Feidhmeannacht na Seirbhíse Sláinte
Health Service Executive

National Policy for the Administration of Intravenous Medication by Registered Nurses and Midwives

Document Reference Number:	ONMSD 2013-001	**Document drafted by:**	Office of the Nursing and Midwifery Services Director, Health Service Executive
Supersedes:	New Document	**Document approved by:** Name: Dr. Michael Shannon Nursing and Midwifery Services Director, HSE **Signature:** Name: Dr Aine Carroll National Director Clinical Strategy and Programmes, HSE **Signature:** Name: Dr Philip Crowley National Director Quality and Patient Safety, HSE **Signature:**	Office of the Nursing and Midwifery Services Director Health Service Executive.
Approval date:		**Responsibility for implementation:**	Directors of Nursing & Midwifery Services
Revision date:		**Responsibility for evaluation and audit:**	Director of Services
		Number of pages:	55

Consultation Trail / Draft History:

Draft 1	First draft to peer review group.
Draft 2	Feedback from peer review group incorporated into the document for consideration by the working group.
Draft 3	Feedback from Office of the Nursing and Midwifery Services Director.
Draft 4	Feedback from Irish Medicines Board and National Medication Information Centre on Draft 3 incorporated into the document.
Draft 5	Feedback from peer review group on Draft 4 incorporated in the document.
Draft 6	Consultation with subject experts and stakeholders/reviewers.
Final Draft	Endorsed by the working group and the peer review group for implementation.

Acknowledgements:
The working group would like to take this opportunity to thank all the hospital and community services for submitting their documents to the working group which enabled the development of this policy document.

The working group would like to extend particular thanks to Dr. Helen Flint, Medicines Management Programme, Clinical Strategy and Programmes Directorate for her guidance, direction and expertise. The working group would like to acknowledge advice received from:

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With thanks, Justin Kerr, Chairperson Working Group for Policy Development.

Table of Contents: **Page No.**

1.0 Policy Statement:

1.1 It is the policy of the Health Service Executive (HSE) that registered nurses (RN) and registered midwives (RM) who have undertaken the necessary education and training are enabled and facilitated to undertake safe administration of Intravenous (IV) Medication. This includes first and subsequent doses of intravenous medications.

1.2 Each service must put appropriate arrangements in place to support this policy regarding risk factors e.g. anaphylaxis management and prevention of health care associated infection.

2.0 Purpose:

2.1 This policy provides direction towards best practice, and must always be used in conjunction with professional judgement. Each registered nurse or midwife is individually accountable to keep up-to-date with advances in the administration of intravenous medication and must acknowledge any limitations in competence. Accountability is an integral part of professional practice. Practising in an accountable manner requires a sound knowledge base upon which to make decisions, in conjunction with professional judgement. The RN/RM must be able to justify and document the reason for taking a particular course of action. This includes any act or omission.

2.2 The purpose of this policy is to:

2.2.1 Enable the registered nurse/midwife to administer first and subsequent doses of intravenous medications safely and within their professional scope of practice.

2.2.2 Provide a standardised approach for RNs/RMs to exercise clinical judgement within the domains of professional accountability.

2.2.3 Act as a guide to enable local development and revision of Policies/Procedures and Guidelines in relation to the administration of intravenous medications by the RN/RM.

3.0 Scope:

3.1 This policy applies to all RN/RMs who prepare and administer IV medications; and who are employed by the HSE, Statutory & Voluntary Services or through an agency and to organisations funded by the HSE as appropriate.

3.2 This policy applies to all registered nurses/midwives, who have successfully completed a recognised education, training and competence assessment to undertake intravenous medication administration.

3.3 This policy does not apply to the administration of oral medication, transfusion of blood and blood products or Total Parenteral Nutrition or other routes of administration outside of IV medications.

4.0 Legislation / Other related policies:

It is expected that each registered nurse/midwife undertaking IV medication administration is familiar with the documents below as well as other publications of An Bord Altranais relating to nursing and midwifery practice. They must also be familiar with and adhere to policy / procedure and guideline documents from their own service area within the Health Service Executive. Quality, Safety and Risk frameworks must be considered in conjunction with this policy.

