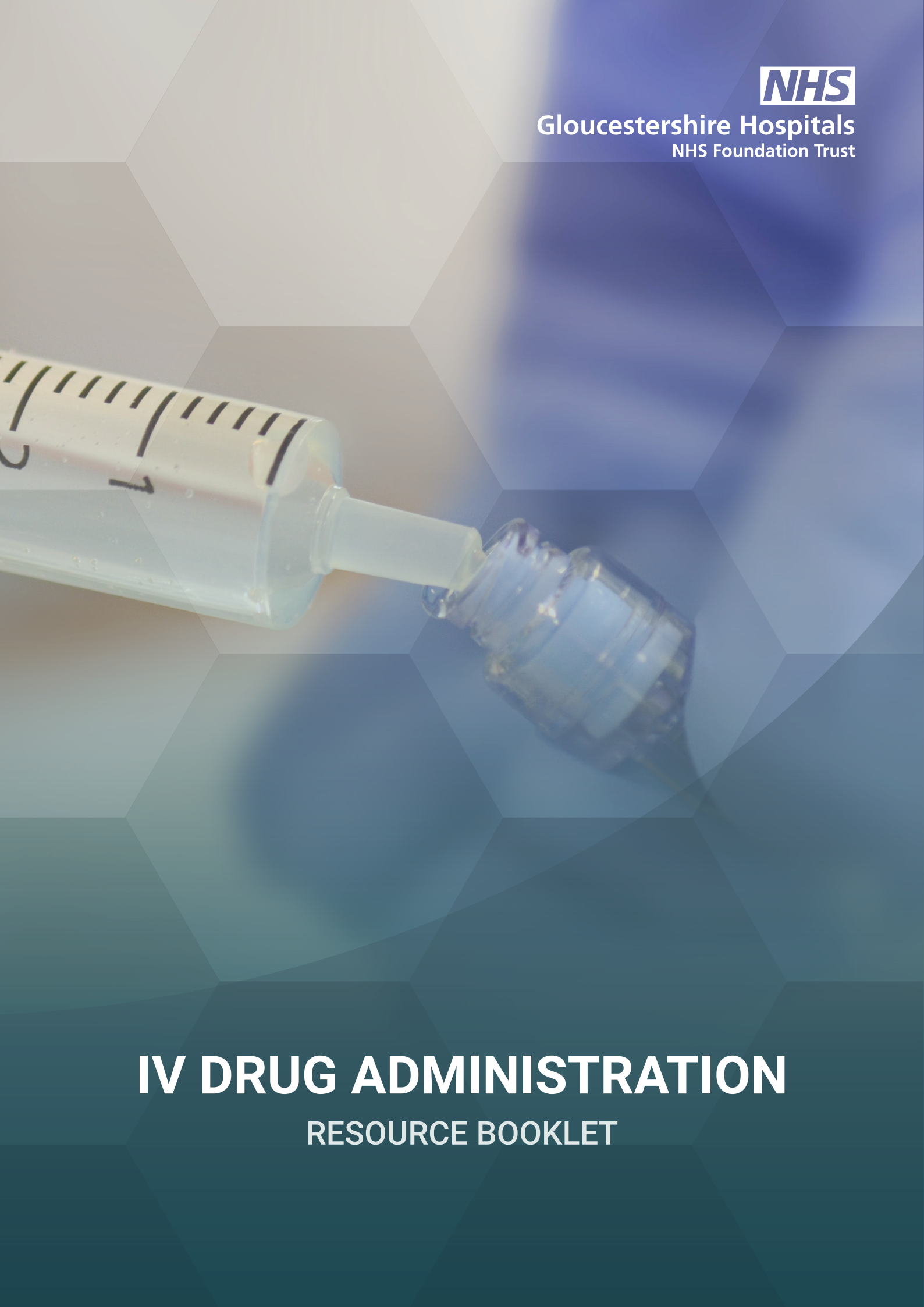

Gloucestershire Hospitals
NHS Foundation Trust

IV DRUG ADMINISTRATION

RESOURCE BOOKLET

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Aims

This document is designed to prepare registered health care practitioners for the skills required to perform intravenous drugs and infusions, safely and in accordance with Trust policy and best practice evidence.

Objectives

In this resource you will look at the many aspects to prepare you for your practical IV drug administration training such as;

- The prescription and dose of an IV drug
- Management of the equipment involved in the procedure
- Hazards involved and how to minimise risk
- Introduction to Patient Group Directions (PGDs) and drug errors
- How to spot complications and appropriate actions to take including Anaphylaxis
- Anaphlylaxis reactions related to IV therapy
- Infection control risk associated with IV therapy

Practical Training

Before attending the practical training session, you not only have to read through this document but you will also need to complete the IV Bolus Administration online learning and pass the IV assessment, these can both be found on the eLearning system. It is also essential to familiarise yourself with the following resources:

- **Intravenous Drug and Fluid Management Administration via Peripheral Access Policy**
- **Policy for Ordering, Prescribing and Administering Medicines (POPAM)**
- **Patient Group Direction (PGD) learning** *(please visit the PGD specific sites on the intranet for information)*
- **Nursing and Midwifery Code (NMC)** or appropriate other *(e.g. Health and Care Professions Council (HCPC))*

Further Preparation Includes:

- Observe competent practitioners carrying out IV administration, participate as second checker for calculation and practice drawing up IV's under supervision in your clinical area
- Identify competent assessors in your workplace

The practical training session is designed to build on the content and questions posed within this document. It will also further equip you to prepare for administering IV drugs/infusions in your clinical area under supervision. The training will be delivered by a Clinical Skills trainer and other speakers at a pre-booked training session.

Accountability

You are professionally accountable for your practice so you should always:

- Understand the limitations of your competency and experience
- Never undertake a task if you don't have the necessary competency
- Ask a competent colleague for help and advice if you are unsure about anything
- Keep up to date with information about new drugs, policies and procedures

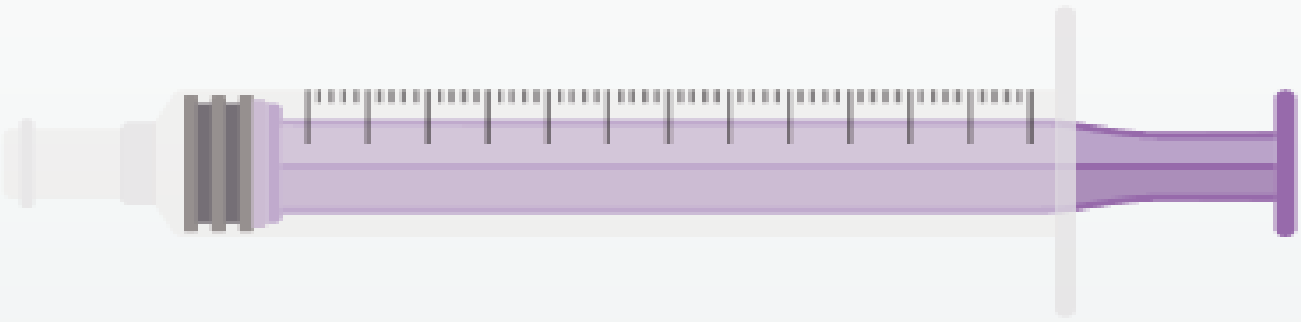
Prescription

The prescription for an intravenous drug is effectively the set of instructions for administering that drug. The prescriber is responsible for providing that set of instructions. The prescriber is responsible for sourcing the appropriate information e.g. BNF, Medusa and Trust antibiotic guidelines when prescribing the treatment.

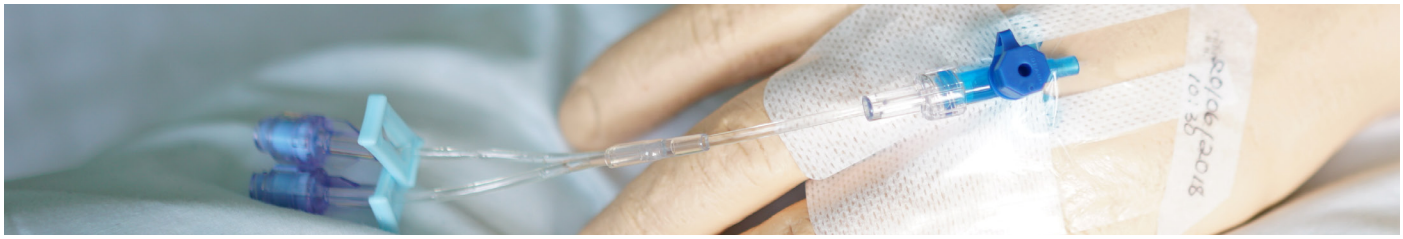
Trust IV Administration Guide

The Trust's IV Administration Guide gives you all the information you need to administer that drug safely and effectively. The information you will need may include:

- Approved name of drug
- Dose to be given
- Method of administration - bolus dose or intermittent infusion via peripheral or central access
- Infusion fluid and volume/final concentration
- Rate (mg per min, drops per min, mls per hour)
- Type of giving set / pump
- Duration of treatment (e.g. review date for antibiotic treatment)



For any oral medications also due - a purple oral use syringe must be used to distinguish between oral and IV route and prevent patient harm.



If an existing infusion is in progress via a double lumen NFAD- check if this infusion can be stopped temporarily. If so- clamp the second Needle Free Access Device (NFAD) *OKA-Octopus/Bionector* lumen at the Y of the double lumen (nearest to patient) and administer via the second lumen. This prevents backtracking and potential mixing of the drugs.

For IV Administration, always follow;

- Aseptic Non-Touch Technique (ANTT) *(refer to ANTT IV Therapy guideline poster on Clinical Skills website)*
- Manufacturers' recommendations
- MUST have additive label *(completed with details and signatures)*
- ALWAYS add date and time label to giving sets
- It is recommended to also label all drug syringes
- If infusion already running via a double NFAD - check if it can be stopped temporarily to give a bolus or intermittent infusion via the second NFAD lumen
- All IVs will normally be given via a NFAD closed system The port/hub is only to be used when a NFAD is not indicated e.g. short stay treatments or for emergency IV drugs.
- It is recommended to use a dedicated cannula for certain drug therapies e.g. Patient Controlled Analgesia (PCA), Insulin and Heparin to prevent drug siphoning, mixing with other drugs and interrupting drug therapy
- Use pre-prepared solutions where possible
- If a drug is added it should only be one additive *(unless confirmed by Pharmacy)*
- Monitor infusions closely for signs of discolourations or particles
- Monitor the infusion site for signs of reaction
- For drug reactions report to Pharmacy
- All IVs will normally be given via a NFAD closed system The port/hub is only to be used when a NFAD is not indicated e.g. short stay treatments or for emergency IV drugs

Dose

The dose given to an individual patient may be affected by a variety of factors. The manufacturers' will recommend a dose for each of their products. This information can be found in;

- British National Formulary *(visit the BNF website or the BNF mobile application)*
- Intranet IV Drug Administration Guide (Medusa) *(If Monographs are printed they must be up to date)*
- Protocol or guidelines used specifically in your work area
- Trust Intranet Antibiotics Guidelines

The dose may need to be adjusted in individuals for a variety of reasons including:

- Age of the patient
- Weight of the patient
- Impaired renal and/or liver function
- Cardiac function and fluid balance

Any queries, such as dose clarification or changes must be discussed with the prescriber, pharmacist or Medicines Information.

