Birmingham Children's Hospital NHS
NHS Foundation Trust

Policy for the Insertion, Administration, Maintenance and Removal of Intravenous Cannula/Catheters

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1 Introduction

1.1 This policy was developed to ensure that there is a consistent approach for caring for infants, children and young people with peripheral cannula and central venous catheter.

1.2 This policy is mandatory for all staff working within Birmingham Children's Hospital NHS Trust. Only staff who have been deemed competent may access intravenous lines. This includes all health care professionals employed by the Trust including those working in the patient's home, but excludes those seconded to other organisations.

1.3 This policy introduces standards to replace existing care-plans as per Appendix 1 & 2.

2 Purpose

2.1 To inform Trust staff of their responsibilities regarding the insertion, maintenance, access and removal of cannulae/catheter.

2.2 To provide practitioners with a concise and logical theoretical framework based on accepted evidenced based practice.

2.3 To ensure all aspects of intravenous practice are consistent throughout the Trust.

3 Abbreviations

2%CHG/70%IPA-2% Chlorhexidine Gluconate in 70% Isopropyl Alcohol

IV – Intravenous PVC – Peripheral Venous Cannulae

CRS – Catheter Related Sepsis RA – Right Atrium

CRBSI – Catheter Related Blood Stream Infection

CVA – Central Venous Access SVC – Superior Vena Cava

CVC – Central Venous Catheter US – Ultrasound

IJV – Internal Jugular Vein VAS – Vascular Access Service

PICC – Peripherally Inserted Central Catheter

ANTT – Aseptic Non-Touch Technique

AVF – Arteriovenous Fistulae PN – Parenteral Nutrition

IO – Intraosseous CVAD – Central Venous Access Device

PGD – Patient Group Directives HII – High Impact Interventions

4 Duties

4.1 Duties within the Organisation

4.1.1 All qualified staff are responsible for ensuring their practice complies within this policy.

4.1.2 It is the local manager's responsibility to ensure that the policy and its procedures are made available to all staff.

4.1.3 This Trust policy will support the training, competency based assessment and clinical support in the working environment.

4.1.4 All staff must ensure that they comply with the requirements for Aseptic / Aseptic Non-Touch Technique (See 6.1.2).

4.2 Identification of Stakeholders

All health professionals who care for infants, children and young people must adhere to the policy.

5 Method for development

5.1 Consultation and Communication with Stakeholders

- All staff were invited to comment on the existing Intravenous Therapy and Central Venous Catheter Policy (2006). Comments were sought from a wide range of health professionals. Cancer Lead Nurses, Manager for Medical Day Care, Consultant Anaesthetists, Hospital at Night Educator, PICU Consultant, PICU Education Facilitator, Infection Control Nurse Specialist, Nutritional Care Manager, Senior Sister of the ED, Manager of ED, Professional development Facilitators, Junior Sister Ward 6, Ward manager Ward 5, Haemodialysis Sister, Specialist Paediatric Registrars, Clinical Skills Educator, Teaching Sister Ward 8.

- A scoping exercise was carried out on current evidence based research.

- A Care Plan and Standard Group (CPSG) was set up to produce the attached Peripheral and Central Venous Catheter (CVC) standards (Appendix 1 & 2).

- National, local policies and guidelines were utilised in the development of this policy.

6. 1

General Principles

6.1.1 Preparation

The child's nurse, the practitioner inserting the catheter/cannula and/or a play specialist, should prepare the child and family, this is wherever possible.

The child needs to be prepared both physically and psychologically. A referral to the child psychologist may be necessary, especially in cases of known needle phobia. The child and family need to be informed of the following issues:

- Why it is necessary to insert peripheral a cannula or CVC
- What the procedure involves
- The risks associated with having a peripheral cannula or CVC
- How long the device is likely to be in place
- That the correct holding and positioning will be undertaken during the cannulation process (Invasive/Distressing Procedures Policy 2006), or that the device will need to be inserted under sedation/anaesthetic
- The importance of maintaining patency of the device; changing the dressing and observing the device access site
- What the procedure entails and how long it is likely to take
- That the device needs to be accessed and/or flushed and why, what it involves and how long it will take
- That the device will need to be removed, why, what the procedure entails and how long it will take

6.1.1.2 Consent

Consent for all aspects of Intravenous (IV) therapy should be discussed with the family at the beginning of the child's stay/treatment. The practitioner performing any part of the procedure should gain written or verbal consent from the child and or the parents/carer prior to commencing the procedure. The information given should include the risks and benefits and this information should be recorded in the patient's health records (Consent Policy 2008). In 'urgent or emergency' situations it is the clinician's responsibility to ensure that there is documentation where consent is implied and not obtained.

Information guidance ''Gaining consent for Central Venous Catheter Insertion'' can be found in Appendix 3.

With elective insertion of CVC's information leaflets on CVC's should be given to families where available.

6.1.1.3 Analgesia

Topical analgesia must be prescribed according to the Trust Medicines Policy (2008) and Patient Group Directives (PGD) after discussion with the child and/or parents. Take note of the following points:

- Ametop gel® may not be used in children under one month and Emla cream® may not be used in children under one year
- Previous allergic reactions are a contraindication
- Some medical conditions may preclude the use of Ametop gel®, these include Epidermiolysis bullosa, active eczema.

- Apply Ametop gel® and cover with a clear dressing. Ametop gel® should be left in place for a minimum 30 minutes, maximum 45 minutes (for cannulation); Emla cream® for minimum 45 minutes for venepuncture and 60 minutes for cannulation. After recommended time remove with a clean tissue.

Following CVC insertion pain relief should be administered as prescribed (Standard for Pain Relief 2008)

6.1.1.4 Invasive Procedure

The Trust Policy for Management of Invasive Distressing Procedures (2006) which is available on the Trust Intranet (P drive go to the Trust Policies folder in the Clinical Policies folder) must be followed.

6.1.2 Aseptic Technique

Because the potential consequences of catheter related blood stream infections (CRBSI) are so serious, enhanced efforts are required to reduce the risk of infection to the absolute minimum. Hand hygiene and compliance with Aseptic/Aseptic Non Touch Technique (ANTT) (Rowley & Laird 2006) are therefore essential and key components of minimising line infections (See Aseptic/ANTT Policy 2008 and Appendix 4 which highlights the principles of ANTT). Asepsis / ANTT will be dependant on the type of device and will be discussed in the relevant section. The hospital environment must be visibly clean, free from dust and soilage when undertaking either aseptic / ANTT procedures.

6.1.3 Hand Hygiene

Hand decontamination is an integral part of preventing infection and cross infection (Pratt et al 2007; Department of Health 2007). Hands must be decontaminated immediately before each and every patient contact/ care and after any patient contact. Hand hygiene is particularly important before handling any invasive device.

Hands that are visibly soiled must be washed with soap and water. Hands still need to be decontaminated even if gloves are to be worn.

All staff must ensure that the current BCH Trust hand hygiene policy is adhered to.

6.1.4 Personal Protective Equipment (PPE)

Appropriate PPE should be worn whenever there is a potential contact with blood or bodily fluids, this includes gloves, aprons, eye/face protection.

Plastic aprons are worn when close contact with the patient and when there is a risk that clothing may become contaminated with pathogenic micro organisms or blood or body fluids.

Face masks and eye protection must be worn where there is a risk of blood, body fluids, secretion or excretions splashing into the face and eyes.

Gloves must be worn as single use items and should be removed and discarded as clinical waste immediately after use. There must be adequate supplies of PPE freely available for staff to use.

The use of sterile versus non-sterile gloves will be discussed in the specified sections, such as PVC and CVC.

6.1.5 Safe Disposal of Sharps

Sharps containers should be available at point of use so that the used sharp can be disposed of directly into the sharps container. Sharps must not be passed from hand to hand. Handling must be kept to a minimum. Do not re-sheathe needles. Do not disassemble used needle and syringe i.e. after accessing AVF. Sharps boxes should not be overfilled (see current BCH Sharps Policy).

6.1.6 Needle Free Devices

Needle free infusion systems have been widely introduced into clinical practice to reduce the incidence of sharp injuries. The use of a needle free device promotes a closed system which will minimise the exposure of key parts (NPSA 2007). However in a resuscitation situation they must be removed in order for the ease of access.

The introduction of new intravascular devices that include needle-free devices should be monitored for an increase in the occurrence of device associated infection. If an increase in infection rates is suspected, this should be reported to the MHRA.

If needle free devices are used, the manufacturers' recommendations for changing the needle free components must be followed.

When needle free devices are used, healthcare workers must ensue that all components of the system are compatible and secured, to minimise leaks and breaks in the system.

When needle free devices are used, the risk of contamination should be minimised by decontaminating the access port before and after access with 2% CHG/70% IPA wipes.

6.1.7 Labelling medication

All medication administered intravenously should be clearly and correctly labelled with the name of the drug on the syringe or appropriate device i.e. burette or at the end of each line (infusion).

6.1.8 Administration Sets

The appropriate administration set should be used with the specific infusion device in line with the manufacturer's recommendations.

All intravenous administration sets must be labelled with the date and time that the infusion was set up. Administration sets must be changed every 72 hours or more frequently if needed i.e. if the vascular device is replaced. Following the administration of blood and blood products, administration sets

must be immediately replaced. If more than 2 units of blood is required the administration set needs to be changed (refer to the Blood Transfusion Policy 2008). Following parenteral nutrition, administration sets must be changed after twenty four hours however if lipids are not used in the parenteral nutrition, sets can then be changed after ninety-six hours (Department of Health 2007, BCH Parenteral Nutrition Protocol 2006).

Wherever possible intravascular devices and administration sets must remain a closed system. There will be additional devices used (such as three way taps and traffic systems) and these should be treated as part of the closed system and be changed accordingly with each administration set. These devices will need to be decontaminated with 2%CHG/70%IPA prior to and after each access. If the closed system is disturbed, a new administration set must be used (this does not include changing the bags of intravenous fluids or accessing the ports or devices along the system).

Ideally medication should not be given via the bung on the administration set however when this is unavoidable, only a fine bore needle should be used (24 gauge or less).

6.1.9 Filters

The in-line administration set filters are sufficient in the filtration of infusions and additional filters are not required routinely for the purposes of infection prevention (Pratt et al 2007). Where filters are needed for use with the administration of specific intravenous medication, Pharmacy will advise.

6.1.10 Discard of Unused/surplus medication

During the preparation of medication the discard must be disposed of in the Sharps Bin in accordance to the Trust Medicine Policy (2008) and the Waste Disposal Policy (2008).

6.1.11 Medical Devices

The user must be trained and competent in the use of any device used to administer the medication intravenously (Royal College of Nursing (RCN) 2005). The device must be for the purpose intended according to the manufacturer's instructions. Staff are required to have completed the Assessment of Clinical Competencies – Medical Devices, which is part of the Trust Risk Management Policy & Procedures for BCH (2008).

The volume of intravenous fluid administered should be recorded each hour and a cumulative total kept. Where there is intravenous fluid administered through an infusion pump the volume is recorded from the medical device, however where there volume is administered via a syringe the hourly and total volume infused must be read from the syringe.

6.1.12 Documentation

The type of fluid, the line it is running through and the pump serial number should be recorded when any intravenous fluid is administered.

The insertion date and site of all intravenous lines should be recorded on the fluid balance chart (Observation & Monitoring Policy 2008).

All staff who administer intravenous therapy are required to adhere to the Policy and must have documented evidence of their clinical competence. A practical assessment form (see Appendix 5 needs to be completed to demonstrate the technique). For some healthcare professional's (for example nurses) it is a requirement that three yearly competency re-assessment takes place. The practical assessment form and the completed competency, once validated by Professional Development Team, needs to be kept as part of the individual's portfolio of evidence. A record or database needs to be updated by the line manager.

Standards of care for the PVC and the CVC needs to be consistent throughout the Trust (see Appendix 1 & 2). However there will be acknowledgement that there is a CVC Care Bundle in use in PICU at BCH. Appendix 6 is completed for the insertion and removal of CVC and a copy filed in the patients notes or where used into the electronic database.

6.2

Risks and Complications

Many of the risks and complications that occur with invasive devices will be associated with both peripheral cannulas and/or the Central Venous Catheters (CVC).

6.2.1 Infection

The incidence of Catheter Related Blood Stream Infection (CRBSI) varies considerably depending on the type of catheter, site of insertion, aseptic precautions undertaken, type of use and duration of insertion. Heparin-bonded catheters have been shown to significantly reduce the incidence of sepsis in Paediatric Intensive Care Units (PICU) patients requiring a temporary CVC (Pierce 2000). A flow diagram for the management of CRBSI is included in Appendix 7.

If either a local infection or a CRBSI is suspected, the invasive device should be removed wherever possible (Removal of CVC section 6.3.5.3 and Removal of PVC section 6.4.3), relevant samples taken and appropriate treatment commenced. Any suspected infections and the actions taken and reasons why the device could not be removed must be documented in the patient's health records.

6.2.2 Phlebitis and Extravasation

Phlebitis is the irritation of the vein, caused by mechanical, chemical or bacterial injury. It can be identified by pain or tenderness along the vein, oedema, warmth and or a palpable cord.

Refer to BCH Extravasation Policy (2005) for recognition, treatment and management.

6.2.3 Air Embolus

Air embolus is defined as air in the vascular system. The risk of air emboli is very real when caring for patients with central access devices, but can occur with any intravenous access. Air collects in the right side of the heart and can cause death or a fall in cardiac output. Children with cardiac defects are particularly at risk if there is a communication between the left and right sides of the heart. Here the air can pass into the systemic circulation and may enter the cerebral circulation causing a cerebro-vascular accident or into the coronary arteries causing cardiac arrest. In this situation much less than 1ml of air can be fatal. Preventative measures should include:

- Remove all air from syringes and IV lines before attaching to patient.
- During line insertion - the doctor will follow the correct technique to prevent air emboli.
- When changing IV tubing on a central venous catheter, if possible have the patient perform the valsalva manoeuvre. Taking a deep breath in and bearing down increases intrathoracic pressure and prevents air from entering the venous system.

Signs of air emboli include confusion, disorientation, cyanosis, hypotension, weak thready pulse or collapse. If an air emboli is suspected then make an

assessment and seek medical assistance immediately. Turn the patient onto his left side and place him in the Trendelenberg (head down) position and administer oxygen.

6.2.4 Occlusion

Occlusion of the catheter lumen may be related to thrombus formation, the infusate or kinking and compression of the catheter. No studies undertaken in children show any benefit from subcutaneous heparin, intravenous heparin infusions or flushing the catheter with heparin-containing solutions (Smith 1991, de Neef 2002).

CVC's in constant use must be flushed with the prescribed Normal Saline (0.9%) in between intravenous medication and infusions (NPSA/2008/RRR002). However where the CVC is not in use for more that 12 hours (and the CVC is still clinically indicated) then the prescribed Heparin 100units/ml should be administered. The dose may vary from a minimum of 0.5 mls to 2mls (dependant upon the size of the child and the catheter inserted).

After all therapies or blood sampling the catheter should be flushed with 0.9% saline (Harris 1999). Use a pulsing motion to create turbulence and therefore help to prevent blockage.

Terminal in-line filters should be used with all PN infusions as per PN Protocol (2006) to prevent debris entering the CVC (Elliott 1994, Bethune 2001).

Where there is an occlusion suspected, syringes smaller than 10 ml volume should not be used to unblock an obstruction, as they can generate very high internal pressures (Conn 1993).

Various methods can be used to treat a suspected occlusion of a CVC lumen (see Appendix 8).

Initially, an attempt should be made to flush the lumen with 0.9% saline or heparinised saline (100 units/ml) in a 10 ml syringe.

Thrombosed catheters can sometimes be unblocked using a balloting technique. This involves attaching an empty 10 ml or 20 ml syringe and repeatedly aspirating and releasing the plunger. After a few minutes it may be possible to aspirate from the lumen again. Although this technique has been used clinically, it has not been validated in clinical trials.

Urokinase or altepase can be used to unblock a thrombosed catheter (Wachs 1990, Choi 2001). Urokinase is the drug of choice at BCH. Altepase is an alternative, but is more expensive than urokinase and is associated with an increased risk of bleeding. As such, it should be avoided if the patient is at increased risk of haemorrhage.

Ethyl alcohol or hydrochloric acid can be used when lipid or drug deposits cause blockage (Duffy 1989, Stokes 1989, Werlin 1995). This must be administered by the Vascular Access Team (VAS).

A guide wire should never be used to unblock a CVC.

6.2.5 Catheter Dislodgement

External catheters should be secured appropriately to prevent catheter dislodgment. If catheter dislodgment is suspected the catheter should not be used for the administration of medication, solutions or chemotherapy until the catheter tip position has been confirmed.

6.2.6 Thrombosis

CVC's are the most common cause of venous thromboembolism in neonates and children (Andrew 1994, Schmidt 1995). This can have serious consequences, as the catheter may no longer function, venous pathways may become permanently occluded and clot may embolise.

If catheter-related thrombus is suspected, do not use until an ultrasound of the catheter tip and surrounding veins by a Radiologist or Cardiologist should be requested as soon as possible (Moukarzel 1991).