4.1 Directions for Nurses and Midwives for the management of a patient who develops anaphylaxis in the community setting incorporating medication protocol for the administration of Adrenaline (epinephrine) injection 1:1000 by intramuscular injection by nurses and midwives for the management of anaphylaxis for patients in the community setting. HSE Policy Document: Version 2 August 2011.

4.2 E-learning guide to medication management. National Council for the professional Development of nursing and midwifery and An Bord Altranais (2007) available at www.nursingboard.ie and www.hseland.ie

4.3 Guidance to Nurses and Midwives on Medication Management. An Bord Altranais (2007)

4.4 Guidance to Nurses and Midwives on the development of Policies, Guidelines and Protocols. An Bord Altranais (2000)

4.5 Guidelines for Hand Hygiene in Irish Health Care Settings Health Protection Surveillance Centre, Health Service Executive. (2005)

4.6 Guidelines for Segregation, Packaging and Storage of Healthcare Risk Waste. 4th Edition. Health Service Executive. 2010. http://www.dohc.ie/publications/healthcarewastepackaging2010.html. Refer to local policy also.

4.7 NHO Code of Practice for Healthcare Records Management. Version 2.0 (illustrated). Health Service Executive (2007)

4.8 Practice Standards for Midwives. An Bord Altranais (2010).

4.9 Professional Guidance for Nurses working with Older People. (2009)

4.10 Recording Clinical Practice: Guidance to Nurses and Midwives An Bord Altranais (2002)

4.11 SARI Prevention of Intravascular Catheter Related Infection in Ireland. Health Protection Surveillance Centre, Health Service Executive (2009)

4.12 Standard Precautions (2009) Health Protection Surveillance Centre. Available from: http://www.hpsc.ie/hpsc/AZ/Respiratory/Influenza/SeasonalInfluenza/Infectioncontroladvice/. Please refer to local policy also.

4.13 The Code of Professional Conduct for Each Nurse or Midwife An Bord Altranais (2000)

4.14 The Scope of Nursing and Midwifery Practice Framework An Bord Altranais (2000a)

5.0 Glossary of Terms and Definitions:

5.1 **Adverse Reaction** – a response to a drug that is noxious and unintended and occurs at doses normally used in man for prophylaxis, diagnosis or therapy of disease or for the restoration, correction or modification of physiological function. (Directive 2001/83/EC) (cited in An Bord Altranais 2007, p.51). This includes noxious and unintended effects resulting not only from the authorised use of medicinal product at normal doses, but also from medication errors and uses outside the terms of the marketing authorisation, including the misuse and abuse of the medicinal product. Adverse Reaction reports can be made through the Irish Medicines Board using the link: http://www.imb.ie/EN/Safety--Quality?Online-Forms/Human-Medicine-Adverse-DrugReaction.aspx.

5.2 **Competence** is defined as the ability of a Registered Nurse or Midwife to practice safely and effectively, fulfilling his/her professional responsibility within his/her Scope of Practice (An Bord Altranais 2000a, p.27)

5.3 **Clinical Governance** is a framework through which healthcare teams are accountable for the quality, safety and satisfaction of patients in the care they deliver. It is built on the model of the Chief Executive Officer (CEO) / General Manager (GM) or equivalent working in partnership with the clinical director, director of nursing / midwifery and service / professional leads. A key characteristic of clinical governance is a culture and commitment to agreed service levels and quality of care to be provided. (HSE 2012)

5.4 **Continuous Infusion** may be defined as the intravenous delivery of a medication or fluid at a constant rate over a prescribed period of time. The length of time over which a continuous infusion is administered will range from several hours to several days (Whittington, 2008, p.125)

5.5 **Direct Intermittent Injection** (also known as bolus injection) constitutes the administration of a medicine in a small volume of diluents directly into a venous access device or in the injection port of the administration set (Whittington, 2008, p.127).

5.6 **Healthcare-Associated Infection** or HCAI refers to an infection that occurs as a result of contact with the healthcare system in its widest sense – from care provided in hospitals to care provided in patients' homes, including primary (GP) care and nursing home care. RCPI Policy Group on Healthcare-Associated Infection (HCAI).

5.7 **High alert medications** are drugs that bear a heightened risk of causing significant patient harm when they are used in error. Institute for Safe Medicine Practices. February 2012.

5.8 **Intermittent Infusion** is the administration of a small-volume infusion i.e. 50-250 ml, over a period of between 20 minutes and 2 hours. This may be given as a specific dose at one time or at repeated intervals during a 24 hour period (Whittington, 2008. p.126).