Administration of Drugs by a Bolus Dose

(See the ADM13 Action Card & ANTT IV Therapy guideline poster on Clinical Skills website

Drugs can be administered via bolus route either as a stat dose or repeated at specific time intervals. Bolus means a single relatively large quantity of a drug substance. This method of administration is sometimes known as direct injection, and also as 'an IV push'. Small volumes (usually up to a maximum of 20mls) are given directly via the needle free access device (NFAD) into the cannula or occasionally via the cannula port in emergency situations. Manufacturers' recommendations must be followed, as most drugs given this way have to be administered over a specified period of time, unless in an emergency e.g. cardiac arrest.

Bolus administration causes an immediate 'peak' concentration and is therefore more likely to cause a reaction. This is one of the reasons manufacturers provide specific information about how to give bolus doses in the package insert/ manufacturer's information.

Administration of Drugs by Intermittent Infusion

(See the ADM12 Action Card)

Drugs can be administered via intermittent infusion route either as a stat dose or repeated at specific time intervals. The infusion is usually given over 20-120 minutes, and is a compromise between a bolus injection and a continuous infusion. The infusion bag must have an additive label attached with all the details completed and signatures. The volume of fluid given is less than with a continuous infusion, so it is less likely to cause fluid overload.

Administration of Drugs by Continuous Infusion

(See the ADM14 action card)

Fluids or drugs are administered continuously at a set rate over a period of time, usually hours and sometimes days. It is usually indicated when constant blood levels are required, or the drug has to be highly diluted in order to be given safely. Another advantage is that infusions can be titrated according to symptoms. Patient controlled analgesia (PCA) may use a combination of a background infusion in specific areas, supplemented by bolus doses given by the patient themselves when required.

Pre-prepared solutions should be used where possible, and only one additive should be made to any bag, bottle or syringe, unless pharmacy has confirmed the stability of the mixture. Whenever an addition is made, ensure that it is thoroughly mixed. Incomplete mixing can lead to layering, and the patient may inadvertently be given a concentrated bolus. The infusion bag must have an additive label attached with all details completed and signatures.

The infusion needs to be monitored constantly whilst it is running for any signs of discoloration or the presence of particles. It is also important to examine the infusion site frequently for any signs of a reaction. If there is any sign of incompatibility or a reaction within the solution please report it to pharmacy giving as much detail as possible - drugs and diluents involved (with batch numbers if possible) and how long the infusion has been running.

Line Management

Administration sets must be:

- Appropriate for the product being administered
- Compatible with infusion pumps if used (staff must be competent to use infusion pumps)
- Dated to identify at the point of care when they must be replaced

Administration sets must be replaced as follows:

- Crystalloid/maintenance fluid - maximum 72 hours
- Total Parenteral Nutrition (TPN) - normally 24 hours (some 48hrly bags)
- Antibiotics and ward prepared drug infusions - 24 hours
- Blood, blood products and colloid (only specific areas) immediately following use
- Once an administration set has been disconnected from a cannula or a needle-free access device it must not be reconnected to the patient due to risk of harm (infection and incompatibility)
- Dispose of all infusion bags/administration sets as a complete unit in designated 'sharpsafe' disposal containers
- For multiple blood units transfusion - Change line after each transfusion episode or after 12 hours - whichever is sooner

Rate of Administration

The rate of administration affects both the dose given over a period of time, and the peak blood level achieved in a given patient. It is recommended that furosemide is administered at a maximum rate of 4mg per minute to prevent toxic concentrations. Prolonged or repeated toxic levels of furosemide can produce tinnitus or deafness. The BNF recommends doses of 50mg or more should be given no faster than 4mg per minute. One option is to dilute the dose in a volume of 50 to 100ml sodium chloride 0.9% and give it as an infusion. Alternatively a suitable syringe pump can be used to deliver undiluted furosemide at an appropriate rate.

Some drugs, particularly those used in critical care, are very potent and the correct rate of administration is important to ensure the patient receives a safe and effective dose. A shock-like syndrome (speed shock) can also result from IV administration that is too rapid.

When accurate control is needed there are a variety of pumps available. There are several factors to bear in mind:

- Which type of pump to use for a given drug
- How to calculate the correct rate of administration
- How to set the pump to administer the drug at the correct rate
- How and when to check the pump is functioning correctly whilst it is running
- Training will be provided on commonly used pumps during the practical session.

Reconstitution or Dilution

Drugs are supplied in a variety of forms. Some come as a solution in an ampoule or a vial; others are supplied as a dry powder which must be reconstituted before use. Whether or not a drug requires reconstitution, it may require further dilution before administration. Undiluted solution may cause phlebitis and or thrombosis (e.g. clarithromycin).

The IV Administration Guide (Medusa) gives details of how to correctly prepare and administer a range of commonly used drugs.

There are several potential hazards if an intravenous dose is not prepared correctly. It is part of your professional responsibility to follow policies and procedures, and to develop a good preparation technique to minimise these risks for your patient. The Aseptic Non-Touch Technique (ANTT) is a proven technique for reducing contamination.

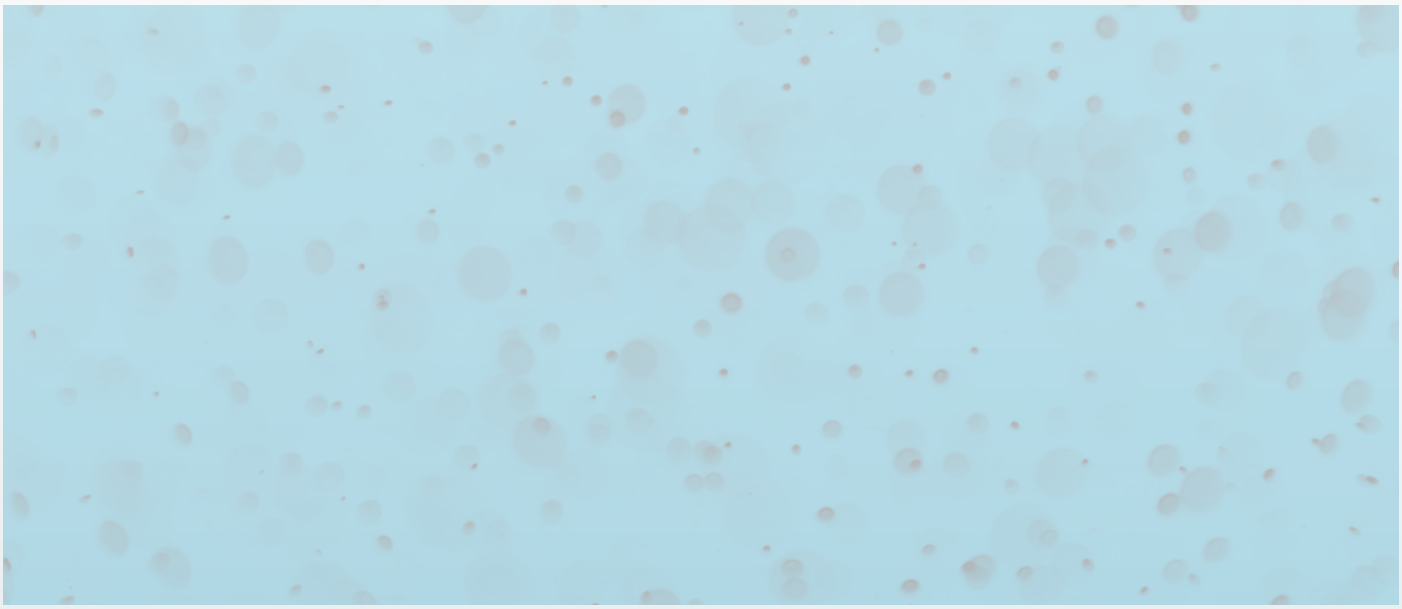
Whatever is given by IV injection needs to be suitable for IV administration with dangerous particles and microbes removed. When we give water by IV injection we would use Water for Injection, not tap water. Tap water is suitable for oral use but not to be given IV. One of the reasons intravenous injections are so expensive is because manufacturers have to produce uncontaminated products. It is important to follow their instructions, and to use ANTT to ensure you prepare the product safely and correctly.

Particles

Manufacturers' make every effort to reduce the number of particles in their products e.g. crystals precipitates, but it is inevitable that solutions for intravenous administration will contain some. Where particles cannot be avoided, the risks from infusing them can be reduced by the use of e.g. a filter in the giving set or between the syringe and the cannula. This is one of the reasons why a specific type of giving set must be used with some products.

Particles, crystals, precipitates or 'coring' may be introduced to a dose of intravenous drug during incorrect IV administration preparation. Examples of these are ; using incorrect drawing up needles, mixing incompatible drugs, or unsuitable diluents as recommended by manufacturers' instructions for drug re-constitution. 'Coring' can happen if the incorrect needle angle is used when piercing the drug vial bung, which allows small parts of the bung to transfer into the reconstituted drug. To avoid this, insert the safety blunt drawing up needle at a 90° angle into the vial bung. Remember to use the correct drawing up needle; non -filter for plastic ampoules and filter for glass ampoules. Do not then use the filter needle to insert into an infusion bag, as any potential glass particles will be instilled into the infusion bag- always change to a non-filter blunt needle to do this.

The most common adverse effect of particles in an IV injection is phlebitis, a painful inflammation of the vein. If the infusion continues the vein may progressively thrombose, becoming hard and tender (thrombophlebitis) see potential IV Complications.