If thrombus is present, consideration should be given to removing the catheter and commencing anticoagulants.

Extensive local thrombus formation may require the use of thrombolytic agents, but a full risk/benefit analysis and discussion needs to be undertaken first (Stokes 1989, Crain 1998, Bethune 2001).

Acute onset of symptoms such as dyspnoea, chest pain, syncope, hypoxia, hypotension, tachycardia, tachypnoea, haemoptysis, sweating and fever may be due to pulmonary embolism. This should be included in the differential diagnosis and the appropriate investigations undertaken to confirm or exclude it.

6.2.7 Failure to Aspirate Blood

If it is impossible to aspirate blood from any of the catheter lumens. Use a saline flush, ask the patient to move position. The catheter should not be used until the position has been checked. This may indicate occlusion of the lumens, but could also be due to malpositioning of the catheter or migration into an abnormal location.

In the case of temporary CVCs, a chest x-ray should be taken and the catheter either manipulated or consideration given to replacement.

In the case of tunnelled lines, a chest x-ray should be taken and the clinical team looking after the patient should then discuss with radiology whether a lineogram is required and then refer to the VAS team. The VAS team will then decide if the CVC requires replacement.

If the catheter has more than one lumen, then only those lumens that allow free aspiration of blood should be used, until the catheter position has been deemed satisfactory by a member of the medical staff.

6.3

Central Venous Catheter (CVC)

6.3.1 Training

Only staff that have been appropriately trained, deemed competent or under direct supervision of competent staff should:

i) insert CVC
ii) access / maintain the CVC
iii) remove the CVC

6.3.2 Booking

The need for CVA in a child may be decided on an elective or an urgent basis, depending on the underlying pathological process and the indications for the catheter. If a CVC is needed on an emergency basis (within 4 hours), it will almost certainly be to assist with the resuscitation of a critically ill child and recommendations in that respect cannot be made by a document such as this, as they will be dependent on the clinical judgement of the attending clinicians.

Once the decision has been made to request CVA, the next step depends on whether it is an elective or an urgent request. All elective requests should go through the Vascular Access Service (VAS). A booking form can be found on the Trust Intranet in the Vascular Access folder (see Appendix 9). This should be completed and returned to Mr Suren Arul, with a copy to his secretary. If necessary, further discussion should be undertaken with a member of the Service.

The type of CVC needed should have been decided following discussion between the referring clinician and the VAS or operator, and will depend largely on the indication for the catheter and the likely duration of need. The VAS has produced recommendations regarding the type of catheter to be inserted (Appendix 8).

A weekly meeting occurs between relevant medical staff i.e. Haematology/Oncology & Gastroenterology to decide on the indications, urgency and order of lines for the next week.

The database of all booked and waiting lines can be accessed by the relevant clinicians on a password protected spreadsheet found on the Trust Intranet.

All urgent requests must be discussed with either a member of the VAS or the on-call Consultant Anaesthetist. A member of the VAS will generally be available for advice from 9-5pm, Monday to Friday (see Anaesthetic Rota). This should be a Consultant to Consultant discussion to determine the urgency of the request, the most appropriate catheter for insertion and the operator. Once these decisions have been made, the operator will liaise with Theatres and book the case with either the Theatre Co-ordinator or the on-call team. Theatres will be instructed not to accept bookings from anyone other than the individual undertaking the procedure.

It may be necessary to inform the X-ray Department or the on-call Radiographer, depending on the type of line being inserted and the need for screening or a check x-ray. This is the responsibility of the operator.

6.3.3 Consent and Information

This is discussed in 6.1 General Principles. However for CVC insertion it is the responsibility of the referring team to obtain consent particularly if general anaesthesia is required.

6.3.4 Principles of CVC Insertion

The insertion of CVC must be done using maximal sterile barriers and sterile drapes (See 6.3.4.4).

The actions below are an integral part of preventing infections associated with CVC and are key components of the DoH (2007) High Impact Interventions (HII) and will be discussed fully.

- Catheter type
- Insertion site
- Skin Preparation
- Personal Protective equipment
- Hand hygiene
- Aseptic technique
- Dressing
- Safe disposal of sharps
- Documentation – to complete Appendix 6 (found in the p-drive VAS folder)

6.3.4.1 Catheter type

Appendix 10 summarises the types of CVC's in current use.

Short-term PVC/polyethylene catheters are generally used for access of less than 3 weeks duration.

Longer-term silastic CVCs (Hickman lines) are recommended for access lasting more than 3 weeks.

A peripherally inserted silastic CVC may be judged to be the best option for access, as these are long-lasting and often don't require general anaesthesia for insertion.

To minimise the risks of catheter-related sepsis (CRS) single lumen catheters should be used where possible unless indicated otherwise (Pratt et al 2007, Department of Health 2007). Where a multi lumen line is required, this should be indicated on the CVC database

Where a multi-lumen catheter is used, wherever possible one port must be designated exclusively to administer Parenteral Nutrition.

The Department of Health (2007) identifies that antimicrobial catheters should be considered where duration is 1 to 3 weeks and risks of CRBSI is high however the impact of using antimicrobial impregnated catheters in paediatric setting is uncertain. Heparin-bonded catheters have been shown to reduce the incidence of CRS and thrombosis, and should be considered in susceptible patients (Pierce 2000).

6.3.4.2 Insertion site

Most CVC's will be inserted into the jugular or femoral vein. Occasionally the subclavian vein will be used instead. The Department of Health (2007) identify that the subclavian or internal jugular should be used however in children this will largely be decided by the operator and be determined by factors such as type of line, indication, availability of veins, familiarity with the insertion process, patient preference and duration of need. Studies in children suggest there is little difference in terms of mechanical and infectious complications between the different sites (Venkatamaran 1997, Johnson 1998, Chen 2001, Citak 2002). In children, femoral lines will often be used.

6.3.4.3 Skin Preparation

The skin should be decontaminated using 2% CHG/70% IPA solution (Pratt et al 2007) using repeated up and down, back and forth strokes and the skin must be allowed to dry. In children under 1000 grams and those less than 30 weeks gestation, extra care needs to be taken in the cleaning technique of the skin with either 2% chlorhexidine or povidone iodine. Careful observation of skin irritation needs to be reported, treated accordingly and documented. Where the patient has a sensitivity to Chlorhexidine a single patient use Povidone-iodine solution should be used.

6.3.4.4 Insertion Technique

All CVC insertions should be undertaken with maximum aseptic precautions (Bull 1992, Raad 1994, Pratt et al 2007). This includes comprehensive hand washing before and after each patient contact using the correct hand hygiene procedure, the wearing of a mask, hat, sterile gown and sterile gloves and eye protection (where there is a risk of splashing with blood or body fluids), the use of sterile drapes (appropriate to length of CVC to be inserted). Dispose of sharps safely at point of use and do not pass from hand to hand.

There has been much debate about the 'best' method for inserting CVCs now that suitable ultrasound (US) equipment and training are readily available. The NICE guidance from 2002 recommended that US-guided CVC insertion was the preferred method for internal jugular vein (IJV) cannulation in children in the elective situation, and should be considered in most emergency situations as well (NICE 2002). A subsequent statement from the Royal College of Anaesthetists indicated that although the guidance was fair and sensible, the landmark method was still an acceptable alternative. They also emphasised the importance of recording which method had been used for localisation of the vein (RCA 2003).

There is increasing evidence in the literature to support the use of US for CVC cannulation in children (Asheim 2002, Leyvi 2005, Chuan 2005). The following recommendations are based on that evidence and the opinions of the VAS, the Anaesthetists and the Intensivists at BCH. It assumes that the IJV is being cannulated, there is access to a suitable US machine and that the operator has had appropriate training in the technique of US-guided CVA.

In the emergency situation either the landmark or US technique can be used, depending on operator preference.

In the urgent or elective situation, any patient requiring CVA should have the vessel screened with US to assess patency prior to the insertion attempt, even if US is not subsequently used for the insertion.

If the vein on one side of the neck is absent, occluded or significantly narrowed, a member of the VAS should be contacted for advice. It is recommended that US is used for the CVC insertion on the opposite side.

If the landmark technique has been chosen and has failed after 2 attempts, it is recommended that US is used to assist with the insertion, either to reassess vein patency or to guide insertion.

If 2 sites have been used and a total of 5 insertion attempts made, consideration should be given to asking a more experienced colleague for assistance or contacting a member of the VAS.

Patients should be placed in the Trendelenburg (head down) position during insertion. This increases the venous pressure, thus distending the vein and preventing air from being drawn into the circulation (air embolism). The risks of air embolism are less if the patient is receiving positive pressure ventilation.

6.3.4.5 Suturing of CVC

All CVCs should be sutured following insertion, to prevent accidental removal.

There are many different ways of suturing a catheter and this will depend on operator experience and the catheter fixation features.

Generally, a 3.0 Ethilon or Prolene suture will be adequate for fixing most catheters.

Ideally, a CVC fixation device should be used with temporary catheters, as this will allow easier adjustment of catheter position.

If the CVC tip is found to be in the atrium, the catheter may need to be withdrawn. This can lead to problems with catheter security, as the original sutures may need to be cut and replacement can be difficult. An alternative may be to use a sutureless CVC fixation device. If the presence of a suture causes or aggravates local infection, there should be discussion with the operator about removing or replacing it.

6.3.4.6 Dressing

All CVCs should be securely fixed at the time of insertion to prevent accidental removal. Ideally, this should include securing with a suture and to apply a sterile, semi-permeable transparent occlusive dressing. Small children may not understand the significance of a CVC, regarding it merely as an irritation. The catheter should be fixed and arranged in such a way that it is difficult for them to get hold of it.

Pratt et al. (2007) and DoH, HII (2007) both advocate the use of a sterile, transparent, semi-permeable dressing to allow observation of the site and this type of dressing will be the standard type of dressing used with CVC’s.

The dressings on CVC's must be replaced at least weekly and more frequently if it becomes loose, soiled, wet or non-adhesive or if clearer entry site inspection is required and documented.

For temporary CVC's the catheter will have a dressing covering the insertion site for the duration of its insertion. Dressings should be intact, dry, sterile, adherent and transparent. There may be situations where alternative dressings are required and this will need to be clearly documented.

During dressing changes 0.5%CHG/70%IPA skin preparation swab should be used to clean the catheter insertion site (avoiding irritated and broken skin); the solution must be allowed to dry (at least 30 seconds). However, if there is excess loss and/or soiling from the situ site then clean area with normal saline, prior to using a 0.5%CHG/70%IPA skin preparation swab.

Some CVC's are 'well embedded' after 12 weeks and the patient may no longer require a dressing, unless they choose to. The child will need to be advised on general hygiene needs.

Where there are concerns about particular groups of patients i.e. Haematology/Oncology/Dermatology and if a different type dressing is required, this should be identified in an agreed local protocol.

6.3.5 Ongoing CVC care actions

The actions below should be adhered to in order to prevent CVC related infections (DoH, 2007 HII) and the general principles of Asepsis /ANTT must be followed (see Appendix 4). General hygiene should be followed as per Parent/Patient Information Leaflet.

Hand hygiene

- Hands must be decontaminated immediately before accessing the device and during the procedure if there is contamination of the key parts
- Gloves should be worn, according to the procedure to be undertaken, for PN sterile gloves must be used at all times

Catheter site inspection

- Regular observation for signs of infection (see 6.3.5.1)

Dressing

- An intact, sterile, dry, adherent transparent dressing should be used unless locally agreed otherwise.
- If it is soiled or loose it should be replaced and changed every 7 days

Catheter access

- Use an aseptic non-touch technique to access the lines
- Where the appropriate gloves
- Disinfect the hub with 2%CHG/70%IPA and allow to dry
- Where a needle-free device is not used, the CVC hub cap must be replaced with a sterile cap

Administration set replacement

- As identified in General Principles (6.1)

Cannula removal / Replacement

- No routine catheter replacement

6.3.5.1 Catheter Site Inspection

Catheter site inspection is paramount to preventing infections and CRBSI. A visual site inspection, which is documented, should be done at least daily when not in use and hourly as per Extravasation policy (2005) whilst in use or as per local policy. Where complications are suspected the appropriate actions must be taken i.e. antibiotics and these need to be documented. If a line infection is suspected, a swab should be taken and sent to microbiology. If there is evidence of CRBSI, the CVC should be removed as soon as possible depending on the infection and as advised by Microbiology.

In the presence of sepsis, broad spectrum antibiotics should be commenced and include vancomycin (see Appendix 7). Haematology/Oncology has a febrile neutropenia protocol, which differs significantly to this. Please refer to the protocol when treating suspected CRS in these patients.

If the patient remains pyrexial after 48 hours of antibiotics, careful consideration should be given to removal of the catheter. In the presence of fungal CRS, the CVC must always be removed.

The CVC tip will often become colonised with bacteria. Following removal, do not send the catheter tip for routine microbiology, unless there is evidence of CRS, or fungal sepsis is suspected.

If it is undesirable to remove the CVC or it is not possible immediately, the antibiotics can be administered through the catheter in an attempt to treat the infection, although this will not treat an exit site infection.

Ideally, the CVC should not be replaced until the CRBSI has been treated. The risks of infection and blockage increase greatly in temporary CVCs after 2 weeks, therefore, consideration should be given to replacing them after this time.

6.3.5.2 CVC access

Hand hygiene is an integral part of the ANTT (Appendix 4). ANTT must be used each time a CVC is accessed. Sterile or non-sterile gloves should be worn, depending on the procedure to be undertaken (for example, sterile gloves are required for Parenteral Nutrition). The hub must be disinfected using 2%CHG/70%IPA and allowed to dry prior to accessing it

Syringe Use

10 ml syringes should be used for central lines when flushing a line or checking patency; because they exert less pressure and therefore cause less damage.

Once patency has been confirmed a smaller syringe can be used, this should be the exception rather than the normal practice. For example if there are micro-doses or the transfer of cytotoxic medication puts the user at risk.
Syringes specifically for intravenous use must be used at all times. Luer-lok syringes must be used where the medication is not to be ‘bolused’.

Where there are needle-free devices the user must follow the manufacturer's instructions, e.g: turn 15 degrees to 'lock' the syringes securely onto the needle-free device.

Flushes

Following insertion it will be necessary to flush the catheter lumen(s) to prevent occlusion prior to usage. If the catheter is to be used immediately, then flushing the lumen(s) with 0.9% normal saline is satisfactory, whilst those not to be used require a 2ml dose of heparin 100units/ml.

CVC's in constant use must be flushed with the prescribed Normal Saline (0.9%) in between intravenous medication and infusions (NPSA/2008/RRR002). However where the CVC is not in use for more that 12 hours (and the CVC is still clinically indicated) then the prescribed Heparin100units/ml should be administered. If there is a clinical need to vary this dose then a local PGD needs to be agreed and prescribed.

The dose may vary from a minimum of 0.5 mls to 2mls (dependant upon the size of the child and the catheter inserted).

The volume of flush may vary according to specialities and should be administered as prescribed on the prescription sheet or Trust/local Patient Group Directive.

Flushing should be done using a pulsated (push-pause) and positive pressure method and clamping as the last ml is instilled. If any therapies (drugs, fluids and bloods) are administered through the catheter at the time of insertion, 0.9% normal saline should be used to flush the catheter in between them to prevent precipitation and occlusion caused by them coming into contact with each other (Harris 1999).

6.3.5.3 Removal of CVC

CVC's will usually need to be removed if damaged or if there is evidence of CRBSI which cannot be cleared by administration of antibiotics through the catheter, or there is evidence of fungal sepsis. Children will also have their CVC removed when CVA is no longer required for their treatment.

Temporary CVC's can be removed by nursing staff on the ward using a strict aseptic technique and as per the Standard 2a Care of Patient with a CVC: Insertion and Removal (2008). Hickman lines, Vascuports and some Haemocaths will need to be removed in theatre under general anaesthesia.

Tunnelled CVC removals will either be undertaken by the VAS as an elective or scheduled procedure, or, if there is evidence of CRBSI, as an emergency procedure, by the VAS or Paediatric Surgeons. Bookings for elective removals should be through the VAS and involve the same booking process as a CVC insertion. Urgent requests for removal will require that the patient is discussed with the relevant operator (usually the on-call Paediatric Surgeon) and booked onto the emergency list.

The process of providing information and consent should be the same for CVC removal as for insertion, in accordance with section 6.1.

6.3.6 Specific CVC considerations

Considerations in relation to CVC will be discussed as below.

6.3.6.1 Parenteral Nutrition

Where a CVC is to be used for the administration of PN, the Trust Protocol must be followed. Ideally any CVC used for the administration of PN should be used for that purpose only (Pemberton 1986).

For many patients receiving PN it will be necessary to use the CVC for the administration of other drugs or infusions, monitoring and blood sampling. If this is the case and the catheter has multiple lumens, wherever possible one must be reserved for the administration of PN (Savage 1993, Ma 1998).

The lumen on a CVC reserved for PN administration should be a designated lumen, that hasn't been used for any other purpose. However, if it is not possible to access a dedicated lumen, any other lumen can be used, providing there is no evidence of CRBSI. This should be documented in the patient's notes.