5.9 Intravenous Medication is a pharmaceutic delivered directly into the bloodstream via a vein. (Mosby's Medical Dictionary, 2009).

5.10 Medication Error is any preventable event that may cause or lead to inappropriate medication use or patient/client harm while the medication is in control of the healthcare professional, patient/client encounter or consumer (ABA 2007)

5.11 Medicinal product is any substance or combination of substances presented as having properties for treating or preventing disease in human beings or any substance or combinations of substances which may be used in / or administered to human beings either with a view to restoring, correcting or modifying physiological functions, by exerting pharmacological, immunological or metabolic action, or to making a medical diagnosis. *Article one of directive 2004/27/EC*.

5.12 Reconstitution refers to adding a diluent (e.g. water for injection) to a drug in solid form (e.g. powder) to form a solution.

5.13 Registered Nurse Prescriber – a registered nurse or midwife who is registered in the Division of the Register of Nurse Prescribers of An Bord Altranais (An Bord Altranais, 2007).

5.14 Vascular Access Device a catheter designed for continuous access to the venous system. Such devices may be required for long-term parenteral feeding or the administration of IV fluids or medications for a period of several days. (Mosby's Medical Dictionary, 2009)

6.0 Roles and Responsibilities:

6.1.1 Nursing / Midwifery staff are accountable for their practice; it is the responsibility of each registered nurse/midwife to be familiar with the main pharmacological actions, the usual dose, diluents, storage and stability of medication and frequency, route of administration and potential side effects and incompatibilities of the drugs which he/she is authorised to administer (as detailed in local service policy). This includes appropriate observation of the patient and adherence to best practice standards for record keeping. It is expected that all nurses and midwives have current An Bord Altranais registration.

6.2 It is the responsibility of the Regional Director of Operations to:

6.2.1 Ensure that this policy is included within the overall clinical governance structure of hospital and community services. Delegates responsibilities appropriately to Integrated Services Manager for implementation of this policy.

6.3 It is the responsibility of the Integrated Service Manager to:

6.3.1 Identify in partnership with CEO/General Manager/Director of Nursing & Midwifery the structures and resources required for the implementation of this policy.

6.4 It is the responsibility of the Director of Nursing and Midwifery:

6.4.1 To ensure that all nursing and midwifery staff are aware of this policy and that effective communications systems are in place to disseminate this policy document.

6.4.2 To identify and provide resources and supports to ensure that this policy is adhered to.

6.4.3 To ensure robust clinical governance structures are in place to monitor and audit practice and ensure patient safety.

6.4.4 To ensure systems are in place, to facilitate education and training with regard to all aspects of intravenous medication management in conjunction with the Centres for Nursing and Midwifery Education and Nurse Practice Development Units.

6.4.5 To ensure that risk management policies and procedures are in place for reporting all adverse events, incidents, near misses and adverse drug events.

6.4.6 To ensure that systems are in place to record and report health care associated infection events associated with intravenous medication e.g. cellulitis, IV line infection, IV line associated bacteraemia.

6.5 It is the responsibility of the Centres for Nursing & Midwifery Education and/or Practice Development Units to:

6.5.1 Liaise with the Director of Nursing & Midwifery to develop and deliver an intravenous medication training and education programme to meet service needs. This training programme should include standard precautions with specific reference to hand hygiene and aseptic technique.

6.6 It is the responsibility of the Assistant Director of Nursing/Midwifery

6.6.1 To ensure that all Clinical Nurse/Midwifery Managers are aware of this policy and the significance of adhering to the principles contained within.

6.6.2 To ensure that communication and clinical governance structures are operationalised at departmental/unit level.

6.7 It is the responsibility of the Clinical Nurse/Midwifery Manager

6.7.1 To ensure that all registered nurses/midwives are aware of the policy and the significance of adhering to the principles contained within.

6.7.2 To ensure that each registered nurse and midwife take appropriate steps to develop and maintain competence with regard to administration of IV medication.

6.7.3 To adhere to Risk Management structures, policies, procedures and guidelines.

6.7.4 To maintain appropriate records regarding the competence of the RN/RM reporting to them.

6.7.5 To maintain a signature sheet detailing that the local policy document is read and understood.

6.8 It is the responsibility of the registered nurse/midwife:

6.8.1 To successfully complete a recognised educational programme and competence assessment that is compliant with their service area.