Pyrogens and Microbes

A pyrogen is something which produces a rise in temperature when injected. It may be an endotoxin produced by certain types of bacteria, or parts of the cell membrane of various organisms. The administration of a solution containing pyrogens may cause a febrile reaction (e.g. a spike in temperature or in severe cases septic shock).
The intravenous administration of a solution containing microbes (such as bacteria, fungi and viruses) via IV access is obviously hazardous. The organisms are given easy entry into the systemic circulation where they can rapidly replicate. Patients receiving intravenous therapy are often very ill, and may also be immunocompromised. All of these factors mean the patient is poorly equipped to deal with a contaminated infusion.

A preservative is sometimes used to try and minimise the adverse effects of contamination (e.g. a multi-dose vial of insulin which will have doses taken out a number of times). The preservative is not designed to kill all organisms, and therefore ANTT must always be employed to reduce contamination to a minimum. Some patients may be sensitive (allergic) to preservatives, and in products such as intrathecal injections a preservative may actually be toxic. This means that many intravenous products do not contain a preservative and are designed for single use only.

The product information may contain a phrase such as “this product is designed for single use only. Discard any unused portion after use”. Any decision to re-use part of such a product is the responsibility of the practitioner making that decision, and they are professionally accountable for any adverse effects, which may occur.

Mixing

Two items may need to be mixed together at several stages during the preparation of a dose including:

- Mixing a dry powder and the appropriate diluent when reconstituting a dry powder
- Diluting a concentrated solution to an appropriate volume for administration as a slow IV injection
- Adding a concentrated solution to an appropriate infusion fluid for infusion

When reconstituting a dry powder, the powder must be completely dissolved to ensure there are no particles contained in the final solution (see above). Some pharmaceutical products are close to their solubility limit (e.g. Mannitol 20% Sodium bicarbonate 8.4%). This means they are prone to crystallisation if they are stored at low temperatures. They should be stored at room temperature and administered through a dedicated line / lumen.

When diluting a concentrated solution, the solution and diluent must be completely mixed to produce a consistent solution. If not, the patient will not receive a consistent dose. This may have significant clinical consequences. (E.g. incomplete mixing of a sliding scale insulin infusion will lead to variable glycaemic control).

The reason we use pre-mixed solutions of potassium chloride (KCl) in the Trust wherever possible, is that KCl is denser than common infusion fluids such as sodium chloride 0.9%, and glucose 5%. When it is added to a bag of fluid there is a risk it may sit in a layer at the bottom of the bag leading to the administration of a bolus dose of potassium which can lead to cardiac arrest. Once the solution is mixed it remains mixed so using pre-mixed bags is much safer.

If potassium chloride must be added to an infusion, then the bag should be inverted at least 20 times to ensure thorough mixing. For all other infusions, invert the bag to mix at least 5 times.

Stability and Incompatibility

The risk of interactions and incompatibilities is greatest with IV infusions, particularly those administered over several hours. This is because the drug and the infusion fluid are in contact with each other for a significant period of time.

The easiest way to reduce this risk is to follow the Trust IV Administration Guide and/or the manufacturers' instructions when preparing and administering the drug.

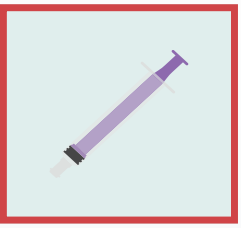
Drug Errors

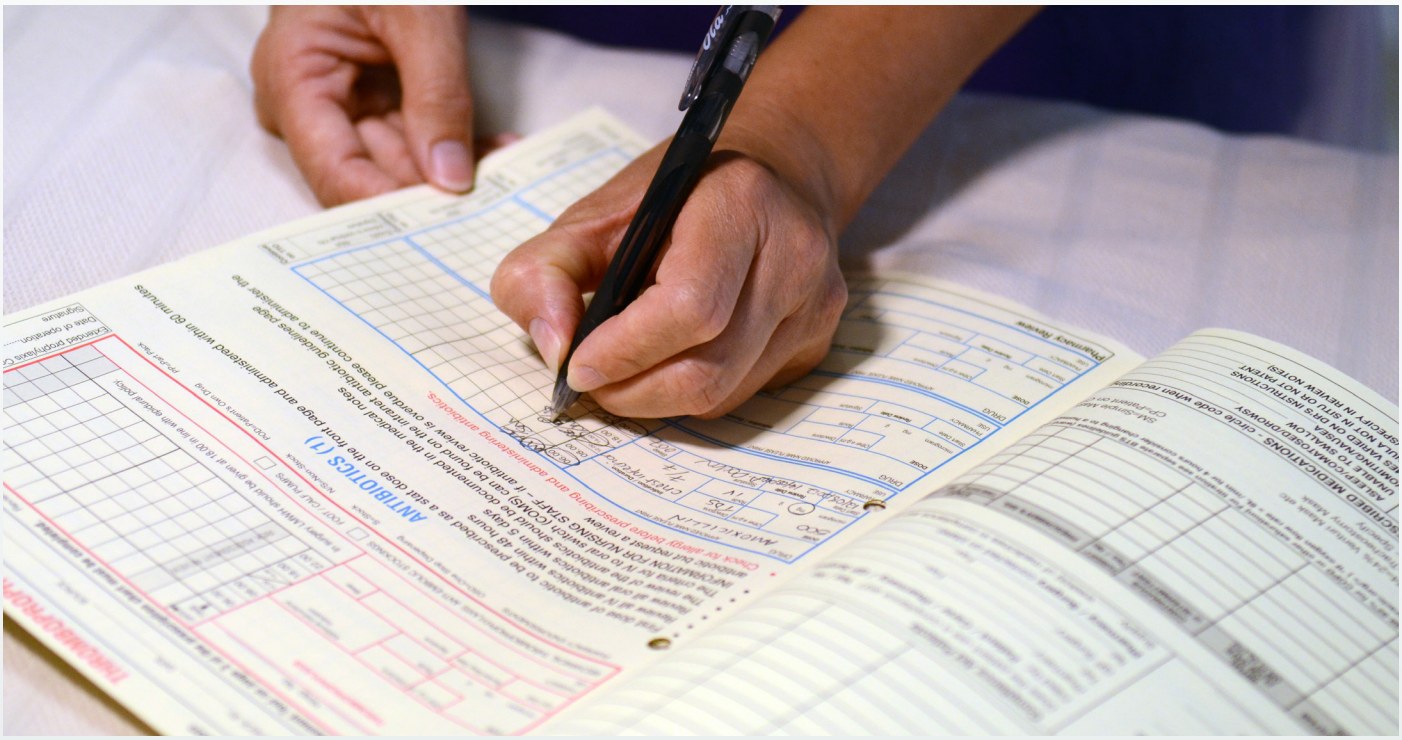
Research indicates that the incidence of errors in prescribing, preparing and administering injectable medicines is higher than for other forms of medicine. They can occur during both the prescribing and administration of intravenous drugs.

The prescription is the set of instructions to administer a drug to a given patient. A number of errors can occur during prescribing including:

- Inadequate knowledge of patient and drug
- Illegible handwriting
- Unlabeled syringes of similar size and content colour
- Drug name confusion
- Use of abbreviations
- Use/positioning of zeros and decimal points
- Poor communication

When mixing up oral and other route e.g. IV medications. Always use a purple syringe for oral medications to distinguish routes - as the syringe does not fit onto the IV port. Do not use clear syringes to measure and administer oral liquid medicines.

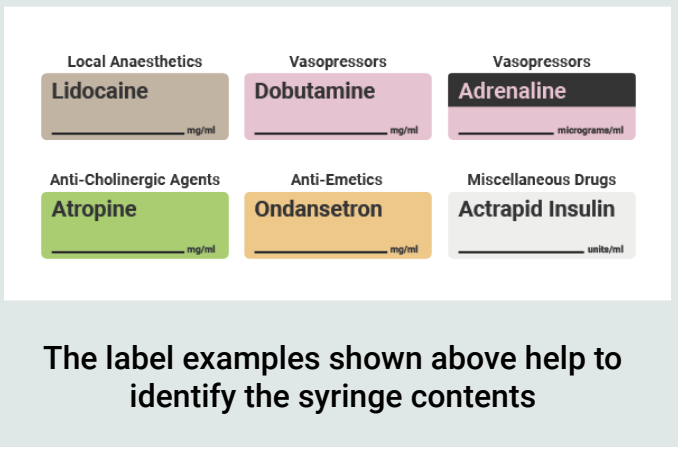




Administration Errors

Safe, successful administration involves a series of complex steps. Reasons for administration errors include:

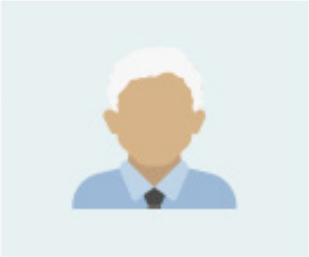
- Selection of incorrect syringes
- Selection of incorrect syringe content because it is not labeled.
- Selection of incorrect drug or diluent
- Incorrect calculation
- Illegible prescription
- Uncommon drug regimens e.g. treatments given on alternate days or once week
- Failure to correctly identify a patient
- Inadequate knowledge of patient and drug
- Equipment failure or malfunction
- User error with infusion devices
- Distractions/interruptions



The label examples shown above help to identify the syringe contents

Preventing Drug Errors

Whatever the route, safe administration comes from ensuring the 'Rights' of drug administration:

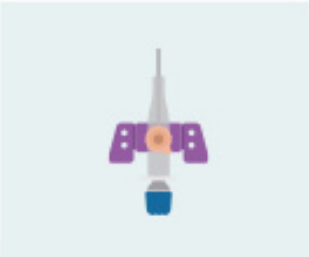


Right Patient

Right Drug
(NB: Allergy status check)

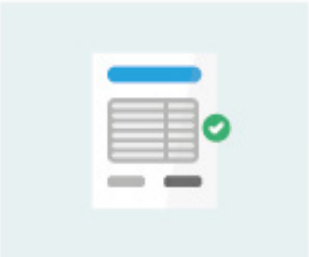
Right Time

Right Dose

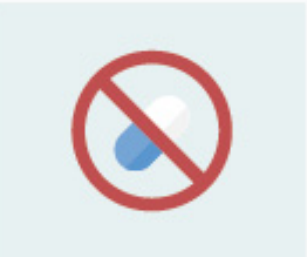


Right Route

Right Method of Administration
(e.g. bolus or infusion)



Right Documentation



Right to Refuse

What to do if you make an error?