In some cases where the designated PN CVC lumen is used for other intravenous administration then the lumen must be accessed using the PN Protocol (use of sterile field and gloves to access hub).

6.3.6.2 Arterial Puncture

Arterial puncture is a recognised complication of CVC insertion, with an incidence of 5-10% in the paediatric population (Hyashi 1992, Mitto 1992). The incidence at BCH is less than 1% with the VAS. Usually, it is recognised at the time of the initial puncture, and removal of the needle or cannula and the application of direct pressure will prevent significant bleeding or haematoma formation. However, this will not be possible with attempted subclavian vein cannulation. Most serious problems arise if it goes unrecognised and a large dilator or CVC is inserted into the artery, there is an underlying bleeding tendency, or drugs and fluids are infused.

If inadvertent arterial puncture occurs during attempted CVC insertion, the needle or cannula should be removed and, if possible, direct pressure applied to the wound for 5 minutes. If bleeding continues after this time, pressure should be reapplied for a further 5 minutes.

Any underlying bleeding tendency should be treated with Fresh Frozen Plasma, cryoprecipitate and platelets, as required.

Following arterial puncture, the blood flow may be pulsatile and the blood look well oxygenated, which will help distinguish it from a venous puncture. However, this is not always the case, particularly if the patient has cyanotic heart disease. If an arterial puncture is suspected, but not confirmed, there are a number of ways of confirming the diagnosis:

- A blood sample can be taken for blood gas analysis.
- The catheter can be pressure transduced.

- Contrast can be injected with radiological screening.
- A guide wire can be passed through the catheter and its position noted on screening.

If in doubt, do not dilate the vessel or introduce the CVC.

If arterial puncture is recognised following insertion of the dilator or catheter, leave in situ and seek assistance from a member of the VAS or a Cardiologist. It may also be necessary to involve a Vascular Surgeon or Vascular Radiologist (Nicholson 2004).

6.3.6.3 Catheter Tip Position

Much controversy surrounds the optimum position for the catheter tip following insertion. Atrial placement is more secure, particularly in neonates as this means the catheter tip is in the area of highest blood flow, and avoids pressure on the vessel wall, with the risks of perforation. However, there have been several case reports of cardiac tamponade, mostly fatal, associated with atrial placement of the CVC tip (van Engelenburg 1998, Nowlen 2002,). Previously, the risk has been estimated to be about 2 per 1000 catheters in the neonatal population and most have been associated with peripherally placed silastic catheters. Risk factors include evidence of the catheter sitting in the atrial wall and the infusion of hypertonic solutions under high pressure. In 2001 the DOH produced a report following the deaths of 4 babies in Manchester presumed to have this complication (DOH 2001). Amongst the recommendations that came from the report, were that the CVC tip should lie outside the heart (ideally, above the level of the pericardial reflection) and that there should be careful screening at the time of insertion to ensure that this was the case. A subsequent large case series in premature neonates has shown that silicone CVCs can be safely managed within the atrium (Cartwright 2004).

Currently, the VAS at BCH believe that with Hickman lines the advantages of having the catheter tip in the high atrium outweigh the potential risk of tamponade, given the much greater risk of a malpositioned catheter or subsequent Superior Vena Cava (SVC) thrombosis in small babies. The situation with temporary CVCs is less clear. Certainly, it is easier to adjust the position of the catheter once it is in. The main concern centres on the left-sided IJV catheters. Their course tends to bring the tip up against the wall of the SVC, unless the catheter is passed into the atrium, increasing the risk of vessel wall erosion.

The following recommendations are made:

- All catheters in the SVC distribution should have their position screened by fluoroscopy at the time of insertion or by chest x-ray as soon as practicable after the procedure, preferably before the patient leaves theatre (excluding patients being admitted directly to PICU)
- For temporary CVCs the tip of the catheter should sit outside the atrium, unless clinically indicated (e.g. Vascath) or it is entering the SVC from the left side, in which case it should sit in the high atrium, to

avoid impinging on the wall of the SVC (Fletcher 2000). Ideally left-sided CVC's should be screened on insertion to avoid this. Appendix 11 gives a guide to insertion length for temporary CVCs and PICCs

- Tunnelled CVC's should be sited in the high right atrium or SVC/RA junction
- It is the responsibility of the operator to confirm the correct position of the catheter prior to its use and inform the relevant staff
- The catheter should not be used if there is no free flow of blood on aspiration, until the correct position has been ascertained Femoral CVCs should be sited with the tip below the level of the renal veins (Shinohara 2005).
- Neonatal PICC lines should never be left coiled in the atrium or impinging on the wall of the atrium (Cartwright 2004)

6.3.6.4 Tunnelling of catheter

There is limited evidence to suggest that tunnelling of CVCs at the time of insertion can reduce the incidence of CRBSI.

The evidence is strongest in long-term (>30 days) silastic CVCs. All long-term CVCs should be tunnelled at the time of insertion.

There is some evidence to suggest that tunnelling temporary internal jugular CVCs reduces the incidence of CRBSI (Timsit 1996). However, this does not apply to other insertion sites and is not strong enough to justify recommending that all temporary CVCs are tunnelled (Randolph 1998). It should be left to the discretion of the operator.

6.3.6.5 Damage to the CVC

The likeliest damage to a CVC is cracking of one of its lumens or the catheter itself. This will usually necessitate removal or replacement of the catheter. However, temporary repair can be undertaken.

6.3.6.6 CVC Replacement

This depends on the type of catheter and the general condition of the patient however CVC's should not be replaced routinely (Cook 1997, HII, 2007, Pratt et al 2007). Catheters are generally replaced if they are malfunctioning, damaged, infected, occluded or associated with venous thrombosis.

In the case of temporary CVCs, it may be possible to undertake guidewire exchange of the existing catheter. Mechanical complications have been shown to be less if a CVC is replaced by guidewire exchange rather than placed at a new site (Cook 1997). Guidewire exchange is not recommended in the presence of CRS or if there is evidence of skin infection at the site of insertion (Michel 1988, Snyder 1988).

If there is evidence of CRBSI, the CVC should be removed as soon as possible. Ideally, the CVC should not be replaced until the CRBSI has been

treated. The risks of infection and blockage increase greatly in temporary CVCs after 2 weeks, therefore, consideration should be given to replacing them after this time. However this is a consideration that will need to be made on the child's clinical condition and the need for the CVC to remain in situ.

If CVA is still required after 2 weeks, there must be a discussion with the VAS, so that an appropriate catheter-type can be selected and the dangers of repeated temporary lines can be avoided.

Replacement of tunnelled CVC will require a surgical procedure under anaesthesia, and should only be undertaken if the catheter is infected, blocked or damaged. Discuss with the VAS.

Hickman lines that split can be repaired using a standard repair kit so that they may still be used. However, they should then be referred for semi-elective replacement by the VAS.

6.3.6.7 Information/Details required

The insertion of CVC should be documented in the patients' notes or the anaesthetic chart, either by completing and the CVC Data collection form is completed or writing a separate operative note (Appendix 9 and P drive Vascular Access folder). The form collects relevant information about insertion, usage and complications associated with CVC. Anaesthetists and Intensivists' should enter details of the insertion into the CVC database on the internet. Once completed the form is filed in the patients notes. In order to determine CRBSI rates, it is really important that the date that the CVC removal date is documented so that accurate infection rates per 1000 line days can be calculated. This needs to be documented on the CVC standard form and a copy returned to Dr Oliver Bagshaw, in the department of Anaesthesia.

6.3.6.8 Audit

There is a requirement for NHS organisations to audit key policies (DoH 2006) so that effective prevention and control of HCAI is embedded into everyday practice and applied consistently by everyone. The DoH High Impact Interventions allow individual areas to monitor compliance in practice. The CVC HII will be used throughout the Trust to allow Directorates to assure themselves that safe reliable care is being delivered each time the clinical procedure is undertaken and that this is consistent with agreed Trust standards/ Policy (see Appendix 12). Further information can be found on the P drive Infection Control folder.

6.4

Peripheral Venous Cannula (PVC)

6.4.1 Training

Only staff that have been appropriately trained and deemed competent or under direct supervision of competent staff should:

i) insert PVC
ii) access the PVC
iii) remove the PVC

All qualified staff are responsible for the overall maintenance of the PVC.

6.4.2 Principles of PVC Insertion

The insertion of PVC should be done using the appropriate ANTT technique. Gloves can be non-sterile for this procedure. The actions below are an integral part of preventing infections and are key components of the DoH (2007) High Impact Interventions (HII): (see Appendix 12)

- Hand hygiene
- Personal protective equipment
- Skin preparation
- If the skin is visibly soiled, the area needs to be washed with soap and water
- Skin must be cleaned using 0.5%CHG/70%IPA using repeated up and down, back and forth strokes
- This should be allowed to dry (approximately 30 seconds).
- Dressing
- Use a sterile, semi-permeable, transparent dressing to allow observation of insertion site
- Documentation
- Date of insertion should be recorded in patient health records.

6.4.3 Ongoing PVC care actions

The actions below should be adhered to in order to prevent PVC related infections (DoH, 2007 HII) and the general principles of ANTT must be followed (see Appendix 10)

Hand hygiene

- Hands must be decontaminated immediately before accessing the device and during the procedure if there is contamination of the key parts

Continuing clinical indication

- Ensure that the PVC is still indicated. If there is no continued clinical indication, the cannula should be removed.

Site inspection

- See next section (6.4.4)
- If there are any signs of infection, the PVC should be removed (wherever possible). If it cannot be removed, the reason should be

clearly documented in the patient's notes and the frequency of observation increased.

Dressing

- An intact, sterile, dry, adherent transparent dressing should be present
- If it is soiled or loose it should be replaced

Cannula access

- Prior to accessing the PVC, disinfect the hub (either the top hub, cannula device hub or the extension piece with 2%CHG/70%IPA and allow to dry)
- Where a needle-free device is not used, the PVC hub cap must be replaced with a sterile cap

Administration set replacement

- As identified in General Principles (6.1)

Cannula removal / Routine cannula replacement

- Cannula should be removed as soon as they are no longer needed.
- Ideally they should be removed after 72 hours or earlier if clinically indicated. In the paediatric population cannula may be left in for longer if there are no complications suspected (i.e.: phlebitis, extravasation or line related infection) as the risk of phlebitis does not increase with the duration of catheterisation (Garland et al 1987; Garland et al 1992; Centres for Disease Control and Prevention 2002). Where there are venous access difficulties in children, cannula may remain in situ for longer than 72 hours. The reasons why must be clearly documented in the patients health records. Strict ANTT must be adhered to.

  The Standards for the care of the PVC must be used by all staff caring for a child with a PVC in situ (see Appendix 2).

6.4.4 Site Inspection

Whilst the PVC is in situ the site must be inspected at all times and throughout any procedures. The site must be observed for infusion related complications: redness, swelling, maceration, leaking fluid or pain. The Trust Extravasation Policy (2005) must be followed.

- The PVC must be inspected prior to each use and the Extravasation score documented on the appropriate form. This should be at least hourly when in constant use, when accessed and daily when not in use.
- Where used the splint and bandage must be removed to allow full site inspection (Extravasation Policy 2005).

Monitoring of patient's vital signs in line with the Observation & Monitoring Policy (2007) and The Medicine Policy (2008) that is drug specific must be undertaken. See BCH guidelines for administration of intravenous drugs protocols that are held locally in all clinical settings.

6.4.5 Syringe Use

10 ml syringes should be used to access the PVC, however an exception to this is that a 2ml syringe should be used when taking blood samples (as this reduces the vacuum created when withdrawing from the cannula).

Once patency has been confirmed a smaller syringe can be used, this should be the exception rather than the normal practice. For example if there are micro-doses or the transfer of cytotoxic medication puts the user at risk.

Syringes specifically for intravenous use must be used at all times. Luer-lok syringes must be used where the medication is not to be 'bolused'. Where there are needle-free devices the user must follow the manufacturer's instructions, e.g. turn 15 degrees to 'lock' the syringes securely onto the needle-free device.

6.4.6 Flushes

PVC's must be flushed with the prescribed Normal Saline (0.9%) in between intravenous medication, infusions and to 'lock' the device at the end of a procedure.

Heparin will not be used a cannula, except in exceptional circumstances as agreed by local protocol.

The volume of flush may vary from a minimum of 1mls to 3mls dependant on the size of the child, size of the cannula inserted and according to the drug being administered.

The PVC should be clamped as the last ml is being instilled.

6.4.7 Splints

The PVC should be supported with a splint where possible. When using splints ensure that the correct size and shape has been selected and secure with the Velcro attachments and straps supplied or a minimal amount of non-elastic tape e.g. 3M Transpore adhesive tape. The Foam padding and straps must not be re-used.

The splint must be removed twice a day and the circulation and skin must be assessed as per Extravasation Policy (2005) (Nicol 1999; Weinstein 2000).

Reusable splints and immobilisation devices should be washed with soap and water and then disinfected with 70% Isopropyl alcohol impregnated wipes for medical devices (Nicol 1999).

6.5

Peripherally Inserted Central Catheters (PICC)

Peripherally Inserted Central Catheters (PICC) are a form of 'temporary' CVC and the considerations for the catheter must be adopted as in the section on CVC's.

6.5.1 Training

Only staff that have been appropriately trained and deemed competent or under direct supervision of competent staff should:

i) insert PICC
ii) access the PICC
iii) remove the PICC

6.5.2 Skin Preparation

The skin should be decontaminated using 2% CHG/70% IPA solution (Pratt et al 2007) using repeated movements ie: that is up and down, back and forth strokes and the skin must be allowed to dry. In children under 1000 grams and those less than 30 weeks gestation, extra care needs to be taken in the cleaning technique of the skin with either 2% chlorhexidine or povidone iodine. Careful observation of skin irritation needs to be reported, treated accordingly and documented.

6.5.3 Insertion

Short-term PVC/polyethylene catheters are generally used for access of less than 3 weeks duration. Aseptic technique and maximum barrier precautions need to be used for the insertion of a PICC. A PICC generally do not need stitching and can be fixed with a dressing, and/or the fixation device when available.

6.5.4 Access

10 ml syringes should be used for central lines when flushing a line or checking patency; because they exert less pressure and therefore cause less damage.

Once patency has been confirmed a smaller syringe can be used, this should be the exception rather than the normal practice. For example if there are micro-doses or the transfer of cytotoxic medication puts the user at risk.

The key to accessing any PICC should be to use the ANTT (see Appendix 4). The technique may vary depending on the type of device being accessed and the reason for it, but the following description provides some general guidelines:

Handwashing should be undertaken before all access procedures and include the use of alcohol gel to disinfect the skin. Sterile or non-sterile gloves should be worn, depending on the procedure to be undertaken

6.5.5 Cleaning Access Site

Catheter access

- Use an aseptic non touch technique prior to accessing the PICC
- Disinfect the hub with 2%CHG/70%IPA and allow to dry
- Where a needle-free device is not used, the PICC hub cap must be replaced with a sterile cap

Hand hygiene is an integral part of the ANTT (Appendix 4). ANTT must be used each time a PICC is accessed. Sterile or non-sterile gloves should be worn, depending on the procedure to be undertaken (for example, sterile gloves are required for PN).

6.5.6 Flushes

Following insertion it will be necessary to flush the catheter lumen(s) to prevent occlusion prior to usage. If the catheter is to be used immediately, then flushing the lumen(s) with 0.9% normal saline is satisfactory.

If the PICC is not to be used for more then 12 hours then a one ml Heparin flush (100 units per ml) should be instilled if a lumen is not going to be used or when the PICC is not in use (NPSA/2008/RRR002) or if there is a clinical need to vary this dose then a local PGD needs to be agreed and prescribed.

It should be flushed with a positive pressure and the PICC clamped as the last ml is being instilled.

The volume of flush may vary from a minimum of 2mls to 4mls dependant on the size of the child, size of the cannula inserted and according to the speciality and should be administered as prescribed on the prescription sheet or local Patient Group Directive.

If any therapies (drugs, fluids and bloods) are administered through the catheter at the time of insertion, 0.9% normal saline should be used to flush the catheter in between them to prevent precipitation and occlusion caused by them coming into contact with each other. (Harris 1999).

6.5.7 Dressings

PICC should be dressed with a sterile, adherent, semi-permeable and transparent dressing. This will allow regular inspection of the insertion site. The catheter must remain dressed for the duration of its insertion.

The dressing on a PICC line should be replaced at least every week and more frequently if it becomes loose, soiled or clearer entry site inspection is required. 0.5% CHG/70% IPA should be used to clean around the site when changing the dressing.

6.5.8 Site inspection

Whilst the PICC is in situ the site must be inspected at all times and throughout any procedures. The site must be observed for infusion related complications: redness, swelling, maceration, leaking fluid or pain. The Trust Extravasation Policy (2005) must be followed.

The PICC must be inspected prior to each use and the Extravasation score documented on the appropriate form. This should be at least hourly when in constant use, when accessed and daily when not in use. Where used the splint and bandage must be removed to allow full site inspection (Extravasation Policy 2005).