6.8.2 To take appropriate steps to develop and maintain competence with regard to all aspects of intravenous medication management, ensuring that knowledge skills and clinical practice are up to date.

6.8.3 To be responsible and accountable to ensure they receive training in the safe use of any medical devices they need to use in order to safely administer IV medication.

6.8.4 To undertake continuing professional development to maintain his/her competence for the administration of IV medication. He/she must inform their line manager of any concerns pertaining to his/her competence.

6.8.5 To adhere to all related policies, procedures, guidelines and protocols for their area.

7.0 Pharmacological Aspects:

7.1 Medicines for IV administration are available as:

7.1.1 Ready to administer aqueous solutions, e.g. Atropine or Heparin.

7.1.2 Sterile powders requiring reconstitution with or without further dilution before administration, e.g. Flucloxacillin or Ceftazidime.

7.1.3 Ready to administer non aqueous solutions e.g. Diazemuls.

8.0 Principles for Practice

8.1 Meticulous checking of each element of preparing and administering a drug is essential to reduce drug errors and the associated potential harm to patients.

8.2 Check that the prescription is clear, unambiguous, signed, and dated, that it is legible and complete i.e. that it specifies the substance, dose, and frequency.

8.3 Check if any drug allergies / intolerances have been documented by the prescriber on the drug chart. Question the patient regarding allergy status prior to each IV medication administration.

8.4 Prior to administration know the expected mechanism of action of the drug, the potential side effects, possible interactions, signs and symptoms of potential adverse effect. An Bord Altranais (2007).

8.4.1 Current versions of Summaries of Product Characteristics or SPCs (formerly known as data sheets) for all authorised medicines are available from the IMB website, under the product listings tab on the home page. From this tab, a search of the individual products will indicate the overall

licensing status of a product, as well as availability on the Irish market, with a link to the SPC. SPCs are updated continually, on the basis of new/emerging information and are published immediately following approval on the IMB website available at www.imb.ie

8.4.2 An additional resource is the Irish Pharmaceutical Healthcare Association at www.medicines.ie

8.5 Be certain of the identity of the patient to whom the medicine is to be administered (local policy will direct safe practice for each setting) e.g. in an acute hospital using a 3 point check:

- Asking the patient his/her name and date of birth
- Checking patient identification band and
- Cross reference with addressograph on drug chart and/or drug label

8.6 Ensure the registered nurse/midwife who prepares the drug(s) administers it immediately following preparation. Only the nurse that prepares the medication shall administer the medication. Double checking should take place as per local policy.

8.7 Immediately prior to administration ensure that the patient is aware of the medication being given and the rationale for the administration of the medication. Obtain informed consent as appropriate.

8.8 Establish if an electronically controlled infusion device is required and to be familiar with its use.

8.9 Administer one drug at a time and do not mix drugs together in the same infusion – unless specifically prescribed/authorised and compatibility has been confirmed with a pharmacist. Flush between medications if appropriate to minimise the risk of drug interactions. A compatible flush should be administered before, between and after each medication. Flushes should be administered no faster than the rate of administration of the IV medication to be flushed.

8.10 The principles of preventing health care associated infection must be adhered to, e.g. that there is strict continuous adherence to standard precautions and aseptic technique during all aspects of the preparation and administration of the medication, including appropriate hand hygiene as per the World Health Organisation (WHO) 5 moments of hand hygiene and aseptic techniques.

8.11 Five rights of medication administration

8.11.1 "There are guiding principles for medication management that each registered nurse/midwife should adhere to in their delivery of care related to medicinal products.

