolli 1995: C).
Apply warm pack	
Group B Drugs:	
Apply cold pack or ice instantly.	To localize the area of extravasation, slow cell metabolism and decrease the area of tissue destruction. To reduce local pain (Polovich <i>et al.</i> 2005: C).
However, if extravasation is with any of the following category B drugs: mitomycin C; doxorubicin; idarubicin; epirubicin; actinomycin D then:	This is the recommended agent for these anthracyclines and helps to reduce local tissue damage (Bertolli 1995: C).
<ul style="list-style-type: none"> • Draw around area of extravasation with indelible pen • Put on gloves. • Apply thin layer of DMSO topically to the marked area using the small plastic spatula in lid of the bottle. • Allow it to dry. • Apply gauze. • This should be applied within 10–25 minutes. 	
Where possible elevate the extremity and/or encourage movement.	To minimize swelling and to prevent adhesion of damaged area to underlying tissue, which could result in restriction of movement (Rudolph & Larson 1987: E).
Inform a member of the medical staff at the earliest opportunity and administer any other prescribed antidotes, e.g. dexrazoxane.	To enable actions differing from agreed policy to be taken if considered in the best interests of the patient. To notify the doctor of the need to prescribe any other drugs (E).
Apply hydrocortisone cream 1% twice daily, and instruct the patient how to do this. Continue as long as erythema persists.	To reduce local inflammation and promote patient comfort (Stanley 2002: E).
Where appropriate, apply DMSO every 2 hours on day 1 and then every 6 hours for up to 7 days (patients will need to have this prescribed as a to take out [TTO] and continue treatment at home where necessary).	To help reduce local tissue damage (Bertolli 1995: C).

Heat packs (group A drugs) should be reapplied after initial management for 2–4 hours. Cold packs (group B drugs) should be applied for 15–20 minutes, 3–4 times a day for up to 3 days.	To localize the steroid effect in the area of extravasation. To reduce local pain and promote patient comfort (Bertolli 1995: C).
Provide analgesia as required.	To promote patient comfort. To encourage movement of the limb as advised (E).
Document the following details, in duplicate, on the form provided:	
a) Patient's name/number.	
b) Ward/unit.	
c) Date, time.	
d) Signs and symptoms.	
e) Venepuncture site (on diagram).	
f) Drug sequence.	
g) Drug administration technique, i.e. 'bolus' or infusion.	
h) Approximate amount of the drug extravasated.	
i) Diameter, length and width of extravasation area.	
j) Appearance of the area.	
k) Step-by-step management with date and time of each step performed and medical officer notification.	To provide an immediate full record of all details of the incident, which may be referred to if necessary. To provide a baseline for future observation and monitoring of patient's condition. To comply with NMC guidelines (Kassner 2000: E; NMC 2005: C; RCN 2005: C; Weinstein 2007: E).
l) Patient's complaints, comments, statements.	
m) Indication that patient's information sheet given to patient.	
n) Follow-up section.	
o) Whether photograph was taken.	
p) If required, when patient referred to plastic surgeon.	
q) Signature of the nurse.	
Explain to the patient that the site may remain sore for several days.	To reduce anxiety and ensure continued co-operation (P: E).
Observe the area regularly for erythema, induration, blistering or necrosis. <i>Inpatients:</i> monitor daily. Where appropriate, take photograph.	To detect any changes at the earliest possible moment (RCN 2005: C).

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All patients should receive written information explaining what has occurred, what management has been carried out, what they need to look for at the site and when to report any changes. For example, increased discomfort, peeling or blistering of the skin should be reported immediately.	To detect any changes as early as possible, and allow for a review of future management. This may include referral to a plastic surgeon (Gault & Challands 1997: E; Polovich <i>et al.</i> 2005: C; RCN 2005: C).
If blistering or tissue breakdown occurs, begin dressing techniques and seek advice regarding wound management.	To minimize the risk of a superimposed infection and sterile increase healing (Naylor 2005: E).
Depending on size of lesion, degree of pain, type of drug, refer to plastic surgeon.	To prevent further pain or other complications as chemically induced ulcers rarely heal spontaneously (Polovich <i>et al.</i> 2005: C; Dougherty 2005: E).

Monitoring of the Guideline

Implementation of the guidance will be considered as a topic for audit by the NSSG in and reviewed in.

Authors

Andrew Stanley Network Pharmacist

References

The Royal Marsden Hospital Manual of Clinical Nursing Procedures 7th Edition; Blackwell Publishing (2008).

Approval Signatures

Pan Birmingham Cancer Network Governance Committee Chair

Name: Doug Wullf



Signature

Date July 2011

Pan Birmingham Cancer Network Manager

Name: Karen Metcalf



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Date July 2011

Network Site Specific Group Clinical Chair

Name: Frances Shaw



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Date July 2011

ENDORSED BY GOVERNANCE COMMITTEE