Monitoring of patient's vital signs in line with the Observation Policy (2007) and Medicine Policy (2008) that is drug specific must be undertaken. See BCH guidelines for administration of intravenous drugs protocols that are held locally in all clinical settings.

6.5.9 Removal of PICC - PICC's can be removed by nursing staff on the ward using strict ANTT using sterile gloves. The removal should be documented in the patient's notes.

6.6 Implanted Ports – (CVAD)

WRITTEN BY: RESPIRATORY/CYSTIC FIBROSIS NURSING TEAM.

GUIDELINES FOR THE SAFE USE AND MAINTENANCE OF AN IMPLANTED PORT (CENTRAL VENOUS ACCESS DEVICE (CVAD).

The purpose of this guideline is to prepare nurses for the safe handling, maintenance and safe administration of intravenous medications/infusions via an Implanted Ports.

WHAT IS A PORT?

A Port is an access device, which is completely implanted and attached to an indwelling catheter to ensure reliable vascular access for repeated drug administration, used in patients with poor venous access who need regular treatment.

- The Port is placed beneath the skin, in an appropriate position for optimum vascular access. This procedure is carried out under general anaesthetic in children.
- The Port consists of a silicone catheter, which is attached to a titanium portal with a self-sealing septum.
- In theatre the Port is inserted subcutaneously. The proximal end of the catheter is tunnelled subcutaneously and connected to the Port. The distal end of the catheter is introduced into a central vein.
- The Port has a raised centre or septum, which is made from a self-sealing rubber material, this is where the needle is inserted for delivery of medication.

The medication is carried from the Port into the blood stream via the catheter.

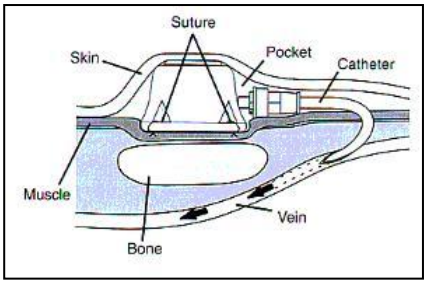
PORT ACCESS

- When in use a Huber (non-coring) needle is used to penetrate the septum and intravenous drugs can be administered along the line attached to the needle.
- Generally only a 22g non-coring needle should be used, but for PN or Blood a 20g may be used.
- When not in use a Port must be flushed every 4-5weeks with heparinised saline (100 iu/ml) by inserting the needle using aseptic non-touch technique with sterile gloves.

PREPARATION FOR OPERATION

- By implanting a Port in a child's/young person's body, their body is altered; the child/young person may become very self conscious.
- It has a psychological impact, they may regard themselves different from their friends; this is especially relevant for teenagers.

- They have a scar and a lump from the Port that their friends haven't got.
- It is a permanent reminder of their illness and the need for treatment.



In order to reduce any emotional and psychological effects, it is very important that Children/young people and their parents/carers are well prepared by doctors, nurses and play therapists, prior to the Port being implanted, .

- Use of puppets, literature and videos can aid in this depending on age and understanding of the child.
- The child/young person may want to meet or talk to another child/young person who has a port.
- The child/young person should be given time to think and talk about having a Port and express any anxieties they may have.

PREPARATION FOR PROCEDURE TO ACCESS PORT

Refer to Policy for the Insertion, Administration, Maintenance and Removal of Intravenous Cannula/Catheters (2008) and the Aseptic Technique and Aseptic Non-Touch Technique (2008).

INSERTION OF A PORT NEEDLE - Equipment

Local anaesthetic cream

Non-sterile gloves

Sterile gloves

Sterile dressing towel

Dressings pack

Syringes 10mls x 2

Filter needle for glass vials + ordinary needle

0.9% Saline chloride 10mls

6mls Heparinised saline 100iu per ml (hep/sal)

Port needle (22 g needle)

2% Chlorhexidine Gluconate & 70% IPA

A transparent , semi-permeable and sterile dressing

Gauze swabs

Procedure

1. Ensure correct patient
2. Explain procedure relative the child's age and cognitive development - involving parent/carer
3. Wash hands and dry thoroughly.
4. Check site access and locate the portal septum by palpation.
5. Apply prescribed local anaesthetic cream as per instructions (if required)
6. Wash and dry hands and put on non sterile gloves
7. Prepare trolley/tray with equipment prior to commencing procedure, as per aseptic non- touch technique
8. Put on sterile gloves
9. Draw up 10mls of Sodium Chloride and prime port needle - close the clamp - leave syringe attached.
10. Draw up 6mls of hep/sal.
11. Clean the area around the port with 2% CHG 70% IPA. Use a circular action, begin with the centre of the port moving outwards, not going over the same area twice with the same swab: discard swab. Repeat this cleaning method three to four times and allow the skin to dry.
12. Relocate the Portal septum by palpation
13. Locate the edges of the Port and hold firmly between the finger and thumb, pressing down gently.
14. Hold the port needle firmly and push it straight at right angles to the skin through the skin into the port septum, until it reaches the bottom of the portal chamber, avoiding any previous injection scars.
15. **Do not use excessive pressure** as this may damage the needle tip
16. Release clamp and aspirate to achieve bleed- back into the tubing (if this does not occur refer to trouble shooting guidelines on page)
17. Secure clamp and discard this syringe
18. Attach the syringe containing 6mls hep/sal. Release clamp.
19. Flush the system applying positive pressure when inserting last 1ml of hep/sal to prevent reflux up the internal catheter.
20. Cushion butterfly/pad with sterile gauze if needed and apply sterile transparent dressing over site.

INSERTION OF A PORT NEEDLE FOR PRESCRIBED MEDICATION E.G IV ANTIBIOTICS.

Follow procedure for insertion of port needle numbers **1-20 :**

- Give prescribed medication as directed.

When medication is completed :

- Flush the line with 5-6mls of haparinised saline and if the line is to remain in situ apply a non-inject able bung.

INSERTION OF NEEDLE FOR ROUTINE FLUSHING TO MAINTAIN PATENCY:

Follow procedure for insertion of port needle numbers **1-19:**

- Hold port firmly and remove needle.

REMOVAL OF A PORT NEEDLE - Equipment

Syringe 10mls

needle

6mls Heparinised of 100iu per ml (hep/sal)

Gauze swabs

Small plaster

Gloves

Procedure

- Wash and dry hands
- Loosen dressing
- Apply Gloves
- Remove dressing
- Inject 5-6mls hep/sal keeping a positive pressure on the syringe
- As you approach the 6th ml, clamp off the tubing whilst maintaining positive pressure - remove the port needle holding the Port firmly with one hand and removing the needle with the other.
- Wipe the Port site with the gauze or remove any Hep/sal exudates
- Apply plaster as required

If the entry site appears red/inflamed

- Swab for culture and sensitivity
- Take peripheral blood culture if the patient is pyrexia +/- line culture to exclude sepsis from Port

ACCESSING A PORT FOR THE WITHDRAWAL OF BLOOD

Extra equipment

10ml syringes x 2.

10mls Saline

Procedure

- Follow procedure for insertion of port needle **1-15**
- Release clamp and withdraw 2-3mls of blood. Clamp
- Remove syringe and attach empty syringe and remove amount of blood required
- Clamp line and remove syringe
- Attach syringe containing 10mls of saline and flush line - clamp
- Attach syringe containing 5-6mls hep/sal. Flush using positive pressure
- Complete all the patient's details on the blood bottles and forms.

Remove the Port needle or leave in situ following guidelines as previously described.

PROBLEMS

INFECTION OF PORT SITE:

Port site and skin necrosis may be caused by:

Extravasations of fluid or drugs, leading to breakdown of the skin over the Port

Not changing the needles every 7 days (Note the policy at Birmingham Children's Hospital Respiratory and CF Dept is that the needle may be left for up to 2 weeks to cover the period of antibiotic therapy, if no sign of Port infection is observed. Please refer to individual Department protocol to address this issue)

Bacterial infection

Prevention

- Always use strict aseptic technique when accessing Ports
    - Clean the port site thoroughly using 2% CHG in 70% IPA
- Use port needle once only
- Check dressing is secure and needle sitting flush to skin
- Do not use Port if any signs of redness, swelling or lesions - to prevent tracking of infection into the blood stream
- Change port needles according to departmental protocol

Treatment

- Swab for culture and sensitivity
- Take peripheral blood culture if the patient is pyrexia (+/- line culture to exclude sepsis)
- Treat infection with appropriate antibiotics or anti fungal treatments - antibiotics given peripherally
- Remove implanted port

INFECTION OF PORT LINE

Research has shown that most common infection found is Staph Epidermis.

A fibrin sheath at the end of the catheter can harbour infection by sequestering the organism. Infection can then be pushed into the circulation on flushing the system. That may present as a raised temperature and general 'unwell' feeling in the days following Port access

Prevention

Refer to Port Site infection

- Do not access port if there are signs of local infection.

Treatment

Refer to Port Site Infection

MOBILE/HIDDEN/TILTED PORT

Sometimes the Port may become mobile leading to difficulty in locating the septum.

Mobile Port:

- Palpate thoroughly for the Port before attempting to access
- Previous scars may not be an indication of the Port location
- Once identified, hold with 2 or 3 fingers (and don't let go until you are in!)

Hidden Port:

- Try putting the child in a new position

  -Leaning back with hands holding behind back

  - Sitting with chest out

  - Lying down with arm hanging over bed edge

Tilted Port:

Occasionally the Port feels like it has 'tilted'

- Re-position as for hidden port
- Ask the child to move around, swing arms, twist from side to side etc.

NO 'BLEED BACK' ON ACCESSING A PORT

1. If the implanted port is new, or usually bleeds back without any problems

- Check that the needle is correctly positioned in the Port chamber and not

  lodged in the septum of the Port

- Attempt to re-insert a new needle

2. If the implanted port is older or usually presents problems with bleeding back, and you are sure you are in the correct place:

- Attempt to gently flush the system with the sodium chloride
- Insert a new needle and try again.
- **If you are at all in doubt ask for a medical opinion**

If problem persists then this could indicate that:

- Blocked Port - see below
- Growth of fibrin sheath in or around the distal end of the catheter
- The port may require X-Ray, Radio-Opaque dye investigation or surgical intervention

BLOCKED PORTS

If unusually high resistance is encountered whilst infusing fluid through the port system, this may indicate that the catheter is blocked.

Possible causes of apparent catheter blockage are:

- Incorrectly positioned port needle (the distal end of the needle may be sitting in the port septum)
- 'Fish hooked' needle within the port
- Tubing is clamped/kinked or kinked under the dressing
- Kinking of the catheter (internally)
- Lodging of the distal end of the catheter against the wall of the blood vessel
- Occlusion by an intraluminal thrombus
- Growth of fibrin sheath around the distal end of the catheter
- Migration of the internal catheter - child may have outgrown the catheter therefore the position may have changed and the tube may migrate upwards

INCORRECT POSITION OF THE PORT NEEDLE

The needle could be lodged in the septum of the port.

Treatment

Apply firm pressure on the needle to free it from the port septum (do not press too hard, or this may cause the needle to 'fish hook' on the base of the port), then check again for patency of the port

'FISH HOOKED' NEEDLE WITHIN THE PORT

If the port needle is pushed too firmly into the port, there is a danger that the point of the needle will bend over where it has hit the base of the port. This hook may then block the needle and restrict the flow of fluid.

Unfortunately there is no treatment for this and the needle will need removing (though you will only see the 'fish hook' once the needle has been removed).

Removing this needle can be very uncomfortable and likely to cause damage to the port septum.

EXTERNAL TUBE KINKED UNDER THE DRESSING

It is worth a quick check to make sure the external tubing isn't kinked.

KINKING OF THE CATHETER (INTERNALLY)

- Ask the patient to change position and/or move upper body and arms. Such movements can free the catheter enough to dislodge its end from the vessel wall or straighten up the kinks.
- If it becomes necessary for the child to do this every time the port is accessed this should be investigated.
- Severe kinks from too much or too little catheter slack, or rotation of an inadequately anchored portal, may require surgical correction.

LODGING OF THE DISTAL END OF THE CATHETER AGAINST THE WALL OF THE BLOOD VESSEL OR THE RIGHT ATRIAL WALL

- Gentle irrigation and aspiration with sodium chloride may dislodge the end of the catheter from the vessel wall.

OCCLUSION BY AN INTRALUMINAL THROMBUS OF GROWTH OF FIBRIN

Solution to this should be undertaken under medical supervision, as there is a great risk of pushing the obstruction into the blood system.

- Gentle, alternating irrigation and aspiration with heparinised saline (100iu/ml) may clear the obstruction.
- Fibrinolytic agents may be used, under medical direction, as per the local/departmental protocol.

WORN OUT SEPTUM

Ports should last for approximately 2000 punctures before the septum is worn out, but it is impossible to keep accurate records of how many times it has been used.

- Patients will complain of pain over the port site.
- The site may be red and swollen due to fluid leaking into the tissues (extravasation)
- When inserting the needle into the septum, it won't feel very tight around the needle, it will feel “wobbly”

Treatment

Removal of port.

EXTRAVASATION

This is when fluid from the port leaks into the surrounding tissue

Causes:

- Needle dislodgement - most frequents cause of extravasation
- Needle not fully through the septum
- Inadequate needle stabilisation
- Blockage
- Catheter tip displacement
- Worn out septum
- Separation of port and catheter.

Prevention

- Appropriately trained staff should carry out port access
- Verify placement of needle with blood withdrawal (bleed-back) before administration of medication
- Watch for signs of burning, swelling or pain during infusion and administration of drugs as per local departmental protocols

6.7

Parenteral Nutrition (PN)

Refer to the BCH NHS Trust PN Protocol

6.8

The insertion, maintenance, blood sampling and removal of Arterial Lines

Refer to BCH PICU Guideline

6.9

Arteriovenous Fistulae (AVF)

HAEMODIALYSIS CATHETERS (TEMPORARY AND PERMANENT)

Arteriovenous fistulae (AVF) and haemodialysis catheters (Haemocaths/Vascaths)

6.9.1 Insertion

Only staff that have been appropriately trained and deemed competent or under direct supervision of competent staff should:

i) fashion AVF, insert haemodialysis catheters.

ii) access the AVF and haemodialysis catheters.

iii) remove the haemodialysis catheters.

The construction of an AVF and the insertion of a haemodialysis catheter are considered medical procedures and can be long-term or temporary. Appendix 13 provides information regarding the Haemocaths/Vascaths, such as patient weight and suggested catheter size.

When removing the guide wire from the catheter, or removing the needle from the fistula, techniques should be employed to reduce the potential for bleeding and to promote haemostasis.

Haemodynamic monitoring and venepuncture should not be performed on the extremity containing an AVF except in an emergency where no other alternative is possible.

Radiographic confirmation should be obtained before initiation of therapy for newly inserted haemodialysis catheters, refer to the Renal Team's Policy.

6.9.2 Skin Preparation

Skin should be prepared with 2%CHG/70% IPA using repeated up and down, back and forth strokes and left to dry.

6.9.3 Administration

Aseptic non-touch technique, should be used for all procedures relating to haemodialysis access devices.

Heparin flush 1000 units per ml should be prescribed and instilled if an AVF is to be 'locked', this needs to be with the appropriate volume of heparin required to occupy the catheter lumen space (NPSA/2008/RRR002). It should be flushed with a positive pressure and the AVF clamped as the fluid is being instilled. If a stronger dose of heparin is required it must be prescribed and reasons noted in the patients health records.

6.9.4 Maintenance

Practitioners should undergo Trust education and be deemed competent to care for and maintain an AVF or haemodialysis catheter

Administration of medicines and/or solutions through an AVF or haemodialysis catheter will be in accordance with a valid prescription or Patient Group Directive

AVF and haemodialysis catheters should not be used for routine administration of parenteral medication and/or solutions (Intravenous Nursing Society 2000)

6.9.5 Removal of Haemodialysis Catheters.

There is no optimal time interval for removal of a haemodialysis catheter as this depends on the type of catheter used.

Permanent haemodialysis catheters (Haemocaths) should only be removed under a GA.

Temporary haemodialysis catheters (Vascaths) can be removed on the ward using strict aseptic technique.

The process of providing information and consent should be the same for CVC removal as for insertion, in accordance with section 6.1.

6.10

Intraosseous Access (IO)

Indications: I.O access shall be initiated by a trained practitioner with the experience, knowledge and skills to undertake this procedure in accordance with profession specific regulations (refer to current APLS guidelines).

Intraosseous (I.O) access shall be obtained for emergency or short-term treatment when access by the vascular route cannot be achieved and the patient's condition is considered life threatening.

Aseptic Non-Touch Technique must be used and standard precautions observed when gaining I.O access, although it is appreciated it is an emergency situation this may not be achievable, however all precautions need to be maintained as far as possible.

Consideration should be given to using the I.O route for infusion in children 6 years and younger.

6.10.1 Insertion

I.O access should not be attempted on sites where I.O access has previously been attempted or if there are fractured tibia and femur on the same side or pelvic fractures, which means that neither lower limb can be used.

The preferred sites for paediatric I.O access should be, where possible, proximal tibia and distal femur. The growth plate in children's bones should be avoided.

Conventional venous access should be established as soon as the patient's condition has stabilised.