8.11.2 The prescription or medication order should be verified that it is correct, prior to administration of the medicinal product. Clarification of any questions regarding the prescription/medication order should be conducted at this time with the appropriate health care professional. The expiry date of the medication should be checked

prior to administration. Expired medications should not be administered. The five rights of medication administration should be applied for each patient/service user encounter:

1. **The right medication**:
    - Matching the prescription / medication order against the label of the dispensed medication.
    - Being aware of look-alike and similar sounding medications.
    - Best practice indicates using 'international non-proprietary name (INN)' names of medications whenever possible.
2. **The right patient / service user**:
    - Being certain of the identify of the individual who is receiving the medication
    - Checking the medical record number and/or identification band
    - Asking the patient / service user to state her/his name
    - Confirming that the name and age are means of ensuring the correct identity.
    - Maintaining a photo of the individual on the medication administration record (When appropriate to the care setting).
3. **The right dosage**:
    - Considering if the dosage is appropriate based on age, size, vital signs or other variables.
    - If it is necessary to measure the dose (e.g. liquid form) the appropriate equipment should be used.
4. **The right form**:
    - Ensuring the correct form, route and administration method of the medication are as prescribed.
    - If this information is not indicated on the prescription or on the label of the medication, it should be clarified with the prescriber, as many medications can be given by various routes.
5. **The right time**:
    - Ensuring the correct timing, frequency and duration of the prescribed order.
    - The timing of doses of medication can be critical for maintaining specific therapeutic blood-drug levels (e.g. antibiotics) and avoiding interactions with other medications". (An Bord Altranais 2007 pg 9)

8.12 Withholding of medication:

"It is appropriate to exercise professional judgement to withhold a medicinal product if relevant in a specific patient/service-user case. The medical practitioner or registered nurse prescriber should be contacted with details if contraindications of administration exist, thereby communicating changes in the condition of the patient/service user. Accurate and contemporaneous documentation should be made for any medicinal product withheld or refused. Any information or advice given to a patient/service user about the possible consequences of such a refusal should also be documented. It may be necessary to consult with a peer, medical practitioner, registered nurse prescriber, pharmacist or manager, as applicable regarding withholding medication. The decision by a patient/service-user or parent / guardian to refuse administration of a medicinal product (after having been provided with information about the drug and the risks and benefits of the therapy) should be respected and the medical practitioner or registered nurse prescriber should be notified". (An Bord Altranais 2007 pg 13)

8.13 Double checking medications:

Double-checking is the process/activity of having a second individual/colleague independently check the preparation of a medication for administration. This may involve verification of the medication against the medical prescription order, performing calculations for dosing of the correct volume or quantity of medication and/or other aspects of medication administration as appropriate. Double-checking is a significant nursing/midwifery activity to facilitate good medication management practices and is a means of reducing medication errors. The use of double-checking medications should be implemented purposefully in situations/indications that most require their use - particularly with high-alert medications. (High-alert medications are drugs that bear an increased risk of causing significant patient harm when they are used in error) (ISMP, 2003) (Appendix II).

8.14 Documentation

The administration of a medicinal product and the patient/service-user response should be accurately documented according to local policy.

8.15 Infection Prevention and Control

Accessing the vascular device potentially puts the patient/service user at risk of infection. Therefore it is critical that RNs/RMs administering IV medications are aware of and adhere to the recommendations in the guidance documents referred to in *Section 4.0 Legislation and other related policies*; with particular reference to hand hygiene, personal protective equipment, safe injection practices, management of sharps and waste and insertion and

management of intravascular catheters using an aseptic technique.

9.0 Administration of IV medication

N.B. the use of needle free systems are recommended.

9.1 The administration of intravenous medications can be given via the following routes:

9.1.1 Administration by direct injection (Bolus) (Point 9.2)
9.1.2 Administration by intermittent infusion (Point 9.3)
9.1.3 Administration by continuous infusion (Point 9.4)

9.2 Administration by Direct Injection, Bolus.

9.2.1 "A direct injection can be used when: the maximum serum concentration of the medicine is required to reach vital organs rapidly, e.g. adrenaline in the case of an emergency; the medicine cannot be further diluted for pharmacological or therapeutic reasons or does not require dilution. Too rapid administration can result in toxic levels and or anaphylactic-type reaction. (Dougherty & Lamb 2008). NB: this does not imply that this route is of quick administration in many cases it is 'slow IV injection' over 1-2 minutes depending on the drug.

9.2.2 This procedure may be carried out via any one of the following:

- An injection port attached to a Vascular Access Device
- An extension set (Dougherty & Lamb 2008)

9.3 Administration by intermittent infusion

9.3.1 The delivery of an intermittent infusion can be by one of the following:

9.3.1.1 Simultaneous infusion: the drug infusion is administered as a secondary infusion run concurrently with the primary infusion, attached to a lower secondary injection port.