The aim of the Trust is to offer safe high quality healthcare to our patients, so we are always trying to minimise errors. If and when an error or a near miss (an error that almost happened but which was spotted before it caused any harm) occurs we need to:

Document details of the incident including what happened, how and why (using the Trust incident reporting system [see below])

Reflect on how to change our practice to try and prevent it happening again
Reflect on whether our procedures and processes need to change to prevent it from happening
In the event of making a drug error, the NMC state that it is the practitioners' responsibility to be honest and act with integrity under the professional duty of candour

There are several crucial steps to take if you make an error:

- Take immediate corrective action if possible (stop administration, prepare a new dose, manage any adverse effects appropriately)
- Inform your line manager
- Decide who else needs to be informed of the error (patient, doctor caring for the patient, pharmacy, lead nurse)
- Record the incident on Datix, the Trust Incident reporting system

Patient Group Directions (PGDs)

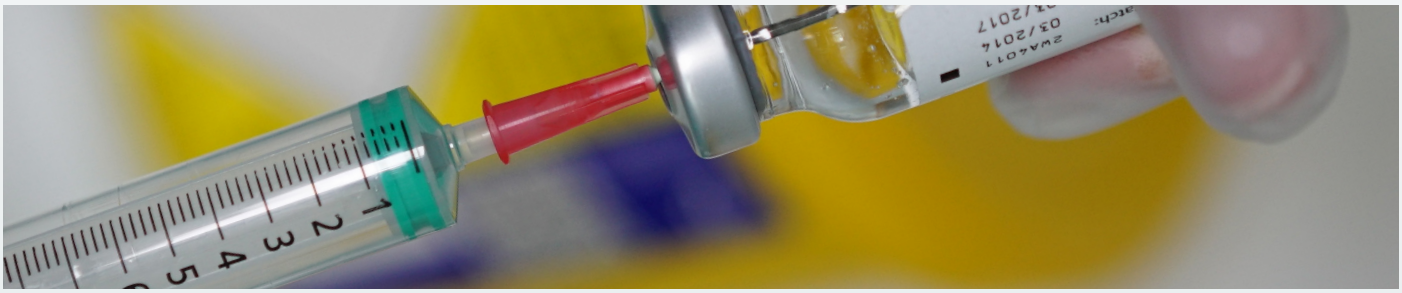
Patient Group Directions (PGDs) provide a legal framework that allows certain registered health professionals to supply and/or administer a specified medicine(s) to a pre-defined group of patients, without them having to see a prescriber. They contain clear criteria about when specific patients can be given specific treatments. They also contain details of the situations where that treatment must not be given. If needed, the PGD will describe how to prepare the product for administration.

Authorisation to use a PGD

As part of your IV drug administration study day you will receive training on how to use PGDs. You will need to:

- Be assessed and signed off on your PGD by a competent health practitioner in your clinical area (you will receive the competency on the day)
- Sign each PGD appropriate for use in your clinical area
- Review PGD competencies at regular appraisal/talent development

Once you have been authorised to use it you must document all the sodium chloride 0.9% flushes you give in the relevant PGD section on the Trust Drug prescription/Administration Chart.



Potential Complications of IV Therapy

Complications can on the whole be avoided or minimised by following best evidence guidelines on: correct cannulation insertion technique, following ANTT and policy guidelines with cannula ongoing care and management and acting appropriately in the event of an emergency in relation to IV access.

Potential IV complications are varied and this guideline provides specific information on; causes, signs and symptoms and nursing management. It is important to note that IV complications can on the whole be avoided or minimised by following best evidence guidelines on: correct cannulation insertion technique, following ANTT and policy guidelines with cannula ongoing care and management and acting appropriately in the event of an emergency in relation to IV access.

For life threatening or serious complications, early recognition of symptoms, prompt emergency treatment and appropriate call for help is essential to minimize further patient deterioration. Anaphylaxis, allergy, circulatory overload, air embolism and extravasation and infection fall into this serious category and will require immediate discontinuation of the IV administration, some level of airway management, oxygen therapy, medical intervention and IV access.

Therefore in these circumstances it is advised to follow Trust guidelines on first line action and treatment by; assessing the patient using the NEWS2 tool and notifying the Dr for urgent review or placing a call to Resuscitation on bleep 2222.

These complications may require specific documentation and notification given to the following: Dr, pharmacist, patient and their next of kin with regard to the incident.

Complication	Possible Causes	Signs and Symptoms	Nursing Management
Anaphylaxis	Sensitivity/allergy to IV drug or additive	• Wheezing, stridor, bronchospasm • Facial flushing, pallor, sweating, rash, tingling lips • Nausea and vomiting • Palpitations, hypotension, tachycardia • Angioedema: Tongue/ face/genitals • Metallic taste in mouth • Feeling of impending doom • Cardiac arrest	• Stop drug administration/maintain IV access • Inform/reassure patient if conscious • Maintain airway- give 100% oxygen • Urgent call to Dr to review using NEWS assessment • Prepare for emergency treatment/ Resus call • Follow Anaphylaxis Algorithm • Monitor vital signs/neurological status • Document in appropriate records • Prescription check/review • Inform Pharmacy/patient/next of kin • Allergy wristband
Air Embolism	Fluid bag or line allowed to 'run through' Air in tubing (not primed) Loose connections	• Dyspnoea/ cyanosis • Weak rapid pulse • Hypotension • Increased CVP • Loss of consciousness • Arrest	• Stop infusion • Inform/reassure patient if conscious • Turn patient (L) side head down if possible • Check for leaks • Maintain airway- give 100% oxygen • Urgent call to Dr to review using NEWS assessment • Prepare for emergency treatment/ Resus call • Monitor vital signs/neurological status • Document in appropriate records • Inform Pharmacy/patient/next of kin

Complication	Possible Causes	Signs and Symptoms	Nursing Management
Circulatory Overload	Too much fluid administered	• Wide variance between fluid input and output (Positive balance) • Dyspnoea, tachypnoea • Wheezing • 'Rattly' respirations • Increased; BP, JVP and CVP readings • Clammy • Anxiety • Late sign- cyanosis of lips and nail beds	• Stop infusion/maintain access • Inform/reassure patient if conscious • Maintain airway- give 100% oxygen • Urgent call to Dr using NEWS assessment Or Resus call • Constant monitoring of vital signs • Position patient in an upright position • Keep warm- promote circulation • Consider Furosemide therapy and also Catheterisation • Document incident in appropriate records • Inform Pharmacy/patient/next of kin
Embolism	From: blood clot formation and or injected solids or shearing of part of canula tubing in the venous circulation	• Sluggish/ absent flow of IV fluid • Cyanosis Breathlessness • Hypotension • Weak rapid pulse • Possible chest pain • Loss of consciousness • Arrest	• Do not flush cannula • Inform/reassure patient if conscious • Stop IV if line is blocked • Remove cannula/maintain IV access Depending on severity of symptoms: • Maintain airway- give 100% oxygen • Urgent call to Dr using NEWS assessment Or Resus call • Prepare for emergency treatment/ arrest • Constant monitoring of vital signs • Document incident in appropriate records • Inform Pharmacy/patient/next of kin
Extravasation (Tissuing with vesicant drugs)	Cannula or fluid displacement Vein weakness i.e. elderly	• Burning/stinging pain at injection site • Swelling or leakage at injection site • Sluggish flow rate or IV counter alarming • Resistance felt on bolus injection • Absence of blood • Backflow • Swelling of entire limb	• Discontinue drug bolus/infusion • Inform/reassure patient • Urgent call to Dr using NEWS/VIP assessment • Keep cannula to aspirate residual drug through cannula • Elevate limb for comfort • Monitor vital signs and neurovascular status • Do not re-site cannula in the same limb • Give prescribed analgesia • Monitor swelling and treatment effectiveness • Document incident in appropriate records • Inform patient/next of kin/IV company to be informed if fault with line
Incompatibility	Chemical : Incorrect mix of drug diluents/volume either before administration or 'unseen' post administration	• Drug Precipitation or Opacity • Pain • Phlebitis • Skin necrosis	• Discontinue drug bolus/ infusion • Inform/reassure patient • Notify Dr using NEWS/VIP assessment • Monitor vital signs • Keep IV line/infusion for reporting • Monitor site and treatment effectiveness • Give prescribed 'antidote'/ analgesic treatment • Document incident in appropriate records • Inform patient/next of kin

Complication	Possible Causes	Signs and Symptoms	Nursing Management
Infection of Venepuncture Site	Poor or absent Aseptic non touch technique (ANTT) on cannula insertion and /or after cannula care Failure to keep site clean Failure to change IV dressing when indicated Failure to change IV equipment as per Policy	• Pain or swelling at site • Purulent discharge • Pyrexia	• Discontinue drug bolus/ infusion • Inform/reassure patient • Notify Dr using NEWS/VIP assessment • Send blood cultures • Complete all Sepsis Six actions • Monitor vital signs • Remove Cannula/maintain IV access • Monitor site and treatment effectiveness • Document incident in appropriate records • Inform patient/next of kin/Infection Control
Infiltration, occurs when cannula dislodges, allowing non vesicant fluid to enter the surrounding tissues 'tissuing'	Inadequate securing of cannula Excessive manipulation of line cannula or fluid displacement Vein weakness i.e. elderly, sick patients	• Burning/stinging pain at injection site • Swelling or leakage at injection site • Sluggish flow rate or IV counter alarming Resistance felt on bolus injection • Absence of blood Backflow • Swelling of entire limb	• Depending on symptoms/VIP score- discontinue drug bolus/ infusion • Inform/reassure patient • Notify Dr to review using NEWS/VIP assessment • Give prescribed analgesia and monitor effectiveness • Position limb comfortably • Monitor vital signs/VIP score/ symptoms • Review correct dilution of drugs/fluids/ administration with prescriber and pharmacy • Review IV access/flushing/care of site in nursing records • Document incident in appropriate records • Inform patient/next of kin
Mechanical Irritation	Poor choice of cannula Inadequate securing of cannula Excessive manipulation of IV line	• Pain • Inflammation at entry site • Phlebitis	• Depending on symptoms/VIP score- discontinue drug bolus/ infusion • Inform/reassure patient • Notify Dr to review using NEWS/VIP assessment • Give prescribed analgesia and monitor effectiveness • Ensure dressing is secure • Monitor vital signs /VIP score / symptoms • Document incident in appropriate records • Inform patient/next of kin