6.10.2 Procedure

- Identify the insertion site: Tibial: anterior surface, 2-3cm, below tibial tuberosity or Femoral: anterolateral surface; 3cm above lateral condyle.
- Clean site with 2%CHG/70%IPA or Povidone Iodine and insert the needle at 90 degrees to the skin. Continue to advance the needle until a 'give' is felt as the cortex is penetrated. Ideally the skin cleaning agent (in sachets) should be available on the resuscitation trolley.
- Prior to infusion, access device placement should be confirmed by aspiration of bone-marrow using a 5ml syringe followed immediately by a flush of 0.9% Sodium Chloride using a separate syringe. There may be occasions where bone-marrow cannot be aspirated even if the IO is in the correct place.
- Attach the filled 50ml syringe and push in the infusion fluid in boluses (Resuscitation Council 2006).

6.10.3 Securing the IO catheter

Secure the catheter with a sterile dressing, using gauze and tape to provide the extra security.

6.10.4 Maintenance

The practitioner caring for the device must have knowledge of the principles involved in paediatric fluid resuscitation; anatomy and physiology of the I.O route; potential complications; patient/family education and must be educated and competent in I.O access.

6.10.5 Removal of IO Access

IO access device placement is a temporary, emergency procedure. The device should be removed as soon as possible preferably within 24 hours. The clinician needs to keep in mind the risk of infection and address this if required.

If resistance is encountered when the Intraosseous catheter is being removed, stop the procedure and notify a Doctor. Apply a sterile occlusive dressing to the access site after removal and ensure the safe disposal of the access device into a sharps box.

After removal, change the site dressing every 24hours until no leakage is observed and the site has epithelialised.

6.11

Preparation for Discharge for Infant/Child/Young Person with a Cannula/ Catheter in situ

In preparing the child and family/carer for discharge refer to the specific Trust Discharge Documentation, as well as those provided by specialities such as the Nutritional Care Nursing Team and the Cystic Fibrosis Team

Training for parents, carer's and patients will be provided by the team caring for the child in hospital (Pratt et al 2007). Training should be planned, taught, assessed and documented accordingly in the health care records. Where training is given the appropriate documentation and information should be given.

Where a child from BCH is discharged into the community setting those staff caring for them (paediatric community nurses) are able to attend BCH Trust training days for intravenous therapy. They will be processed as external candidates as they are not directly employed by the Trust and they will need to adhere to their own locally agreed policies.

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Appendix 1: Standard for CVC care and management

Standard 1a - Care of a Patient with a Central Venous Catheter (CVC): Insertion and Removal

Name: **Hospital Number:** **Ward/dept:**

Preparation: Inform the child and family about the need for the procedure. Involve play specialists to prepare the child in non-urgent situations. CVC information leaflets should be given to the family.

Insertion of central lines:

- Ensure consent is obtained and the appropriate consent form is signed.
- The catheter tip must be verified by x-ray prior to use. Temporary femoral CVC's need not be x-rayed before use.
- Ensure High Impact Interventions are followed. Eg skin preparation, hand hygiene, aseptic technique etc.

CVC's should not be used at **any** time if there is no free flow of blood, until the correct position has been established.

Catheter site inspection and observations following insertion to ensure the prevention/early detection of complications:

- Monitor vital signs and temperature and document as per BCH policies. Monitor child for signs of complications. Tachycardia, hypotension, chest/ referred pain and dyspnoea may indicate thrombosis.
- Check the access site for redness, swelling, pain at exit site, or bleeding.

Complications: ***extravasation, infection, line damage, catheter blockage, haemorrhage, extravasation and air embolism. If extravasation occurs adhere to the policy with regards to the management of this injury****. Report any changes to medical staff immediately.*

No. of Central Line	Date of Insertion	Type of Line	Site of Insertion	Number of lumens	Reason for removal	Date of removal and signature
1						
2						
3						

Line types: Tunnelled lines: Cuffed long-term line. Temporary CVC's (anaesthetic): Non-tunnelled short term line. Peripherally Inserted Central Catheter (PICC): Line is inserted via a peripheral vein. Haemocath/Vascath: Line usually used only for haemodialysis. Haemocaths may only be accessed by staff that have been recognised as competent specifically in the use of haemocaths. For vascuports follow separate trust guidelines (2007).

Only staff that have undergone training and are deemed competent in the management of CVC's can access the lines, unless under the direct supervision of a competent staff member (IV policy 2008).

Dressings and securing the lines:

New tunnelled CVC's (up to 3 weeks post insertion): (see local protocols)

- Loop the line ('s' shaped) and use tape to take up the weight of heavy infusion lines. (see diagrams in Standard 2b as per CVC Guidelines 2006).
- The dressing may need replacing before 21 days if loose/soiled or the child becomes febrile. Please refer to BCH CVC guidelines (appendix 4) for detailed guidelines. When changing the dressing use the ANTT principles and clean the insertion site with 0.5% CHG in 70% IPA
- Following 21 days, the dressing should be changed to a transparent semi-permeable dressing and changed weekly unless soiled, infected or loose, in which case it must be changed promptly.

All other CVC's:

- Lines should be dressed with a transparent semi-permeable dressing and changed weekly unless soiled or loose, in which case it must be changed promptly.
- When changing the dressing use the ANTT principles and clean the insertion site with 0.5% Chlorhexidine gluconate in 70% Isopropyl Alcohol.
- Use a gauze dressing if the site is oozing/ bleeding and the site must be checked at least daily. Once the site is normal, replace with a semi-permeable transparent dressing.

(Any speciality variations to policy must be agreed with the Infection Control Team and Quality Assurance Group.)

Shared care with child/parent/carer:

- Ensure that the child/young person and family are made aware of the symptoms of CVC complications and commence an educational programme for the family to learn how to care for and if necessary use the central line whilst in hospital and at home.
- Advise the family that baths/showers are safe but they should avoid fully immersing the line.
- If the child/parent/carer is involved in the administration of fluids/medication it must be clearly negotiated and documented.
- Prior to discharge, ensure the child and family have a BCH Trust information leaflet, and ensure they are confident and understand all the information. Provide the child and family with a care pack containing plastic clamps and dressings in case the line falls out or is damaged. Also check that the family know who to contact if the child/young person develops a fever.

Removal of CVC's: Tunnelled lines will be removed under general anaesthetic.

Removal of non-tunnelled CVC's: Lines must only be removed by practitioners with appropriate experience. Refer to the CVC guidelines, appendix 8 for specific details.

- Use an ANTT technique for the procedure.
- Turn the child/young person onto their left side (where possible) and place them in the Trendelenberg (head down) position to avoid air embolism.
- Remove the catheter from the vein with a slow, smooth action and apply firm pressure to the site for 5 minutes (10 minutes for a child with clotting disorders). If resistance is felt during the removal, stop the procedure and seek medical advice.
- Cover the site with a mepore dressing for 24hours. Only send the line tip to microbiology if an infection is suspected.
- Record the child/young person's vital signs and monitor for indications of haemorrhage and air embolism. Observations should be charted as per Observation and Monitoring Policy (2008).

Summary of outcome: Once session of care/treatment is completed, record the outcome in the child/young person's health records. (e.g. CVC removed/ replaced, pt to be discharged)

Standard 1b - Care of a Patient with a Central Venous Catheter (CVC): Access and Management

Name: **Hospital Number:** **Ward/dept:**

Date of Insertion	Type of Line	Site of Insertion	Number of lumens

Only staff that have undergone training and are deemed competent in the management of CVC's can access the lines (IV policy 2006).

Line types: Tunnelled lines: Cuffed long-term line. Temporary CVC's (anaesthetic): Non-tunnelled short term line. Peripherally Inserted Central Catheter (PICC): Line is inserted via a peripheral vein. Haemocath/Vascath: Line usually used only for haemodialysis. Haemocaths may only be accessed by staff that have been recognised as competent specifically in the use of haemocaths. For vascuports follow separate trust guidelines (2007).

Dressings, site care and securing the lines:

General Principles:

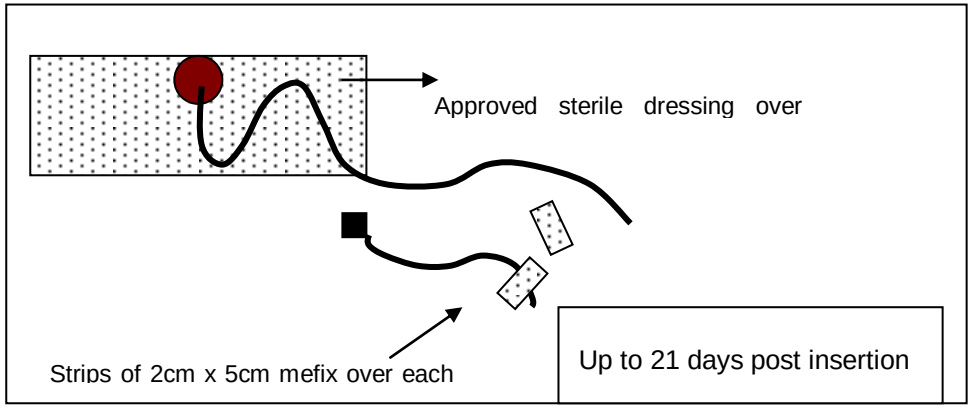
- Lines should be dressed with a transparent semi-permeable dressing and changed weekly unless soiled or loose, in which case they should be changed promptly.
- When changing the dressing use the ANTT principles and clean the insertion site with 0.5% Chlorhexidine gluconate in 70% Isopropyl Alcohol.
- Use a gauze dressing if the site is oozing/ bleeding and the site must be checked at least daily. Once the site is normal, replace with a semi-permeable transparent dressing.

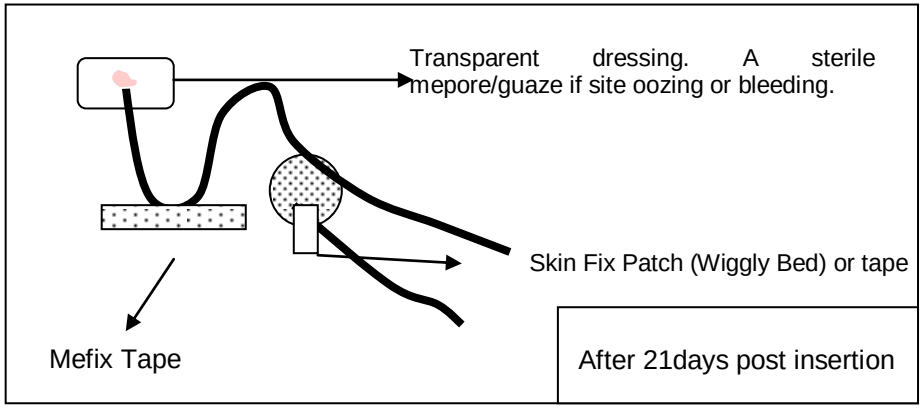
Tunnelled CVC's 21 days after insertion: (For newly inserted lines refer to Standard 2a and the diagram below.)

- Ensure the catheter is secure, looping ('s' shaped) tunnelled lines for additional safety.

- Use tape or skin-fix patches to take up the weight of heavy infusion lines and to ensure the ends clear are of nappies/stomas etc. The clamp must be positioned on the line as advocated by the manufacturer.
- 12 weeks post insertion, the exit site does not need to be dressed, however the catheter should be fixed to prevent accidental removal.

(Any speciality/regional variations to policy must be agreed with the Infection Control Team and Quality Assurance Group.)





Catheter site inspection and observations to ensure the prevention/early detection of complications:

- Monitor vital signs and temperature and document as per BCH policies. Monitor child for signs of complications. Tachycardia, hypotension, chest/ referred pain and dyspnoea may indicate thrombosis. Confusion/cyanosis hypotension or collapse may signify an air embolus.
- Check the access site for redness, swelling, pain at exit site, or bleeding.

***Complications:* extravasation, infection, line damage, catheter blockage, haemorrhage, extravasation and air embolism. If extravasation occurs adhere to the policy with regards to the management of this injury**. *Report any changes to medical staff immediately.*

Catheter Access and Hand Hygiene: Use the ANTT principles when accessing CVC's and follow the IV policy for specific procedure.

- Minimise the amount of times lines are accessed to prevent infection and cluster drug times and blood sampling where appropriate. Scrub the hub with 2% Chlorhexidine gluconate in 70% Isopropyl Alcohol, pre and post administration of fluids/medications. Clean heamocaths as per current haemodialysis protocol guidelines.
- Prior to administration of fluids and medication withdraw any heparin locks and establish patency and position by flushing with saline and ensuring the line bleeds back. To check patency, use only 10ml syringes as this reduces pressures in the line. Once patency is established smaller syringes may then be used only if necessary. Flush the line using pulsing positive pressure and clamp as the last ml is being instilled.

- Follow the IV and Medicines Policy (2008) regarding the administration of medications. Administer heparin as prescribed when lines are not in regular use. Care **MUST** be taken to ensure that excess heparin is not injected into the patient. Haemocaths should only be heplocked on PICU or the renal unit.
- For the management of blocked lines, refer to BCH CVC guidelines (section 5.2).

Care of administration lines: All lines must be labelled with date and time of change.

- Blood transfusion lines should be changed immediately following the administration of blood/blood products or after 2 Units of blood.
- Parenteral nutrition lines should be accessed and changed in accordance to the BCH Parenteral Nutrition Protocol (2007).
- With other fluids, lines must be changed 72 hourly, but need not be more frequent, unless clinically indicated or the line becomes disconnected.
- Replace bungs with a sterile bung each time the line is accessed. Where used, needle free devices must be replaced as per manufacturer recommendations and change documented on the regular care record. Remove needle free devices when administering Resuscitation Drugs.

Shared care with child/parent/carer:

- Ensure that the child/young person and family are made aware of the symptoms of CVC complications and commence an educational programme for the family to learn how to care for and if necessary use the central line whilst in hospital and at home.
- Advise the family that baths/showers are safe but they should avoid fully immersing the line.
- If the child/parent/carer is involved in the administration of fluids/medication it must be clearly negotiated and documented.
- Prior to discharge, ensure the child and family have a BCH Trust information leaflet, and ensure they are confident and understand all the information. Provide the child and family with a care pack containing plastic clamps and dressings in case the line falls out or is damaged. Also check that the family know who to contact if the child/young person develops a fever.

Summary of outcome: Once session of care/treatment is completed, record the outcome in the child/young person's health records. (e.g. CVC removed/ replaced, pt to be discharged)

Appendix 2: Standard 2 - Care of a Patient with a Peripheral Cannula

Name: **Hospital Number:**

Ward/dept:

Preparation: Inform child/family about the need for the procedure. Use distraction to prepare child/family and play in non-urgent situations

Insertion of cannula: Identify patient and ensure informed consent (verbal) is obtained prior to the procedure. Use topical anaesthetic agent whenever possible as prescribed. Aseptic Non-Touch Technique (ANTT) must be used when the cannula is inserted as per IV Policy (2008) i.e. hand hygiene, appropriate personal protective equipment. Clean skin using 0.5% Chlrohexidine Gluconate in 70% Isopropyl alcohol. There should be no more than 2 to 3 attempts at cannulation without a rest break or by the same technician. It is understood that in an emergency situation this may not always be achieved and document insertion as below.

Recording insertion and removal of cannula:

No of Cannulae	No of attempts	Consent for Cannul-ation	Cannula site	Cannula size	Date of insertion	Signature after each cannulation	Reason for removal	Date of removal
1								
2								
3								
4								
5								
6								

Dressings and splints: Secure the cannula with a sterile transparent semi-permeable dressing ensuring there is no direct pressure from the cannula device onto the skin. If necessary place sterile gauze beneath the cannula flanges (wings). Use tape or skin-fix patches to take up the weight of heavy infusion lines.

The use of a splint must be based on the assessment of need according to the age of the child and mobility of the limb. When using splints ensure the correct size and shape has been chosen. Secure with the Velcro attachments and straps supplied or use a minimal amount of non-elastic tape (IV Policy 2008). The splint must be removed at least twice a day in order to assess the patient's skin integrity, circulatory status

and an opportunity to exercise the joint. Ensure that it is documented in the Regular Care Record. Apply bandage for comfort and to ensure the cannula remains secure.

Observation: Ensure cannula is still clinically indicated. Observe for phlebitis and extravasation as per IV Policy (2008) & Extravasation Policy (2005) and record on the fluid balance chart or in the absence of one on the observation sheet Observation Policy (2008). If extravasation occurs adhere to the Policy with regards the management/treatment of this injury. If phlebitis is apparent discuss the management/treatment with the medical team. Ensure dressing is intact and dry. Change if required.

Accessing the cannula: When accessing the cannula follow the ANTT principles as per the IV Policy 2008 **(**hand hygiene, gloves, aseptic field, non-touch technique). Ensure that the dressing is intact, dry and adherent. Change administration sets as per IV Policy. Where possible, remove and replace cannula after 72 hours if cannula still needed, document in patient notes if left in situ longer than 72 hours.

Flushes - prior to administration of fluids/medication check patency with saline. Follow the IV Policy (2008) regarding the administration of medications and Hepsal as prescribed. If the cannula is not in use flush daily with 0.9% sodium chloride or Hepsal if prescribed.