9.3.1.2 Volume control set: the drug infusion is administered via a volume control set such as a burette.

9.3.1.3 Directly via the venous access device: the drug infusion is administered via an administration set connected to the venous access device. At the end of each infusion the drug container and administration set must be disconnected and discarded and the venous access device flushed as prescribed.

9.3.1.4 N.B. Some drugs that are administered by intermittent infusion are ready for infusion e.g., metronidazole. Other drugs require constitution and/or dilution prior to infusion. It is necessary to return to the patient at frequent intervals to ensure that the infusion

is being delivered at the correct rate. (Dougherty & Lamb 2008) and to monitor for reactions or side effects.

9.4 Administration by Continuous Infusion

9.4.1 "Continuous infusions constitute the delivery of a medicine within a large volume of solution at a constant rate over a prescribed period of time. This method of IV administration may be selected if the medicines needs to be administered in a highly dilute form, requires a constant plasma concentration to be maintained, e.g., heparin or dopamine. Continuous infusions should be delivered via an infusion device (Pump or syringe driver) to ensure accurate flow rate and even delivery of the medicine. It is unsafe practice to administer IV medication without the use of an infusion pump.

10.0 Implementation Plan

10.1 This policy will be disseminated from the Office of the Nursing and Midwifery Service Director using existing communication structures.

10.1.1 All relevant staff members including those contracted to provide services to the HSE, must sign a signature sheet to confirm that they have read, understand and agree to adhere to the policy (Appendix XIII)

10.2 It is expected that each service area will have a policy/procedure for IV medication administration developed in consultation with the appropriate multidisciplinary team. Such a document should mirror the principles contained within this policy, whereby local variation is acknowledged. The appropriate clinical governance structures should be in place to support the development of a local document, e.g. a drugs and therapeutics committee/ medication safety committee. (if your service area currently has a first dose IV administration policy, please ensure that clinical governance structures are adhered to) Please ensure that at a minimum local policy should detail:

10.2.1 Education and Training; to include:

- Duration in clinical practice before the RN/RM is authorised to undertake IV medication administration unsupervised and any other local prerequisites, if necessary.
- The recognised educational/training programme for the individual area of practice, e.g. a HSE study day in the CNME.
- The frequency of attendance at such educational/training programmes in order to maintain competence in practice.
- The relevant elements of standard precautions including hand hygiene and aseptic technique.

10.2.2 Competence:

- Details as to how competence will be demonstrated to the employer.

- The RN/RM must be satisfied that they can demonstrate competence in intravenous medication administration based on their practice setting.

10.2.3 Procedure:

The procedure section should detail the local practice with regard to:

- The detailed procedure for the administration of medication by way of direct injection, intermittent infusion, continuous infusion.
- Details regarding the mechanism of administration lines including (as per local need) (see appendix V):
    - Peripheral Vascular Access Device
    - Central Venous Access Device
    - Vas Cath
    - Perm Cath
    - Hickman and Broviac catheters
    - Peripherally inserted central catheters (PICC)
    - Implanted Venous Access Ports (port a Cath)
- Maintaining catheter patency
- Catheter replacement frequency
- Flushing techniques for each of the catheters as listed above, with strict adherence to hand hygiene and aseptic technique.

10.2.4 Inclusion and Exclusion Lists

- Consideration must be given with regard to inclusion and exclusion lists for different groups of medication and/or areas of clinical practice, e.g. an IV medication list for a general medical ward may be different to an emergency department and this may be different from an IV medication list in a community setting.
- Special consideration must be given to paediatrics as appropriate.

10.2.5 Management of Anaphylaxis

- The policy must contain an evidence based anaphylaxis algorithm.
- The Director of Nursing and Midwifery must ensure that appropriate education/ training and other systems are in place in order for the RN/RM to effectively manage an anaphylaxis event. e.g. The RN/RM administering the I/V medication should ensure that he/she has received training in Basic Life Support for Health Care Workers within the last 2 years and an approved Anaphylaxis Treatment Training programme. It is also the responsibility of the line manager to ensure that the RN/RM is up to date with BLS and anaphylaxis training.

10.2.6 Complications

- The policy must detail the complications associated with IV medication administration taking into consideration local variations of practice, as well as product/class-related effects.

The sub headings in 10.2 are listed as a minimum and it is not intended to be prescriptive. It is the responsibility of the Director of Nursing/Midwifery to ensure that the RN/RM undertaking IV medication administration is doing so in line with current best practice and local Policies/Procedures/Guidelines and Protocols, and educational programmes are in place to support this.