Complication	Possible Causes	Signs and Symptoms	Nursing Management
Phlebitis	Injury to vein on cannula insertion or mechanical movement Irritation due to: Irritating or incompatible additives Vein/cannula too small	• Erythema • Pain • Oedema • Tracking along vein • Swelling • Pyrexia	• Depending on symptoms/VIP score- discontinue drug bolus/ infusion • Do not flush line • Inform/reassure patient • Notify Dr to review using NEWS/VIP assessment • Do not flush line • Position limb for comfort • Give prescribed analgesia and monitor effectiveness • Ensure dressing is secure • Monitor vital signs /VIP score / symptoms • Document incident in appropriate records • Inform patient/next of kin
Speed Shock	Drugs administered too quickly	• Varies according to drug: • Headache • Flushed • Tight chest • Irregular pulse • Hypotension • Loss of consciousness • Shock • Arrest	• Discontinue drug administration • Maintain line/ do not flush • Inform/reassure patient if conscious • Depending on severity of symptoms: • Maintain airway- give 100% oxygen • Urgent call to Dr using NEWS assessment Or Resus call • Prepare for emergency treatment/ arrest • Monitor vital signs/neurological status • Document incident in appropriate records • Inform Pharmacy/patient/next of kin
Systemic Infection	Poor or absent ASEPTIC technique during cannula insertion or cannula after care/ access. Contamination of equipment Flushing of blocked lines	• Chills • Pyrexia • Rigors • Tachypnoea Tachycardia • BP variations • Loss of consciousness • Altered consciousness • Confusion- worse or new	• Discontinue drug bolus/ infusion • Inform/reassure patient • Notify Dr using NEWS/VIP assessment • Send blood cultures • Complete all Sepsis Six actions • Monitor vital signs/neurological status • Remove Cannula/maintain IV access • Monitor site and treatment effectiveness • Document incident in appropriate records • Inform patient/next of kin/Infection Control

Anaphylaxis

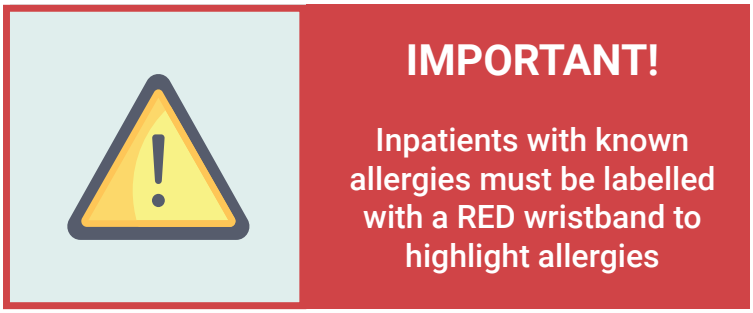
What is Anaphylaxis? Anaphylaxis is an exaggerated life threatening response to a substance to which an individual is sensitized, in which vasoactive substances are released from basophils and mast cells in response to an Ig E (immunoglobulin) mediated reaction.

Anaphylaxis can occur on first exposure to the drugs/fluids or on subsequent exposures. Anaphylactoid response is a secondary anaphylaxis up to 12 hours or more after the first. It effects the whole body within minutes of exposure to the allergen and often within seconds, although it can be fatal up to 6 hours after exposure. If not recognised and treated quickly, the mortality rate increases dramatically.

What happens during Anaphylaxis?

All mediators can cause varying degrees of:

- Mucosal oedema
- Capillary leakage
- Smooth muscle contraction



Ensure awareness of patient's allergy potential, respond quickly and appropriately to initiate appropriate expert help early to reduce severity of anaphylactic reaction.

Remember anaphylaxis is rare. It is important to prepare for this potential complication, so you may wish to discuss this with your senior colleagues.

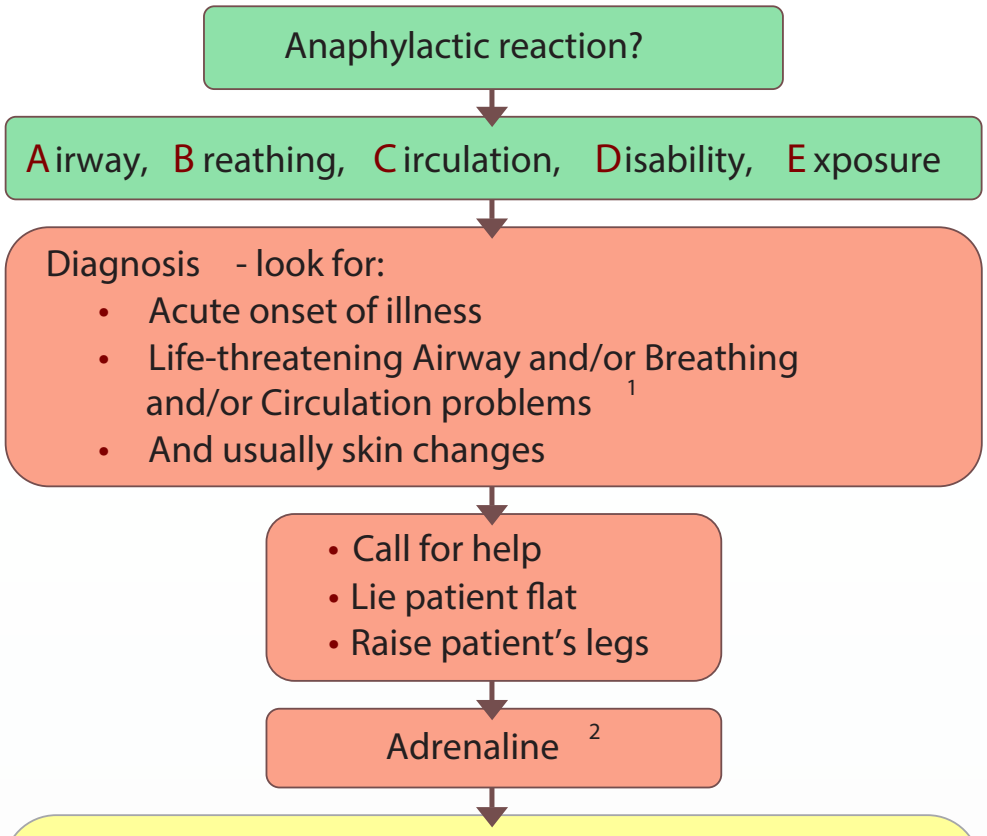
(i) Triggers of Anaphylaxis

Medicines	Contrast agents
Medicines known to trigger anaphylaxis in a small amount of people include: • Antibiotics – *particularly penicillin-like antibiotics* • Muscle relaxant medicines used during surgery *(general anaesthetic)* • Non-steroidal anti-inflammatory drugs (NSAIDs) – *a type of painkiller that includes ibuprofen and aspirin* People sensitive to these types of medicines will usually develop anaphylaxis as soon as they begin a course of treatment, although they may have safely received them in the past. The risk of anaphylaxis using these types of medicines are very small, so in most cases the benefits of treatment outweigh the potential risk. For example, the risk of developing anaphylaxis: • after taking a NSAID-type painkiller is around 1 in 1,480 • after taking penicillin is around 1 in 5,000 • after being given a general anaesthetic is around 1 in 10,000	Contrast agents are a group of special dyes used in some medical tests to help certain areas of your body show up better on scans such as X-rays. For example, a contrast agent injected into a blood vessel will help show up any problems in the vessel, such as a blockage, on the X-ray. This is known as angiography. The risk of developing anaphylaxis after being injected with a contrast agent is thought to be less than 1 in 10,000.

(ii) Recognition of Anaphylaxis

Airway	• Angioedema - Airway swelling e.g. throat and tongue swelling • Dyspnoea - Difficulty in breathing • Dysphagia - Difficulty in swallowing • Sensation that throat is 'closing up' • Hoarse voice • Stridor - Inspiratory wheeze
Breathing	• Shortness of breath • Tachypnea - Increased respiratory rate • Wheeze • Patient tires • Confusion, caused by hypoxia • Cyanosis (appears blue) – a late sign • Respiratory arrest
Circulation	• Signs of shock – pale, clammy • Tachycardia - Increased pulse rate • Hypotension - Low blood pressure • Decreased conscious level • Myocardial Ischaemia/ angina • Cardiac arrest
Disability	• Sense of "impending doom" • Anxiety, panic • Decreased conscious level caused by airway, breathing or circulation problem
Exposure	Skin changes often the first feature and are present in over 80% of anaphylactic reactions. • Skin, mucosal, or both skin and mucosal changes • Erythema–a patchy, or generalised, red rash • Urticaria (also called hives, nettle rash, wealsor welts) anywhere on the body • Angioedema- involves swelling of deeper tissues e.g. eyelids and lips, sometimes in the mouth and throat

(iii) Anaphylaxis Treatment Algorithm



1 Life-threatening problems:

Airway:	swelling, hoarseness, stridor
Breathing:	rapid breathing, wheeze, fatigue, cyanosis, SpO_2 < 92%, confusion
Circulation:	pale, clammy, low blood pressure, faintness, drowsy/coma

2 Adrenaline (give IM unless experienced with IV adrenaline)

IM doses of 1:1000 adrenaline (repeat after 5 min if no better)

- Adult 500 micrograms IM (0.5 mL)
- Child more than 12 years: 500 micrograms IM (0.5 mL)
- Child 6 -12 years: 300 micrograms IM (0.3 mL)
- Child less than 6 years: 150 micrograms IM (0.15 mL)

Adrenaline IV to be given only by experienced specialists
Titrate: Adults 50 micro grams; Children 1 micro gram/kg

3 IV fluid challenge:

Adult - 500 – 1000 mL
Child - crystalloid 20 mL/kg

Stop IV colloid if this might be the cause of anaphylaxis

	4 Chlorphenamine (IM or slow IV)	5 Hydrocortisone (IM or slow IV)
Adult or child more than 12 years	10 mg	200 mg
Child 6 - 12 years	5 mg	100 mg
Child 6 months to 6 years	2.5 mg	50 mg
Child less than 6 months	250 micrograms/kg	25 mg

Infection Control Issues

IV therapy is documented as a high risk area of clinical practice, due to associated complications including the risk of infection and in particular the risk of direct microbial entry into the blood stream. This can potentially lead to a life threatening bacteraemia/septicaemia. A wide variety of bacteria can cause bacteraemias, the two most common being Staphylococcus aureus and Escherichia coli.