Hub care –scrub the hub with 2% Chlorhexidine and 70% alcohol pre and post administration of fluids/medications ensuring that it is left to dry for at least 30 seconds.

Shared care with child/parent/carer: Ensure that the child/parent/carer is made aware of the symptoms of extravasation/phlebitis. Explain all procedures to those involved. If child/parent/carer is actively involved in the administration of fluids/medication then this must be clearly negotiated and documented as per the current policy.

If the child is going home with the cannula please ensure that the ''Going Home with a Cannula'' leaflet is given to parents, making sure that they understand the information using an Interpreter if necessary.

Removal of cannula: Cannula should be removed when no longer needed. Use a clean technique and apply pressure to site until bleeding stops (10 minutes for a child with clotting disorders). Use spot plaster for immunocompromised patients and advise them to remove the plaster within 24hours. If cannula is needed for more than 72 hours, is patent then it needs to be documented.

Repeated cannulation: ensure that sites are rotated checking the child's preference.

Summary of outcome: once session of care/treatment is completed the outcome e.g. IV medication/fluids completed, cannula removed/ replaced, CVC inserted, pt to be discharged must be documented in the patients health care records.

Date and Signature:

This standard is evidence-based and for references see the main PVC section (6.4) of the IV Policy (2008).

Appendix 3: Gaining Consent for Central Venous Catheter Insertion

The clinician requesting the CVC insertion must engage in discussions with the Clinician undertaking the procedure, identifying the need for the line in the context of the child's condition, diagnosis and prognosis and any other relevant details.

The two 'experts' (the referring Clinician and the Operator) should discuss the case, recording this discussion in the patient's record, and then take a shared approach to explaining the reason for the need to do the procedure to the parent and/or patient, the risks of doing that procedure, as well as the benefits and alternatives. This process must be noted within the patient's record.

The appropriate consent form is then completed by the Operator and ideally the referring Clinician who has shared in the discussion with the parent and patient (age appropriate).

Written or taped information must be available. The information should address:

- The general reasons why central venous line insertion is most often required
- The type of line to be inserted
- Overview of the insertion process
- The risks
- The benefits
- Alternatives (there may be none this should be stated)
- Care after the procedure

N B. **Verbal discussions with the parent/patient would identify the patient's specific risks and these would be recorded on the consent form.**

The added value of this approach is that the process clearly defines that the joint discussion takes place and is recorded and also provides an opportunity for Clinicians to explore options of type of venous access that may be most suitable for the specific circumstances.

Appendix 4 Key principles of Aseptic Non-Touch Technique

<table>
<tr><td>1</td><td>  </td><td colspan="2">Put on apron. Wash hands with soap & water.</td></tr>
<tr><td></td><td></td><td>Action
Put on apron
Wash hands using effective hand hygiene (see diagram) with soap and water
Dry hands completely with paper towel
Cover any cuts with waterproof dressing</td><td>Rational
Apron will be required where the patient is being isolated or if contamination of clothing with blood or body fluids is anticipated
Effective hand hygiene is vital to reduce the risk of contaminating key-parts/sites
Bacteria can re establish quickly on moist hands.</td></tr>
<tr><td colspan="4">Choose appropriate aseptic field i.e. tray or dressing trolley.
The size of the working field is determined by the complexity in the administration of intravenous medication and/or infusions.</td></tr>
<tr><td>2</td><td>  </td><td colspan="2">Clean aseptic field using 70% IPA and allow to dry. Dressing towel may be used (if desired).
Whilst drying, gather equipment, drugs etc.</td></tr>
<tr><td></td><td></td><td>Action
Trolley / Tray should be cleaned with soap and water on a daily basis and when visibly soiled
Disinfect tray or trolley with 70% IPA
Allow surface to dry before use
Open equipment onto working field</td><td>Rational
70% IPA only disinfects – it does not clean. Cleaning with soap and water will remove any dirt, dust or grime. Visible soiling is removed by washing with soap and water.
The disinfectant works through evaporation so surfaces MUST be allowed to dry.</td></tr>
<tr><td>3</td><td>  </td><td colspan="2">Apply alcohol rub to hands. Put on non sterile gloves.</td></tr>
<tr><td></td><td></td><td>Action
Apply alcohol rub to hands
Put on non-sterile gloves</td><td>Rational
Hands are disinfected prior to putting on gloves.
Non-sterile gloves and a non-touch technique maintain asepsis of key-parts/sites
Gloves protect operator contact with drugs</td></tr>
<tr><td>4</td><td>  </td><td colspan="2">Prepare drugs & equipment. Identify key parts (for example needle, tip of the syringe, tip of giving set, connections) & protect key-parts at all times using a non-touch-technique.</td></tr>
<tr><td></td><td></td><td>Action
Identify key-parts/sites and remove equipment from packaging carefully
Assemble equipment and arrange in an orderly manner in aseptic field
Ensure key-parts are not handled
Handle non key-parts with confidence</td><td>Rational
Prevents contamination of key-part/sites during removal from packaging
An orderly aseptic field decreases chance of contaminating key-parts.
Handling of key parts increases the risk of contamination
A non-touch technique protects key- parts/sites</td></tr>
<tr><td colspan="4">DO NOT PUT ANY OUTER PACKAGES OR VIALS IN THE CLEAN WORKING FIELD
IF ANY OF THE KEY PARTS ARE TOUCHED OR CONTAMINATED RESTART THE PROCEDURE</td></tr>
<tr><td>5</td><td>  </td><td colspan="2">Remove gloves and wash hands if contaminated</td></tr>
<tr><td></td><td></td><td>Action
Remove gloves
Wash hands using soap and water</td><td>Rational
Hands should be washed after removing gloves.
Handwashing will remove the latex proteins.</td></tr>
<tr><td>6</td><td>  </td><td colspan="2">Prepare the patient & gain free access to the IV line.</td></tr>
<tr><td></td><td></td><td>Action
Gain access to the IV line – remove bandages, clothing</td><td>Rational
Ensure IV site is accessible to avoid contamination via contact during procedure</td></tr>
<tr><td colspan="4">DISINFECT HANDS AND PUT ON CLEAN GLOVES</td></tr>
<tr><td>7</td><td>  </td><td colspan="2">Clean key-parts with 2% Chlorhexidine in 70% IPA wipe (2% CHG in 70% IPA).
WAIT FOR IT TO DRY. Administer drugs.</td></tr>
<tr><td></td><td></td><td>Action
Disinfect ports/injection sites with 2% CHG in 70% IPA before and after medication
Wait at least 30 seconds to dry
Administer infusion/medication using non-touch technique</td><td>Rational
Effective against some bacteria, fungal and viral organisms
Drying of any cleaning solution is vital for disinfection to be completed</td></tr>
<tr><td>8</td><td>  </td><td colspan="2">Remove gloves and apron. Wash hands soap & water.</td></tr>
<tr><td></td><td></td><td>Action
Dispose of equipment appropriately
Place sharps directly into sharps bin
Remove non-sterile gloves & apron
Wash hands using soap and water</td><td>Rationale
Safe disposal of sharps
Gloves must only be used for one procedure
Hands must be washed after glove removal as organisms thrive in the warm, moist environment beneath gloves. Hand washing will remove the latex proteins</td></tr>
</table>

Appendix 5: Practical Assessment Form for Aseptic Non-Touch Technique (ANTT)

Name: **Date:**

Unit: **Trainer:**

Preparation ○ Cleans tray with detergent ○ Disinfects tray with alcohol impregnated wipes ○ Allows alcohol to dry ○ Gathers equipment **Standard Precautions** ○ Apron ○ Hand wash using ANT technique ○ Alcogel applied to hands and allowed to dry ○ Correct Choice of Gloves ○ Eye Protection **Identification of key parts** ○ Can define a key part ○ Can identify all key parts to be used during procedure ○ Can apply this theory to practice ○ Can assess the risk of contaminating the key parts	**Performing Procedure** ○ Put on apron ○ Wash hands ○ Disinfect tray ○ Alcogel hands/Put on gloves ○ Assemble equipment, prepare drugs and label syringes ○ Go directly to patient and administer drugs If patient area requires preparing ○ Prepare patient i.e. pull back sheets ○ Remove gloves and alcogel hands ○ Put on new clean gloves ○ Perform procedure ○ Dispose of equipment safely ○ Remove gloves and apron ○ Clean tray ○ Wash hands
Procedure Demonstrated: Yes / No Notes / Comments: Suggested Update:	

Signed:
Practitioner

Signed:
Trainer

Date:

Central Venous Catheter Insertion Sheet*

(After completion file in patient record)

Patient Label

Date: | | | / | | | / | | |

Time: | | | : | | |

Referring Specialty:_____

Operator:_____ **Supervisor:**_____ **Emergency?** Y N

Location:

- ○ PICU
- ○ Theatres
- ○ A&E
- ○ Ward:_____
- ○ Other:_____

Indication:

- ○ Access
- ○ Monitoring
- ○ Inotropes
- ○ TPN
- ○ Sampling
- ○ Other drugs

Catheter type:

- ○ Single lumen
- ○ Multi-lumen (Lumens:___)

Multi – lumen justified ? Y N

- ○ Vascath
- ○ PICC
- ○ Temporary
- ○ Tunnelled long-term
- ○ Other (specify):_____

Make:_____ Size (FG):_____

Insertion Site:

- ○ IJV ○ Subclavian ○ Femoral
- ○ Axillary ○ Brachial ○ Cephalic
- ○ Other (specify):_____

Right ☐ Left ☐

Method of insertion:

- ○ Landmark
- ○ U/s to identify vein
- ○ U/s to access vein
- ○ U/s to check CVC position
- ○ Fluoroscopy screening

Duration (mins):
(From first needle
to CVC being secu

_____

No. needle sticks

_____

Guidewire exchange?

Y N

CVC length (cm

_____

Sites attempted:

- ○ IJV Right ☐ Left ☐
- ○ Subcl Right ☐ Left ☐
- ○ Femoral Right ☐ Left ☐
- ○ Other (specify):_____

Barrier precautions:

- ○ Mask ○ Sterile gloves
- ○ Hat ○ Sterile drapes
- ○ Sterile gown

Skin prep:

- ○ Chlorhexidine ○ Alcohol (incl swab)
- ○ Betadine ○ None
- ○ Other (specify):_____

Complications:

- ○ Arterial puncture ○ Pneumothorax
- ○ Haemothorax ○ Catheter malposition
- ○ Arrhythmia ○ Failure
- ○ Other (specify):_____

Method of securing:

- ○ Suture Type/size:_____
- ○ Dressing Type:_____
- ○ Other (specify):_____

Position check:

- ○ Fluoroscopy ○ CXR
- ○ U/s ○ None
- ○ Repositioned Final position:_____

Signature:_____ **Name:**_____**Date:**_____

* Any CVC inserted in Theatres or PICU should be entered directly into the CVC Database

Central Venous Catheter Maintenance Sheet
(Complete for each CVC episode and file in patient record)

Patient Label

Specialty:_____**Ward:**_____

Catheter type:

- ○ Single lumen
- ○ Multi-lumen (Lumens:____)
- ○ Vascath
- ○ PICC
- ○ Temporary
- ○ Tunnelled long-term
- ○ Other (specify):_____

Make: _____ Size (FG): _____

Complications:

- ○ Exit site infection
- ○ CRS
- ○ Occlusion
- ○ Thrombosis
- ○ Accidental removal
- ○ CVC damage
- ○ Extravasation
- ○ Tamponade
- ○ Other (specify):_____

Insertion date:

		/			/		

Insertion Site:

- ○ IJV
- ○ Subclavian
- ○ Femoral
- ○ Axillary
- ○ Brachial
- ○ Cephalic
- ○ Other (specify):_____

Right ☐ Left ☐

Treatment:

- ○ Removal
- ○ Replacement
- ○ Antibiotics
- ○ Anticoagulant
- ○ Thrombolytic
- ○ Unblocking
- ○ Other details:_____

○ **Catheter replaced** ○ **Catheter removed**

Date:

		/			/		

Time:

		:		

Indications:

- ○ No longer needed
- ○ CRS/septic shock
- ○ Occlusion
- ○ Thrombosis
- ○ Accidental removal
- ○ CVC damage
- ○ Extravasation
- ○ Malposition
- ○ Other (specify):_____

Replacement:

- ○ Rewired
- ○ New site (specify):_____
- ○ IJV
- ○ Subclavian
- ○ Femoral
- ○ Other:_____

Removal/replacement:*

- ○ Ward
- ○ Theatre
- ○ PICU
- ○ Other (specify): _____
- ○ LA
- ○ GA
- ○ Sedation
- ○ **Tip sent for culture**

Comments:

_____

_____

_____

_____

Side: Right ☐ Left ☐

Signature:_____**Name:**_____
Date:_____

Appendix 7: Catheter Related Bloodstream Infection

Catheter related sepsis is a potentially life threatening complication of a central venous catheter and carries significant morbidity and mortality. Prompt action is vital to detect and treat sepsis, prevent serious morbidity and also to preserve long-term catheters

Seek evidence for catheter related sepsis in any child with a central venous line with evidence of infection:

CENTRAL VENOUS CATHETER (CVC) INFECTIONS

- Fever, malaise or vomiting
- Leucocytosis
- Raised neutrophil count, low platelets, coagulopathy
- Hypothermia
- Feed intolerance

INVESTIGATION OF SUSPECTED CVC SEPSIS

Microbiology: Central blood culture from each lumen
Peripheral blood culture
Arterial line blood culture (PICU)
Swab of central line skin site
Septic screen

Haematology: Full blood count, differential, platelet count ± clotting (septic shock)

Imaging: Consider echocardiography

TREATMENT

These guidelines cannot cover all eventualities. The patient diagnosis, line history, recent antibiotic treatment and infections should be considered when selecting antibiotic therapy

- **In cases of life-threatening septicaemic shock or systemic candidiasis, remove the CVC**
- **Commence supportive treatment as clinically indicated**
- **All line tips must be sent to Microbiology Department**

TABLE: Selection of broad-spectrum antibiotic therapy[1]

Age group	First-line regimen	Regimen for patients at risk of cephalosporin-resistant Gram-negative bacteria[2]
Babies up to 6 weeks	vancomycin[3] + cefotaxime or ceftriaxone or ciprofloxacin	vancomycin + meropenem
Children age >6 weeks	vancomycin + cefuroxime	vancomycin + ciprofloxacin or meropenem

[1]Broad spectrum antibiotic therapy can often be narrowed once the causative microorganism has been identified. Please discuss with Microbiology. For febrile neutropenia patients, refer to Haem/Onc protocol

[2]Risk factors for cephalosporin-resistant Gram-negative bacteria:

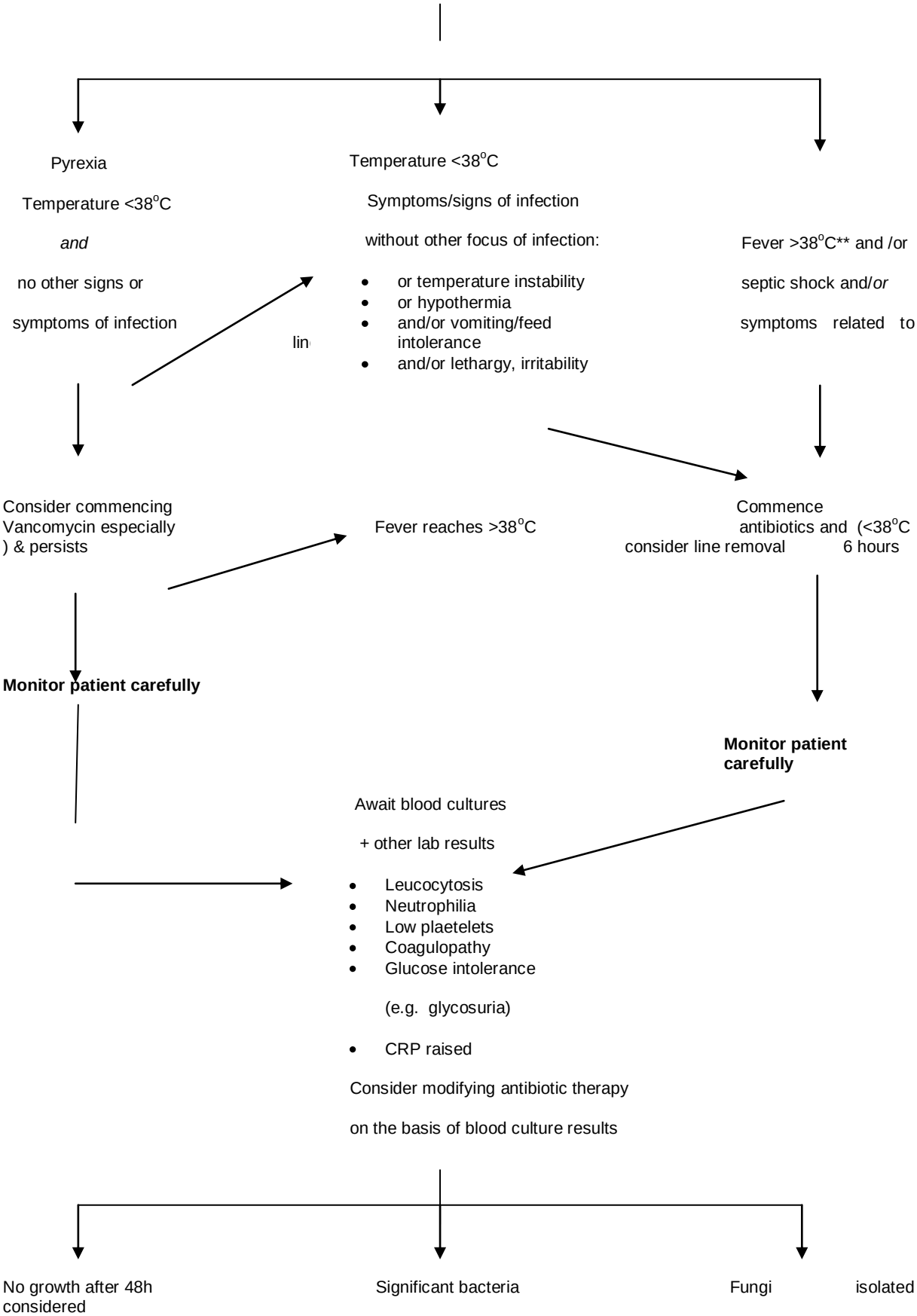
- ❑ Presence of septic shock
- ❑ Patient has received more than two doses of a cephalosporin in the preceding two weeks