10.3 Directors of Nursing and Midwifery are responsible for ensuring that sufficient nursing and midwifery staff undertake education and training programmes appropriate to their service requirements in light of emerging developments within the Health Service Executive.

11.0 Revision and Audit:

11.1 This policy should be reviewed two years from the date effective.

11.1.1 The Office of the Nursing and Midwifery Services Director is responsible for further review.

11.1.2 Revision of this document must be considered if new evidence that impacts on this policy emerges in advance of a two year period.

11.1.3 It is expected that each organisation will define the criteria for audit, the mechanism, the personnel involved, the frequency and the reporting requirements.

11.1.4 For guidance and support in relation to audit refer to www.hseland.ie

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13.0 Appendices

Appendix I	First dose – the evidence
Appendix II	High Alert Medications
Appendix III	Complications
Appendix IV	Anaphylaxis
Appendix V	Vascular Access Devices
Appendix VI	Infusion Pumps
Appendix VII	Units and Equivalences
Appendix VIII	Displacement Values
Appendix IX	Example of Visual Infusion Phlebitis Score
Appendix X	List of Key stakeholders that reviewed the policy
Appendix XI	Membership of Working Group
Appendix XII	Membership of Peer Review Group
Appendix XIII	Signature Sheet

Appendix I

First Dose – The Evidence

Following a review of sources available to the National Medicines Information Centre, St. James's Hospital, Dublin in November 2011 no general information was found on the relative risk of anaphylaxis / allergic reaction with first and subsequent administration of IV medicines.

The National Patient Safety Agency (NPSA) in the UK have published documents on promoting safer use of injectable medicines, and on monitoring the administration of injectable medicines: no reference to first versus second dose is made.[1],[2]

The Royal College of Nursing (RCN) in the UK published a document entitled *Standards for Infusion Therapy* (2010). The chapter on various infusion therapies has a section on **intravenous immunoglobulin** (IVIG) therapy: the safety risks of first and subsequent infusions are addressed – **it is recommended that first and second doses of IVIG are administered in a hospital setting**. However, in the sections on other infusion therapies, including the one on medication and solution administration, no specific reference is made to the risks of first and subsequent dose(s) [3].

Trowbridge and Kralik[4] (2006) conclude the routine practice of administering the first does of intravenous antibiotic therapy in a hospital setting with medical supervision appears to have little merit. They further conclude that there is no increased risk of adverse drug reaction (including anaphylaxis associated with first and second dose intravenous antibiotic therapy) if suitable clients are chosen, and community nurses are educated to closely monitor, manage and record all reactions as they occur. The literature underscores the necessity for documented emergency plans, including information sheets for candidates and their carers, detailing the management plan for anaphylaxis. When clients are supported by a multidisciplinary approach in the community (under the direct care of a medical officer or GP in conjunction with the community nurse), education and training for all involved will improve outcomes for the candidates and the providing service.

[1] NHS NPSA Patient Safety Alert 20 (2007) *Promoting safer use of injectable medicines*. Accessed online at www.nrls.npsa.nhs.uk on 02/11/2011.
[2] NHS NPSA Workforce competence statement *monitoring the administration of injectable medicines* (2007) accessed online at www.nrls.npsa.nhs.uk on 02/11/2011.
[3] RCN Standards for infusion therapy (2010) accessed online at www.rcn.org.uk on 02/11/2011.
[4] Trowbridge K, Kralik, D. (2006) Evidence for intravenous antibiotic therapy in the community. Australian Nursing Journal. 13, 9, 28-31.

Appendix II

High Alert Medications

High Alert Intravenous Medications

The following section was taken directly from the website from the Institute for Safe Medication Practice. The section below contains a list of drugs which have been highlighted as high alert medication in the IV form and this should be noted by registered nurses/ midwives / doctors. For more information about high alert medications please go to website www.ismp.org.

High Alert Medications

These are medications that bear a heightened risk of causing significant patient harm when they are used in error. While errors with these types of medications may or may not be more common, the consequences of errors with high alert medications are more serious for patients. These medications are listed here. We expect that you will use this list to determine which medications require special safeguards to reduce the risk of errors. This may include strategies like improving access to information about these medications; limiting access to high-alert medications; using auxiliary labels and automated alerts; standardising the ordering, storage, preparation, and administration of these products; and employing redundancies such as automated or independent double checks when necessary. (Note: manual independent double-checks is not always the optimal error-reduction strategy and may not be practical for all of the medications on the list).