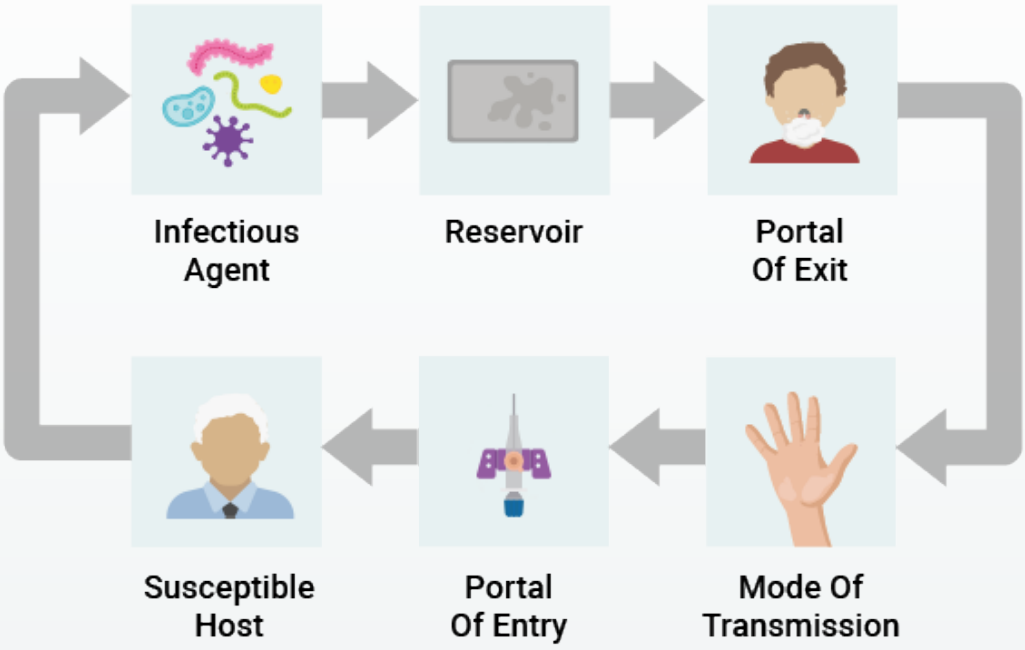
Bacteraemia: The presence of bacteria in the blood. The term 'fungaemia' is used if the micro-organisms in the blood are fungi (e.g. yeasts) rather than bacteria.

Bloodstream infection: Is the presence of micro-organisms in the blood with signs of infection. This can be 'primary' i.e. inoculated directly into the bloodstream e.g. via an IV line or 'secondary' spread to the bloodstream from an original focus somewhere in the body e.g. urinary tract.

The main routes of transmission in IV therapy are:

- **Direct contact - via portal of entry - IV access ports or cannula site**
- **Direct contact - e.g. healthcare worker hands**
- **Indirect contact - e.g. contaminated equipment, fluids, drugs or infusates**
- **Airborne - "aerosols" tiny infected particles from an infected person released when they cough or sneeze which can be breathed in.**

The Chain of Infection



Transmission is the easiest chain in the link to break. Therefore it is essential that practitioners' who administer IV therapies, understand that the majority of IV related, health care associated infections (HCAI's) are avoidable on the proviso that practice guidelines are followed consistently. This fundamental principle underlines several main health documents including; DoH, High Impact Interventions (HIIs) (2017), EPIC 3 guidelines (2014) and the Health Care Act. This can be achieved with following aseptic non touch technique (ANTT).

Please take a look at the ANTT IV Therapy guideline poster on Clinical Skills intranet pages.

Visual Infusion Phlebtis (VIP) Score

Visual Infusion Phlebitis (VIP) score

VIP scoring must be documented on the cannula care bundle (or other appropriate documentation) twice daily to indicate cannula status and appropriate actions.

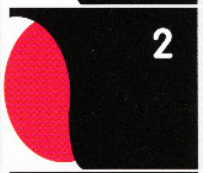
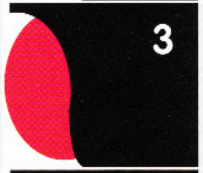
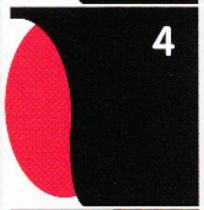
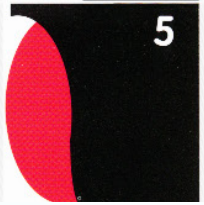
Important information - please read

All patients with an intravenous access device in place must have the IV site checked at least daily for signs of infusion phlebitis. The subsequent score and action(s) taken (if any) must be documented. The cannula site must also be observed when:

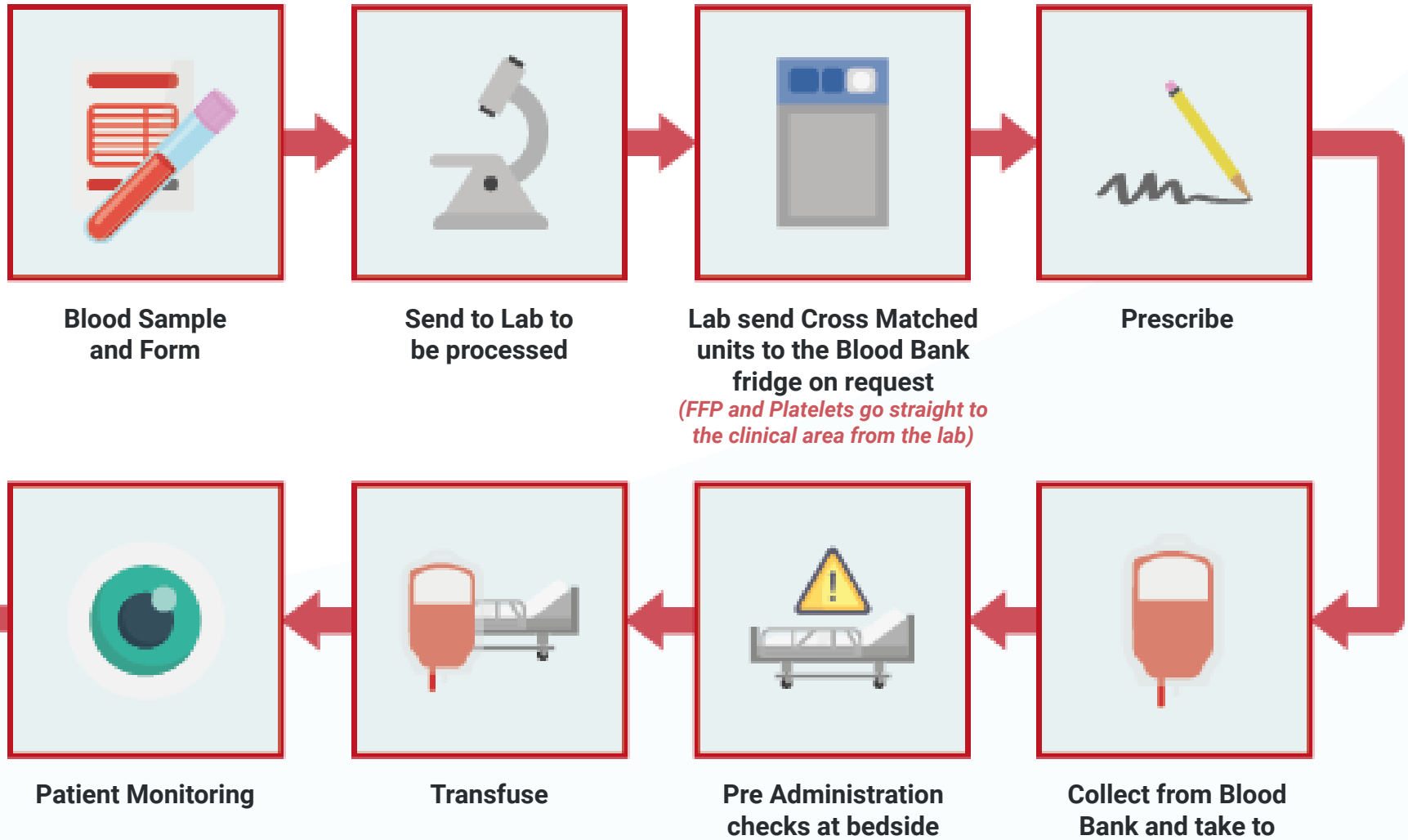
- Bolus injections are administered
- IV flow rates are checked or altered
- Solution containers are changed

The incidence of infusion phlebitis varies. The Following 'Good Practice Points' may assist in Reducing the incidence of infusion phlebitis:

1. Observe cannula site at least daily
2. Secure cannula with a proven intravenous dressing (IV3000®)
3. Replace loose, contaminated dressings
4. Cannula must be inserted away from the joints whenever possible
5. Aseptic technique must be followed
6. Consider your policy position on resiting of the cannulae
7. Plan and document continuing care including VIP score
8. Use the smallest gauge cannula most suitable for the patients' needs
9. Replace the cannula at the first indication of infusion phlebitis (Stage 2 on the VIP score)