Patient has had a previous episode of sepsis related to the same catheter with Gram-negative bacteria that are resistant to cefuroxime/cefotaxime/ceftriaxone

[3]If the patient is truly vancomycin-allergic, use teicoplanin instead

Investigation & Management of Suspected Catheter- related Sepsis‡

Collect central venous line cultures from each lumen + peripheral blood cultures and perform septic screen*



Or

Isolate of uncertain significance

for 7days[#]

to be significant

Remove/replace temporary CVC

Ensure antibiotic therapy appropriate

Remove line *and* give Fluconazole oral or IV

Complete 7-14 day course

Signs & symptoms resolving

Consider need to continue antibiotics

Signs & symptoms not resolving

Repeat blood cultures

Consider other diagnoses

Discuss antibiotic therapy with a Medical Microbiologist

- ***It is not necessary to stop parenteral nutrition in patients with suspected or proven line sepsis (unless line is removed or clinically indicated, e.g. shock)***

[‡]Based on Nutritional Care Department guidelines

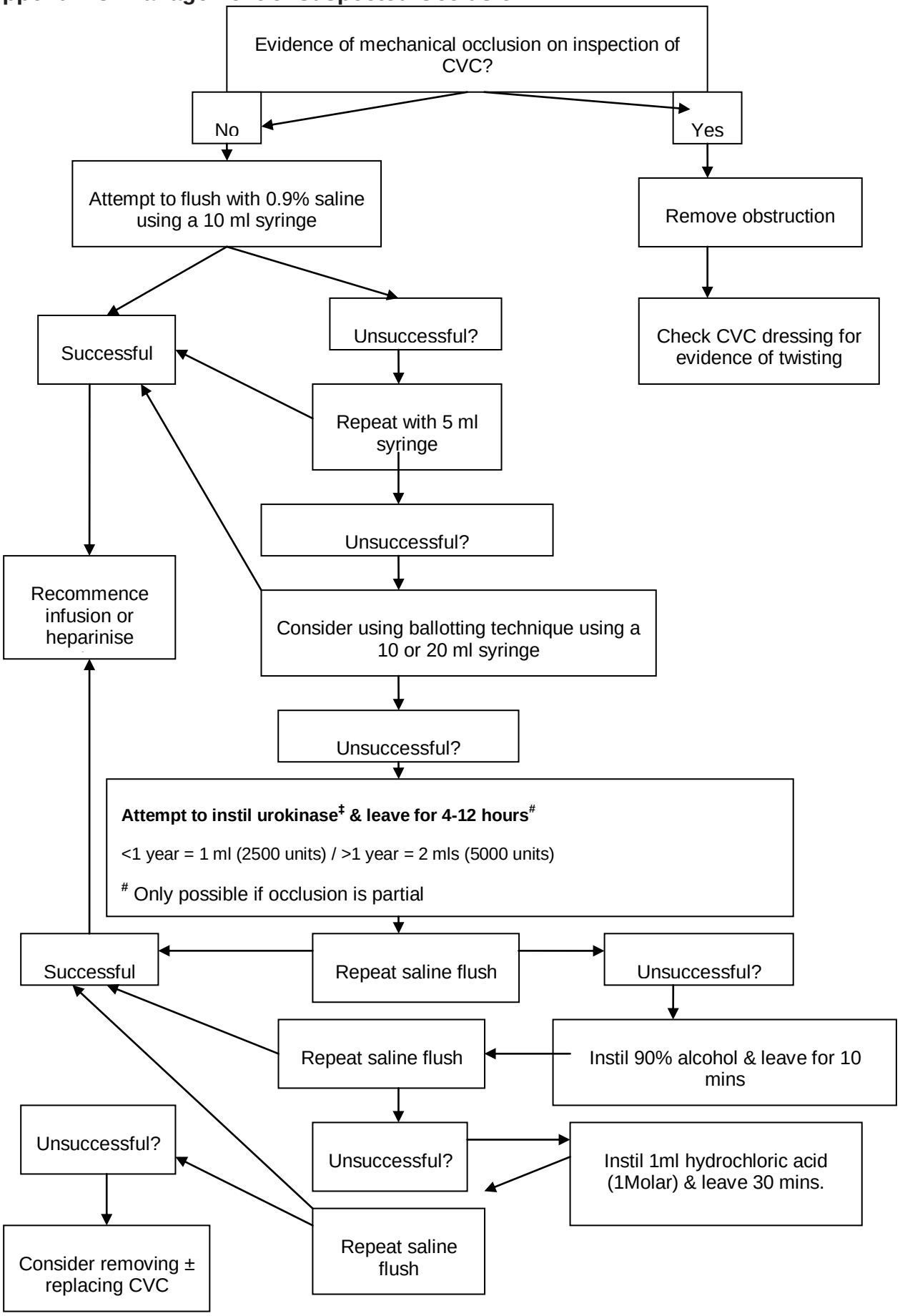
* Full blood count, PT Glc, CRP, acid-base status. Consider urine culture, CXR throat swabs, NPA, LP as indicated clinically

e.g. tachycardia, or other signs of hypotension, poor perfusion

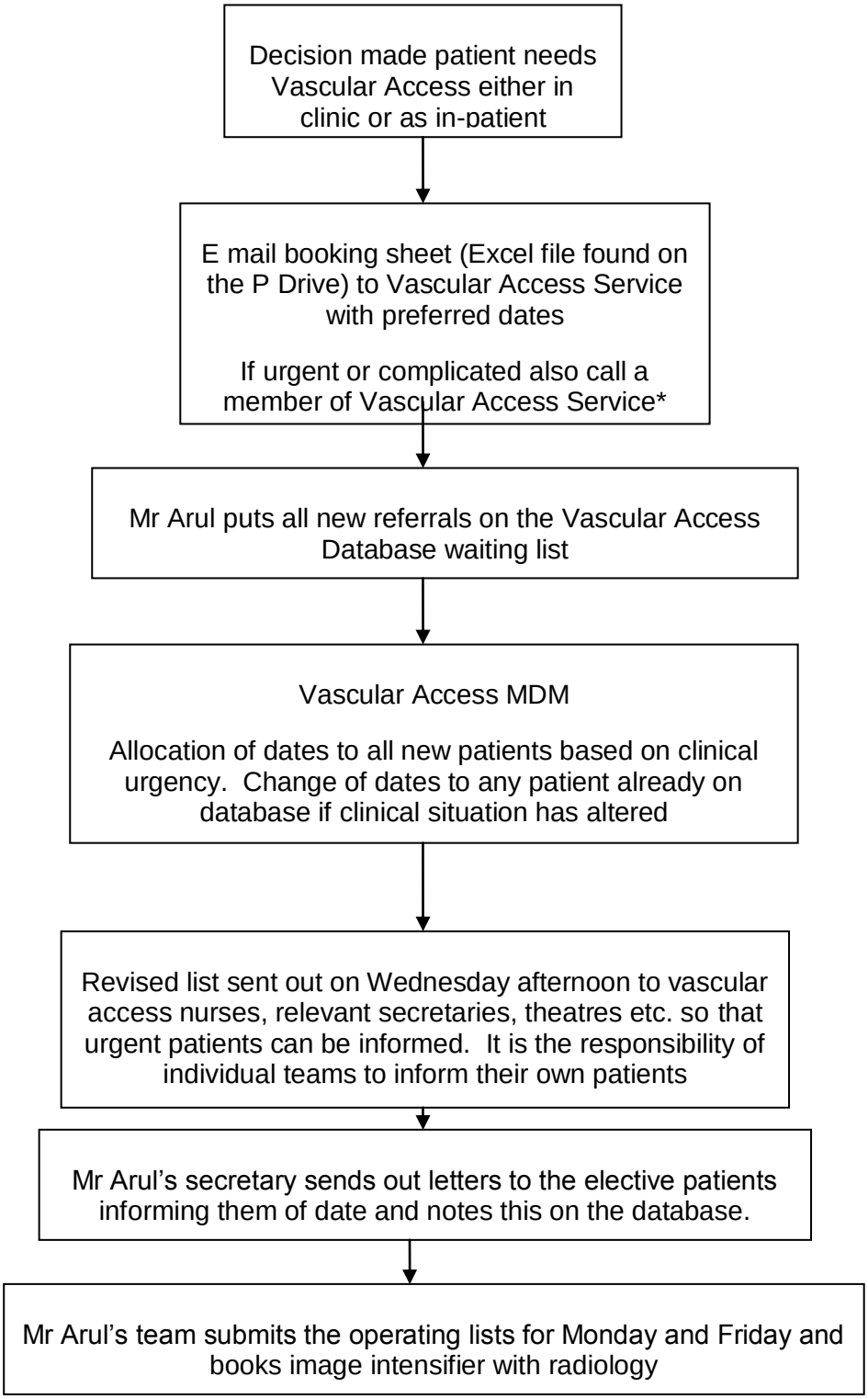
**Temperature instability, hypothermia, feed intolerance, lethargy, irritability

[#]Also, if other cultures negative, but line tip culture positive for Candida. Even if patient is clinically well

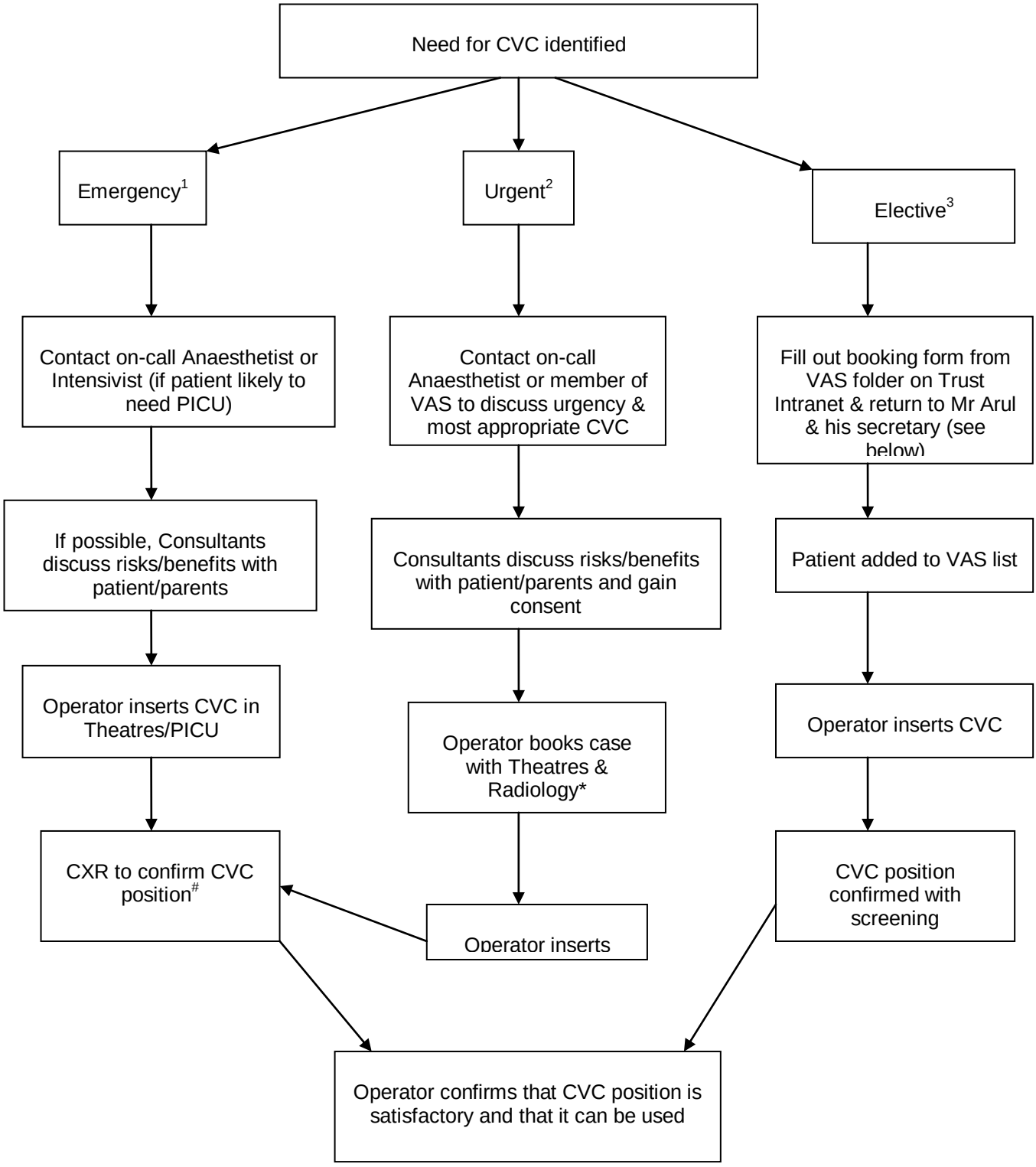
Appendix 8: Management of suspected Occlusion



Appendix 9: The VAS Process



The CVC process:



[1] Emergency - CVC required within 4 hours / [2] Urgent - CVC required within 48 hours / [3] Elective - CVC required after 48 hours

N.B. For femoral CVCs, it is not always necessary to screen or for a check XR to be undertaken, as malpositioning is uncommon and less critical than with other sites.

Appendix 10: Types of CVC's

Hickman Line*

Definition: Cuffed, silicone, long-term line (>3 weeks), Single, double or triple lumen and Sizes 2.7FG to 10FG

Indications:

- TPN
- Chemotherapy
- Regular blood products
- Antibiotics
- Regular blood sampling

Precautions:

- Requires general anaesthesia for insertion and takes approximately 30 minutes of surgical time
- Can be damaged if the child/parents are not careful
- Infected lines need removing in theatre under general anaesthesia in most patients
- Can damage the long-term patency of the vein, particularly if inserted by venous cut down

***** This term now covers all previous descriptions of the above line, including Broviac, tunnelled long-line, silastic triple-lumen line etc.

Vascuport/Portocath

Definition: Surgically implanted port, Subcutaneous and Long-term CVA (>6 months)

Indications:

- Longer-term, intermittent CVA – Antibiotics, regular blood products, chemotherapy
- Good if child very active
- Lower infection rate than Hickman

Precautions:

- Skin erosion can occur with too frequent access
- Single lumen only
- Not good for needle-phobic children
- Unsuitable for long-term TPN
- Hard to clear established infection
- Inserted under general anaesthesia and takes approximately 1 hour to insert
- Can damage the long-term patency of the vein, particularly if inserted by venous cut down

Temporary Central Venous Catheter (Anaesthetic)

Definition:

- Percutaneously inserted CVC
- Inserted directly into a central vein
- Not tunnelled
- Uncuffed
- Tip of catheter lies in a central vein

Indications:

- Regular & frequent venous access for 5 days to 3 weeks
- Monitoring of central venous pressure
- Short-term central venous access (inotropes, TPN)
- Difficult venous access (antibiotics‡, blood sampling)
- Venous access in potentially septic child (can be removed easily)

Precautions:

- Risks of blockage & infection increase greatly after 2 weeks
- Line management often less rigorous than Hickman
- Can damage long-term patency of veins, if frequent and inserted blindly

‡Oral antibiotics can often be substituted for IV antibiotics. Please discuss with Microbiology before requesting a temporary CVC for this purpose.

Peripherally Inserted Central Catheter (PICC)

Definition: Percutaneous CVC usually inserted via an arm or leg or the scalp (neonates) and can be single or double-lumen

Indications:

- Intermediate to long-term access (weeks–months)
- TPN, chemotherapy, prolonged antibiotics
- Easier to insert and remove (anaesthesia & theatre not always required)
- Patency of central veins rarely affected

Precautions:

- Technically more difficult to insert
- Relatively narrow gauge and greater length make them more prone to blockage
- Neonatal PICC lines need fluid to be running through them all the time, making discharge from the ward difficult
- Infection rates related to number of times line accessed
- Catheter tip doesn't always reach a central vein

Haemocath/Vascath

Definition: Percutaneous, double-lumen catheter and is sited in large vein, with high blood flow

Indications:

- Short to long-term access
- Haemodialysis-related procedures or harvesting of blood products (e.g. stem cells)

Precautions:

- Vascaths are made of polyurethane and are relatively stiff
- Less variety of sizes and lengths than other catheter types
- Require high blood flow through them to work effectively
- Need to be heparin-locked when not in use

Appendix 11: Guide to the CVC insertion

These figures apply to a CVC inserted via the right internal jugular vein, using the insertion landmark of the midpoint between the mastoid process and the sternal notch (high approach). In over 99% of patients the tip of the CVC should be sitting outside the RA, above the level of the pericardial reflection. If lower approaches are used, the difference in the distance between them must be subtracted from the figure below.

Patient weight (kg)	Length of CVC insertion (cm)
2-2.9	4
3-4.9	5
5-6.9	6
7-9.9	7
10-12.9	8
13-19.9	9
20-29.9	10
30-39.9	11
40-49.9	12
50-59.9	13
60-69.9	14
70-79.9	15
80+	16

N.B. These distances also apply to subclavian vein catheterisation using a lateral approach, but are slightly less accurate (94%).

If inserting a PICC line from the ACF, distance to the right atrium can be estimated by the formula: height(cm)/4 + 10%.

For femoral venous insertion with the catheter tip at L3 level (below the level of the renal veins), optimal insertion length (cm) = 0.45 x body weight (kg) + 8.13

References

Andropoulos DB, Bent ST, Skjonsby B, Stayer SA. The optimal length of insertion of central venous catheters for pediatric patients. *Anesth Analg* 2001; **93:** 883-6.

Shinohara Y, Arai T, Yamasita M. The optimal insertion length of central venous catheter via the femoral route for open-heart surgery in infants and children. *Paediatr Anaesth* 2005; **15:** 122-4

Appendix 12: High Impact Interventions (HII)

Every healthcare worker has the potential to significantly reduce the risk of infection by consistently complying with agreed Trust standards/ Policy each time they undertake a clinical procedure however individual clinicians, clinical teams and organisations need to have a way of measuring compliance to these procedures in order to assure themselves that safe reliable care is being delivered consistently. HIIs or care bundles, provide the means to do this.

The HIIs highlight the critical elements of a particular procedure, the key actions required and a means of demonstrating reliability using compliance measurement.

The purpose of the HIIs is to reduce variation in practice by identifying where compliance needs to be increased and measuring how often all of the elements are performed. Timely, continual feedback to staff and the implementation of agreed actions can result in continuous quality improvement and progress can be tracked using visual charts. Further information can be found on the P drive Infection Control folder

CVC Insertion Actions

- Use single lumen line, unless indicated otherwise
- Clean skin with 2% Chlorhexidine Gluconate in 70% Isopropyl Alcohol (IPA), using repeated up and down, back and forth strokes. Allow to dry.
- Use maximum aseptic precautions when inserting CVC i.e. hand hygiene, sterile gown, sterile gloves and sterile drapes (appropriate size to length of line)
- Use eye/face protection where there is a risk of splashing with blood or body fluids.
- Cover CVC with a sterile, transparent, semi-permeable dressing to allow observation of insertion site
- Dispose of sharps safely
- Document date of insertion in patient's notes

CVC Ongoing Care Actions

- Hand hygiene and ANTT technique each time the CVC is accessed
- 'Scrub the hub' with 2% Chlorhexidine Gluconate in 70% Isopropyl Alcohol prior to accessing the line
- Observe the site regularly for signs of infection. Documentation
- Ensure the dressing is intact and clean and dry. Change dressing if not
    - During dressing changes, clean skin using 0.5% Chlorhexidine in 70% IPA and allow to dry. If excessive loss then use normal saline to initially clean the skin, followed by 0.5% Chlorhexidine in 70% IPA
- Replace administration set following administration of blood, blood products or after 24 hours if PN (72 hours if no lipids) and after 72 hours for other fluid sets
- CVC should not be routinely replaced

PVC Insertion Actions

- Decontaminate hands immediately prior to inserting PVC
- Use an ANTT technique using appropriate personal protective equipment
- Clean skin using 0.5% Chlorhexidine in 70% Isopropyl Alcohol before inserting PVC
- Cover with a sterile, semi-permeable, transparent dressing to allow observation of insertion site.
- Document date of insertion in patient's notes should be recorded in notes.

PVC Ongoing care actions

- Decontaminate hands before accessing the PVC
- Remove PVC if no longer clinically indicated
- Observe site regularly for signs of infection, at least daily.
- Ensure that dressing is dry, adherent and intact
- Scrub the hub using 2% Chlorhexidine Gluconate in 70% Isopropyl Alcohol, and allow to dry prior to accessing PVC
- Replace administration set following administration of blood, blood products or after 24 hours if PN (72 hours if no lipids and 72 hours for other fluid sets)
- PVC should not be routinely replaced
- Replace PVC after 72 hours and always if clinically infected
    - If venous access limited, the cannula can remain in situ if there are no signs of infection.

Appendix 13: Haemocaths/Vascaths information

Background

Haemocaths (or Vascaths) are double-lumen catheters inserted percutaneously (and rarely surgically) into a large vein for the instigation of haemodialysis or renal replacement therapy. They can be used for short-term access (polyurethane catheters) or longer term access (silastic catheters)

In the past there have been problems ensuring the correct type and volume of solution has been used to flush and lock the catheter lumens. Injection of excess concentrated heparin solution may lead to the patient becoming anticoagulated.

This document is provided as a guide those who insert, flush or access Haemocaths.

Catheter details (polyurethane catheters)

Patient weight	**Haemocatheter**			
	Gauge	Length	Priming volume	Manufacturer
<2kg	5FG	6cm	Proximal = 0.15ml Distal = 0.18ml	Edwards Lifesciences
3-6kg	5FG	6cm	Proximal = 0.15ml Distal = 0.18ml	Edwards Lifesciences
3-6kg	6.5FG	10cm	A = 0.75mls V = 0.78mls	Hespal
6-10kg	8FG	12.5cm	A = 0.84mls V = 0.86mls	Hespal
10-20kg	8FG	12.5cm	A = 0.84mls V = 0.86mls	Hespal
20-40kg	11FG	15cm	A = 1.04mls V = 1.10mls	Hespal
>40kg	11FG	20cm	A = 1.24mls V = 1.35mls	Hespal

Silastic catheters will vary in size and length according to patient requirements.

Catheter management

Following insertion of the Haemocath in theatre or PICU, initial flushing should be with heparin 100units per ml only. **The catheter must not be 'locked' with stronger concentrations of heparin until the patient has returned to the Renal Unit or PICU.**

Once the patient has returned to the Renal Unit or PICU, the catheter can either be used immediately or locked by instilling 1000 units per ml heparin. **Care must be taken to ensure only the volume of heparin required to occupy the catheter lumen is injected** (see Table above).

9 Associated Documentation

Birmingham Children's NHS Foundation Trust (2005) Extravasation Policy

Birmingham Children's NHS Foundation Trust (2006) Trust Policy for the Management of Invasive/Distressing Procedures

Birmingham Children's Hospital NHS Foundation Trust (2008) Blood Transfusion Policy

Birmingham Children's NHS Foundation Trust (2008) Medicines Policy

Birmingham Children's NHS Foundation Trust (2008) Patient Identification Policy

Birmingham Children's NHS Foundation Trust (2008) Seeking and Obtaining Consent to Treatment, Examination and Research with Children, Young People and those with "parental responsibility"

Birmingham Children's NHS Foundation Trust Observation Policy (2008)

9 Equality Impact Assessment

See completed form

10 Approval, Dissemination and Implementation

10.1 Approval of document

Approval will be sought through the Clinical Risk and Quality Assurance Committee

10.2 Dissemination

The policy will be disseminated through the appropriate line management structure.

The policy will be incorporated on the relevant training events.

The Policy for the Insertion, Administration, Maintenance and Removal of Intravenous cannulae/catheter will be kept on the trust intranet (P Drive)

10.3 Implementation

The responsibility will be through the line managers.

The policy will be updated every 2 years.

11 Monitoring Compliance With and the Effectiveness of the policy

11.1 Process for Monitoring Compliance and Effectiveness

This will be done through ongoing audits overseen by the IV/CVC Working Group and in conjunction with monitoring of the HII 's (which will be coordinated by the Infection Control Team. See Appendix 13.

11.2 Standards/Key Performance Indicators

- Consistency in practice as per the audit results.
- Trust wide action plan will be formulated by IV/CVC Working Group and the Infection Control Team and implemented by the line managers.
- Evidence of an Assessment and Competency Documentation

Appendix D - Checklist for the Review and Approval of Procedural Document

To be completed and attached to any document which guides practice when submitted to the appropriate committee for consideration and approval.

	Title of document being reviewed:	Yes/No/ Unsure	Comments
1.	**Title**		
	Is the title clear and unambiguous?	Yes	
	Is it clear whether the document is a guideline, policy, protocol or standard?	Yes	
2.	**Rationale**		
	Are reasons for development of the document stated?	Yes	
3.	**Development Process**		
	Is the method described in brief?	Yes	
	Are people involved in the development identified?	Yes	
	Do you feel a reasonable attempt has been made to ensure relevant expertise has been used?	Yes	
	Is there evidence of consultation with stakeholders and users?	Yes	
4.	**Content**		
	Is the objective of the document clear?	Yes	
	Is the target population clear and unambiguous?	Yes	
	Are the intended outcomes described?	Yes	
	Are the statements clear and unambiguous?	Yes	
5.	**Evidence Base**		
	Is the type of evidence to support the document identified explicitly?	Yes	
	Are key references cited?	Yes	
	Are the references cited in full?	Yes	
	Are supporting documents referenced?	Yes	
6.	**Approval**		
	Does the document identify which committee/group will approve it?	Yes	
	If appropriate have the joint Human Resources/staff side committee (or equivalent) approved the document?	N/A	

	Title of document being reviewed:	Yes/No/ Unsure	Comments
7.	**Dissemination and Implementation**		
	Is there an outline/plan to identify how this will be done?	Yes	
	Does the plan include the necessary training/support to ensure compliance?	Yes	
8.	**Document Control**		
	Does the document identify where it will be held?	Yes	
	Have archiving arrangements for superseded documents been addressed?	Yes	
9.	**Process to Monitor Compliance and Effectiveness**		
	Are there measurable standards or KPIs to support the monitoring of compliance with and effectiveness of the document?	Yes	
	Is there a plan to review or audit compliance with the document?	Yes	
10.	**Review Date**		
	Is the review date identified?	Yes	
	Is the frequency of review identified? If so is it acceptable?	Yes	
11.	**Overall Responsibility for the Document**		
	Is it clear who will be responsible for co-ordinating the dissemination, implementation and review of the document?	Yes	

Individual Approval			
If you are happy to approve this document, please sign and date.			
Name		Date	
Signature			
Committee Approval			
If the committee is happy to approve this document, please sign and date it and forward copies to the person with responsibility for disseminating and implementing the document and the person who is responsible for maintaining the organisation's database of approved documents.			
Name		Date	
Signature			

Appendix E-Committee Approval Matrices

Committee	Example Policy Categories
Clinical Risk and Quality Assurance Committee	Clinical
	Audit
	Infection Control
	Resuscitation
	Medicines Management
Non Clinical Risk Committee	Estates and facilities
	Health and Safety
Records Management	Health records
	Records management
	Information Governance
IM&T Committee	IM&T
	Data Protection
	Clinical Coding
	Data Quality
Staff and Environment Committee	Human Resources
Participation Committee	Patient and Public Involvement
	Membership
Education and Training Steering Group	Education
	Training

Appendix F – Equality Impact Assessment

To be completed and attached to any procedural document when submitted to the appropriate committee for consideration and approval.

EQUALITY IMPACT ASSESSMENT FORM

SECTION 1:

Department	**Assessor: Hermione Montgomery and Jay Kumar**
Policy/ Service Title: Policy for the insertion, administration, maintenance and removal of intravenous cannulae/catheter	**Date of Assessment: 21st October 2008**
1. Describe the purpose of this policy or function	To ensure safe evidence based practice by all health professionals who care for infants, children and young people
2. Who is affected by this policy?	All staff who insert, care for or remove CVC's or PVC's
3. What are the outcomes or intended outcomes of this policy/ function?	This policy will replace all existing administration of intravenous therapy and the insertion, maintenance and removal of central venous catheter policies. It will introduce the implementation of national guidelines, such as NPSA and EPIC 2 Standards of care for CVC's and PVC's will introduced and will replace all existing care plans in the Trust
4. What consultation has been undertaken during the development of this policy/function?	Comments were sought from a wide range of health professionals

5. What information or evidence has been used to assess the potential impact across the equality strands?	Comments were sought from a wide range of health professionals Complies with current policies and this policy does not exclude any groups

IMPACT

1. What is the impact or likely impact, either positive or negative, of the initiative on individuals, staff, or the public at large?

Standardises current policy to ensure consistency

Introduction of change could produce negative reaction

2. Please complete the following list and identify if there is, or likely to be, an impact on a group

a) Grounds of race, ethnicity, colour, nationality or national origins.	Yes ☐ No √	Adverse? ☐ Provide further details:
b) Grounds of sexuality or marital status	Yes ☐ No √	Adverse? ☐ Provide further details:
c) Grounds of gender	Yes ☐ No √	Adverse? ☐ Provide further details:
d) Grounds of religion or belief	Yes ☐ No √	Adverse? ☐ Provide further details:
e) Grounds of disability	Yes ☐ No √	Adverse? ☐ Provide further details:

f) Grounds of age	Yes ☐ No √	Adverse? ☐ Provide further details:
If you have stated that there is an adverse impact a Full Impact Assessment is Required. Complete Section 2.		

SECTION 2:

Modifications
1. If you stated that the policy/ function has or could have an adverse impact on any group, how could you modify it to reduce or eliminate any identified negative impacts? N/A
2. If you make these modifications, would there be an impact on other groups, or on the ability of the policy to achieve its purpose? N/A
Consultation **Under the Race Relations (Amendment) Act 2000 you are required to consult on the impact of new policies, functions and service change.**
3. How do you plan to consult on these modifications? Specify who would be involved, timescales and methods. N/A

Decision Making
1. Who will make the decision? Clinical Quality and Risk Assurance
2. What is the decision? ☐ Reject the policy/ function XIntroduce the policy/ function ☐ Amend the policy/ function ☐ Other (Please explain)
Monitoring and Review
1. How will the implementation of the policy/ function and its impact be monitored? Audit of compliance to meet nationally set targets, such as High Impact Interventions (DOH 2007)
2. What are the overall learning points from this assessment?
3. What actions are recommended from this assessment?
4. When is the review date?

For advice in respect of answering the above questions, please contact the Equality and Diversity Officer on Ext: 8611. A completed form must be returned with your procedural document.

Appendix G – Version Control Sheet

Version	Date	Author	Comment (Identify any significant changes to the procedural document)
3.0.0	30th September 2008	Jay Kumar, Hermione Montgomery, Oliver Bagshaw and Judith Room	
		Intravenous Therapy and Central Venous Catheter Working Group	

Appendix H – Plan for Dissemination of Procedural Documents

To be completed and attached to any document which guides practice when submitted to the appropriate committee for consideration and approval.

Title of document:	**Policy for the insertion, administration, maintenance and removal of intravenous cannula/catheter**

Date finalised:	November 2008	**Dissemination lead: Print name and contact details**	Jay Kumar Extn 8617 Professional development team
Previous document already being used?	**Intravenous Policy and the Insertion, Maintenance and Removal of Intravenous Catheters**		
If yes, in what format and where?	Both policies are on the 'P' drive		
Proposed action to retrieve out-of-date copies of the document:	The Information and Quality Compliance Manager will remove the old policies from the 'P' drive and replace them with this new policy The Ward/Department Managers will be responsible for replacing the existing policies with this new one.		

To be disseminated to:	**How will it be disseminated, who will do it and when?**	**Paper or Electronic**	**Comments**
Ward/Department Managers	Via Email by the Lead Person	Electronic	The Policy will be launched in the Conservatory and all Wards/Department will be given a paper copy
Heads of Nursing Clinical Co-ordinators (Hospital @ Night)	Via Email by the Lead Person	Electronic	
Anaesthetists	Via Email by the Lead Person	Electronic	
Consultants	Via Email by the Lead Person	Electronic	
SPR's	Via Email by the Lead Person	Electronic	

Dissemination Record – to be used once document is approved.

Date put on register / library of procedural documents	10th December 08	**Date due to be reviewed**	November 2010

Disseminated to: (either directly or via meetings, etc)	**Format (i.e. paper or electronic)**	**Date Disseminated**	**No. of Copies Sent**	**Contact Details / Comments**
Directly and via email	Paper version and electronic is available on the P-drive	11th December 08	1 per ward/dept.	