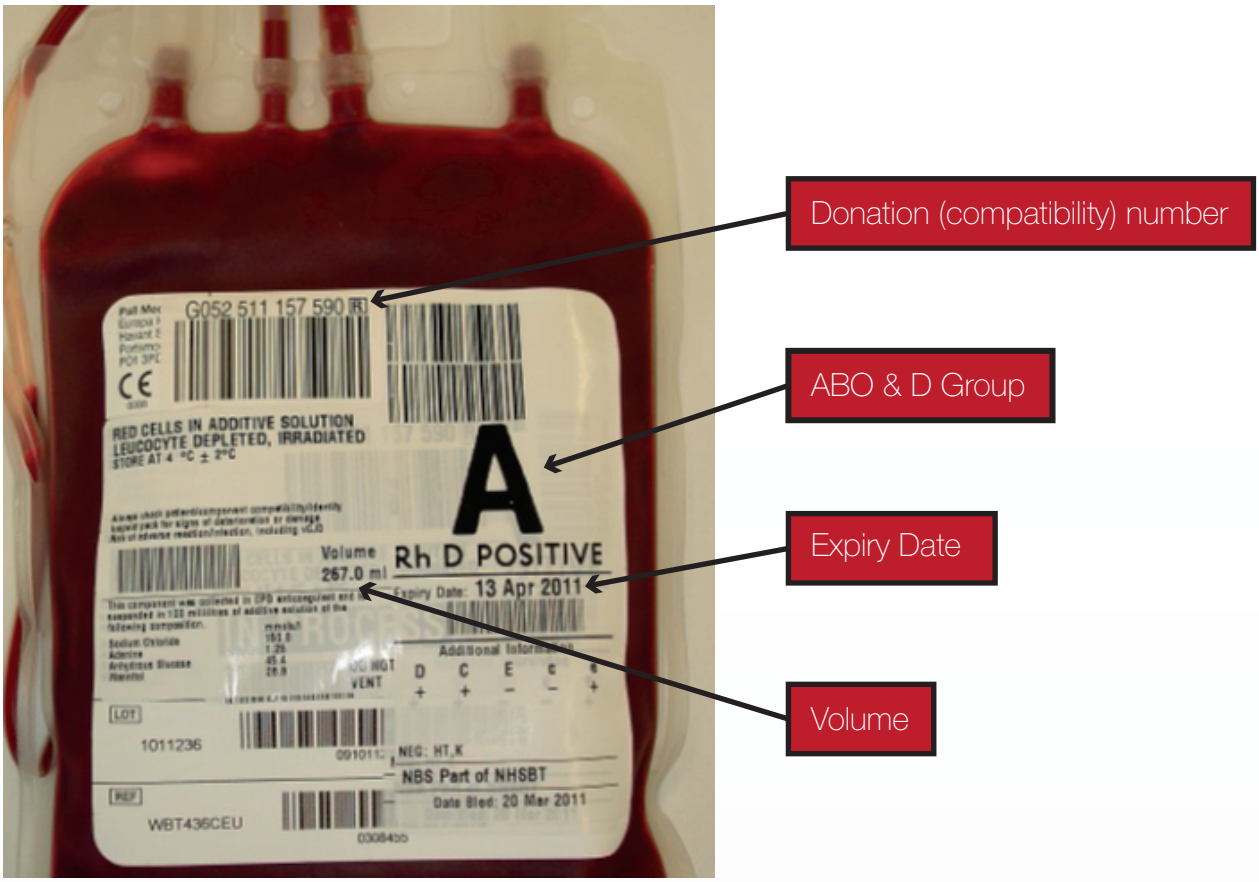
IV site appears healthy	 0	>	No signs of phlebitis **OBSERVE CANNULA**
One of the following is evident: • Slight pain near IV site or • Slight redness near IV site	 1	>	Consider re-siteing Cannula **OBSERVE CANNULA** The following should be considered: • Ease of cannulation • Patient preference • Cannula site • Cannula use • Duration of treatment remaining
Two of the following are evident: • Pain at IV site • Erythema • Swelling	 2	>	Early stage of phlebitis **RESITE CANNULA**
All of the following signs are evident: • Pain along path of cannula • Erythema • Induration	 3	>	Mid-stage of phlebitis **RESITE CANNULA CONSIDER TREATMENT**
All of the following signs are evident **and extensive**: • Pain along path of cannula • Erythema • Induration • Palpable venous cord	 4	>	Advanced stage of phlebitis or start of thrombophlebitis **RESITE CANNULA CONSIDER TREATMENT**
All of the following signs are evident and extensive: • Pain along path of cannula • Erythema	 5	>	Advanced stage of thrombophlebitis **INITIATE TREATMENT**

Blood Transfusion - The Process



Fate Unit as transfused on BLOOD HOUND system

Red Cell Packs



Red Cells
Make up 90% of all transfusions at GHNHSFT
Storage life 35 days
Must be stored between 2°C to 6°C in specialised blood fridges
Administered over a MAXIMUM period of 4 hours
Subject to 30 minute rule
Can be stored in a designated blood coolbox with Medicool inserts (special cool packs) for up to 6 hours if packed correctly. Only staff who have had specialised training are permitted to pack blood boxes e.g. lab staff and porters
Once cross matched for the patient the red cells are placed in blood bank fridges for 48 hours (e.g. theatres, oncology blood bank fridges)

Red Cells - 30 Minute Rule

Once a red cell unit has been removed from the Blood Bank fridge or a blood cool box you have 30 minutes to commence the transfusion or return it to the blood bank fridge.

After 30 minutes of being out of storage the blood cannot be scanned back into the blood bank fridge using Blood Hound. In such cases, if the blood has been out of the blood bank fridge or blood coolbox for more than 30 minutes and is not going to be used, the laboratory MUST be contacted.

If blood has been removed from the blood bank fridge for more than 30 minutes and providing it has been at room temperature, it may still be transfused.

In such cases the transfusion must be completed within a total of 4.5 hours from the time it was removed from the blood bank fridge. This includes the 30 minutes from the time it leaves the fridge to the commencement of the transfusion.

- *e.g. if the blood has been out of storage for 45 minutes then you have a maximum of **3hours and 45 minutes** to complete the transfusion*

If in doubt contact the blood transfusion department.

If a red cell unit is packed correctly in a blood coolbox it can be stored there for up to 6 hours as indicated by the label on the blood coolbox. Once removed from the blood coolbox the 30 minute rule applies.

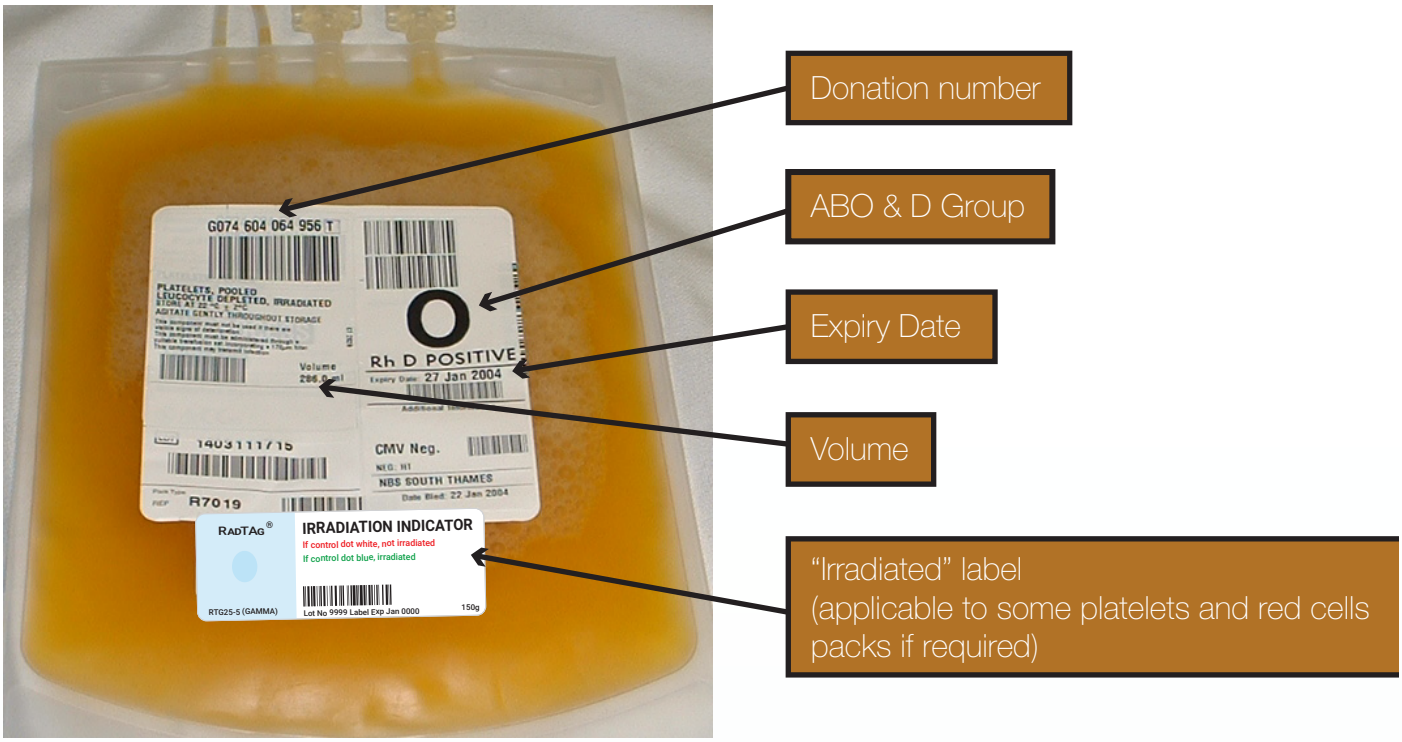
Blood Groups Compatibility - Red Cells

Recipient	Donor							
	A Pos	A Neg	B Pos	B Neg	AB Pos	AB Neg	O Pos	O Neg
A Pos	√	√					√	√
A Neg		√						√
B Pos			√	√			√	√
B Neg				√				√
AB Pos	√	√	√	√	√	√	√	√
AB Neg		√		√		√		√
O Pos							√	√
O Neg								√

√ = compatible Blank = incompatible

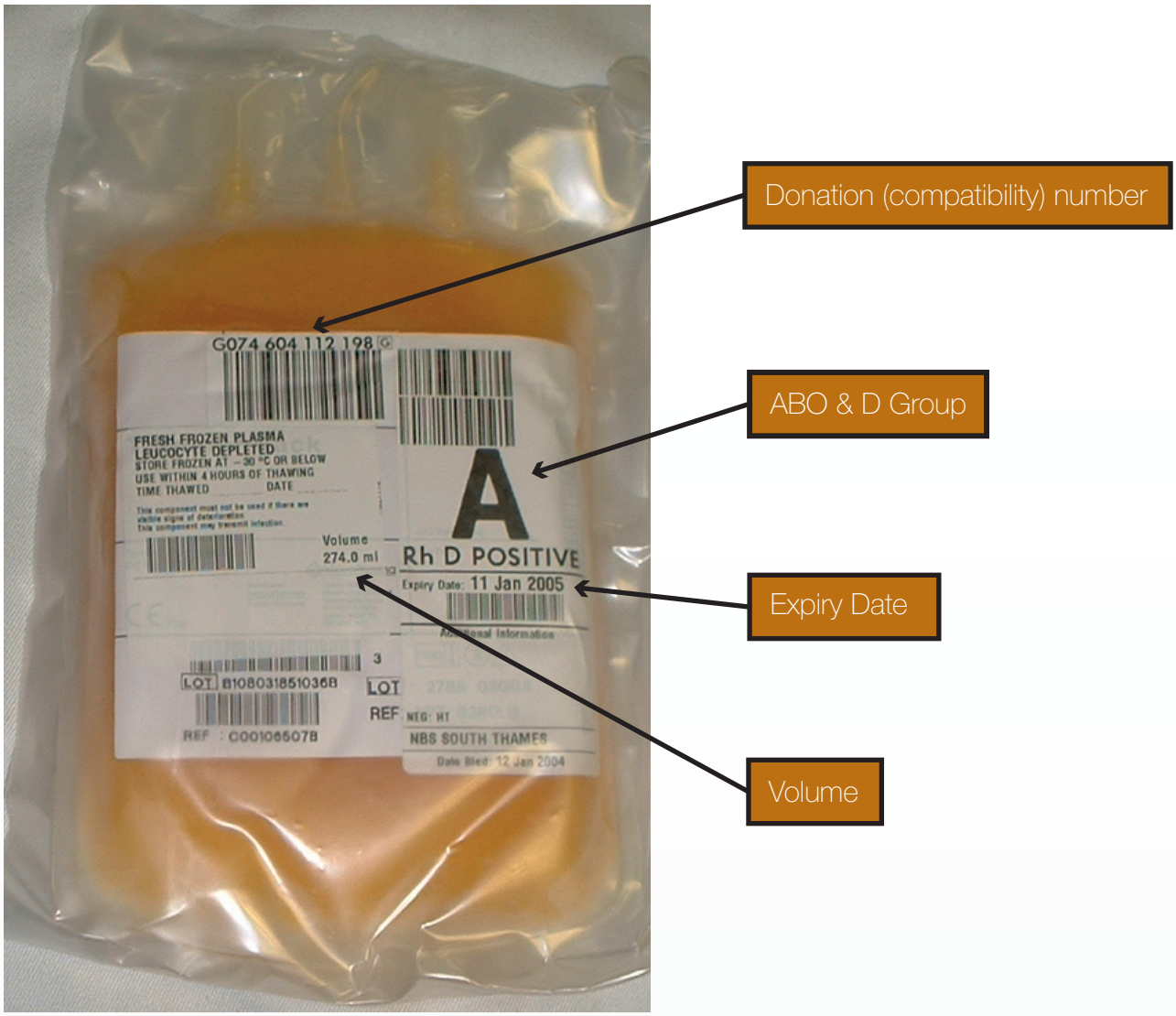
When preparing donor blood for a patient consideration has to be given to any clinically significant antibodies that the patient may have. In such cases it may be necessary for the transfusion department to liaise with the NHS Blood and Transplant service in order to obtain compatible blood for these patients if the blood is not in stock.

Adult Platelets (Irradiated)



Platelets
Stored in lab at between 22°C and 24°C
Need to be constantly agitated in laboratory storage facility
Storage life up to 7 days from donation
Platelets are sent directly to the patient when ready
Administration must commence promptly (after bedside checks) and is usually completed over 30 minutes as prescribed
DO NOT put outer wrapper on platelets because they are supplied in a breathable bag
Notify the laboratory if there is any delay in administering this component
Sometimes platelet stocks in the laboratory may be low, so it may be necessary to order them from NHS Blood and Transplant in Bristol. This usually takes at least 2 hours and it is best to request them the day before the patient requires them (where possible).

Fresh Frozen Plasma



Fresh Frozen Plasma
Stored at -25°C to -40°C in laboratory conditions
Storage life 36 months
Thawed by laboratory on request (takes approximately 30 minutes). Once thawed, it cannot be refrozen
FFP is sent directly to the patient when ready
Administration must commence promptly (after bedside checks) and is usually completed over 30 minutes as prescribed
Notify the laboratory if there is any delay in administering this component
A therapeutic dose of FFP may consist of multiple packs (depending on the patient's weight)

Irradiated Blood Label

Platelets and Red Cell packs may have to be irradiated before being transfused to patients who have specific diseases or treatments that may compromise their immune system.

For these patients irradiated blood must be prescribed and the laboratory will then provide such patients with irradiated blood components as required.

The blood components will have an IRRADIATED BLOOD LABEL to show that the component has been irradiated.

This helps protect vulnerable patients from Transfusion-Associated Graft-versus-Host Disease. This is a rare but potentially fatal disease.

The radiation prevents lymphocytes in the donor blood pack from dividing and causing harm in these particular vulnerable patients.

Blood Administration

When preparing donor blood for a patient consideration has to be given to any clinically significant antibodies that the patient may have. In such cases it may be necessary for the transfusion department to liaise with the NHS Blood and Transplant service in order to obtain compatible blood for these patients if the blood is not in stock.

Component / Product	Instructions for adult administration
Red Cells	• 170 - 200 micron filter is required (standard blood administration set) • Either gravity or electronic infusion pumps may be used. Electronic infusion pumps should only be used if the manufacturer verifies them as safe for that purpose. • The transfusion must be completed no more than 4 hours after the component has been removed from temperature controlled storage.
Platelets	• 170 - 200 micron filter is required (either a blood or platelet administration set may be used) • Platelet concentrates should not be transfused through administration sets which have already been used for blood • Platelet administration sets have a smaller priming capacity than a blood administration set • A unit of platelets is usually administered over 30 minutes

FFP (Fresh Frozen Plasma)	• 170 - 200 micron filter is required (blood administration set)
	• Once thawed, FFP must not be re-frozen and should be transfused as soon as possible as post-thaw storage will result in a decline in the content of labile coagulation factors
	  • For products kept at 22 oC post thawing, the transfusion must be completed within 4 hours of thawing
	  • For products stored at 4 oC in the blood transfusion laboratory post thawing, the transfusion must be completed within 24 hours of thawing
	• A unit of FFP is usually administered over 30 minutes

Granulocytes	• 170 - 200 micron filter is required (standard blood administration set) • The whole dose should be transfused over 1-2 hours
Cryoprecipitate	• 170 - 200 micron filter is required (standard blood administration set) • Once thawed, cryoprecipitate must not be re-frozen and should be used immediately. If delay is unavoidable, the component should be stored at ambient temperature and used within 4 hours
Stem cells	• Administer using a standard intravenous fluid administration set
Human Albumin Solution (HAS)	• 15 micron filter vented giving set (most standard intravenous fluid administration sets have a 15 micron filter)
I/V Immunoglobulin	• 15 micron filter vented giving set (some manufacturers supply a giving set in the product packaging)

(a) Priming the line

The line must be primed to remove air before attaching it to the patient. It is unnecessary to prime with anything other than the blood component, however 0.9% Sodium Chloride may be used for this purpose. Dextrose should never be used in a giving set before or after blood, as it can cause haemolysis.

There are a variety of blood administration sets available. Manufacturers instructions for priming the line should always be followed.

(b) Changing the administration set

If multiple units are being transfused, the administration set should be changed at least every 12 hours to prevent bacterial growth. Some administration sets may be supplied with different instructions, or your hospital policy may vary. In these cases you should follow the manufacturer's instructions or your hospital policy, as appropriate.

(c) On completion of the transfusion

Flushing through the remainder of the blood in the line with 0.9% Sodium Chloride is unnecessary and is not recommended because it may result in particles being flushed through the filter. If another IV infusion is to take place after the blood transfusion, it is good practice to use a new administration set to reduce the risk of incompatible fluids or drugs causing haemolysis of any residual red cells which may be left in the administration set.

(d) Drugs

Drugs must not be added to any blood component pack. It is generally advised that an infusion line that is being used for blood should not be used to administer any other drugs. Dextrose solution (5%) can cause haemolysis and must not be mixed with blood components. Calcium-containing solutions may cause clotting of citrated blood. The topics of compatible IV fluids and co-administration of drugs and blood components are currently under review by BCSH transfusion task force. (The Handbook of Transfusion Medicine 4th edition 2007).

(e) Blood warmers

Hypothermia impairs haemostasis and reduces red cell oxygen delivery to the tissues. Rapid transfusion of blood at 4ºC can lower the patient s core temperature by several degrees. Cold blood infused faster than 100mL/minute has been reported to cause cardiac arrest in adults. Rapid infusion devices may be used when large volumes have to be infused rapidly. Rapid infusers usually incorporate a blood warming device.

Blood should only ever be warmed using a specifically designed commercial device with a visible thermometer and audible warning. Only CE marked commercial blood warmers should be used and the manufacturers' instructions strictly followed. Some blood warmers are designed to operate up to and including 43°C but are safe, provided they are used and maintained according to manufacturers instructions. Blood and blood components should not be warmed using improvisations such as putting the pack into hot water, in a microwave or on the radiator. Fatalities have occurred due to haemolytic transfusion reactions and/or bacterial contamination of the blood component following the use of inappropriate blood warming procedures.

(f) Paediatric administration

The principles are the same as for adult administration. Blood administration sets containing an integral 170-200 micron filter should always be used. Paediatric blood administration sets are appropriate for small volume transfusions. These come with an integral 3 way tap which can then be used to attach a syringe driver if required. The component bag should be left attached during the transfusion even if using a syringe driver.

It is vital for the doctor to specify both the volume in mL and the time over which the transfusion should take place when prescribing paediatric transfusions.

(g) Intra Uterine Transfusions

Red cell preparations for Intra Uterine Transfusion (I.U.T) should not be transfused straight from 4ºC storage. As no specifically designed warming system exists for the small volume of blood used for I.U.T any active warming must be carried out with great care and the blood product not exposed to temperatures more than 30ºC. Active warming may not be necessary if the blood component is removed from 4ºC storage in a timely manner and the infusion is given at an appropriate rate.

MSoft Blood Tracking System – "Blood Hound"

Blood Hound is an easy to use electronic system which is used to track blood components from the time they leave the laboratory to the completion of the transfusion. This system was implemented to all blood fridges and virtually all clinical areas across the GHNHSFT during 2008. This was done in order to comply with the EU Directive for Blood Safety and Quality Regulations (2005) with particular reference to the vein to vein traceability of each unit – which is a legal requirement.

Using the system allows individual units of red cells, fresh frozen plasma and platelets to be tracked from the laboratory through to being administered to a patient.

When the unit has been administered it can be recorded by staff as transfused (fated) on Blood Hound on a PC. This completes the audit trail for each unit and ensures vein to vein traceability.

Also it is possible to check on the Blood Hound system the whereabouts of a particular unit so that staff can find out if it is in the laboratory, in the blood fridge or on its way to the patient.

When trained, the member of staff is issued with a barcode and a 6 number PIN and only staff who have received training will be able to use Blood Hound.

Blood Hound Training

Each clinical area has a Blood Transfusion Champion who is trained to cascade the Blood Hound training to their colleagues who have yet to be trained. For any queries please contact Pathology GRH 5244 or Rob McGowan, Hospital Transfusion Practitioner, CGH 3410

Summary

You have now been through the material for this course, before you can book onto the practical session you need to complete the IV Administration eLearning and then pass the IV theory assessment, these can both be found in the eLearning system.

If you have any queries, please contact the Clinical Skills Department on:

0300 422 5667

ghn-tr.clinicalskillstraining@nhs.net

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