Classes / Categories of Medications

Adrenergic agonists, IV (e.g. epinephrine, phenylephrine, norepinephrine)
Adrenergic antagonists, IV (e.g., propranolol, metoprolol, labetalol)
Anaesthetic agents, general, inhaled and IV (e.g. propofol, ketamine)
Antiarrythmics, IV (e.g. lidocaine, amiodarone)
Antithrombotic agents (anticoagulants), including warfarin, low-molecular-weight heparin, IV unfractionated heparin, Factor Xa inhibitors (fondaparinux), direct thrombin inhibitors (e.g. argatroban, lepirudin, bivalirudin), thrombolytics (e.g. alteplase, reteplase, tenecteplase), and glycoprotein IIb/IIIa inhibitors (e.g., eptifibatide)
Cardioplegic solutions
Chemotherapeutic agents, parenteral and oral
Dextrose, hypertonic, 20% or greater
Dialysis solutions, peritoneal and haemodialysis

Classes / Categories of Medications

Epidural or Intrathecal medications
Inotropic medications, IV (e.g. digoxin, milrinone)
Liposomal forms of medications (e.g. liposomal amphotericin B) and conventional counterparts (e.g. amphotericin B deoxycholate)
Sedation agents, IV (e.g., midazolam)
Sedation agents, oral, for children (e.g. choral hydrate)
Narcotics/opiates, IV, transdermal, and oral (including liquid concentrates, immediate and sustained-release formulations)
Neuromuscular blocking agents (e.g. succinylchoilne, rocuronium, vecuronium) radiocontrast agents, IV
Total parenteral nutrition solutions

Specific Medications

Colchicine injection
Epoprostenol (Flolan) IV
Insulin, subcutaneous and IV
Magnesium sulphate injection
Opium tincture
Oxytocin, IV
Nitroprusside sodium for injection
Potassium chloride for injection
Concentrate Potassium phosphates
Injection Promethazine, IV
Sodium chloride for injection, hypertonic (greater than 0.9% concentration)
Sterile water for injection, inhalation, and irrigation (excluding pour bottles) in containers of 100ml or more.
This list was reproduced from www.ismp.org (accessed 15.01.2012)

Appendix III

Complications[5]

Specific complications that can arise following the procedure of cannulation include infiltration, extravasation, venous spasm, phlebitis, thrombophlebitis, haematoma, nerve injury, arterial puncture, embolism and needle stick injury. Children are at greater risk of complications due to the smaller size of their veins and reduced blood flow around the cannula tip (Bravery, 1999). It is critical for the nurse to detect and prevent complications arising and to treat as required. It is especially important for patients who may not be able to verbalise pain.

Infiltration	○ **Infiltration is the inadvertent administration of a non-vesicant (non irritant) solution of medication into surrounding tissue (Wong, 2007)**
Cause	○ Peripheral intravenous cannula occlusion or misplacement causing fluid to infiltrate the tissues. When a peripheral cannula is difficult to flush, trauma to the vessel wall can occur, which weakens the wall and increases the probability of infiltration from leakage.
Signs	○ Swelling and oedema, pain, loss of mobility or reluctance to move the affected limb. ○ Discolouration and coolness of the site adjacent to cannula. It can be measured according to the infiltration scale.
Prevention	○ Regular monitoring (hourly) of cannula site helps prevent infiltration ○ Ensure the cannula is secured correctly
Treatment	○ Immediately remove the cannula ○ Apply an appropriate dressing ○ Administer analgesia as prescribed

[5] Source: taken entirely from the National Clinical Policy and Procedural Guideline for Nurses and Midwives undertaking peripheral cannulation in adults. Health Service Executive April 2010

Extravasation	**Extravasation is the inadvertent administration of a vesicant (irritant) solution of medication into surrounding tissue (Wong, 2007)**
Cause	Leakage if vesicant solutions into the tissues. Examples of vesicant solutions are Dextrose 10%, Total Parenteral Nutrition, Calcium, Potassium Chloride (KCL high doses) and chemotherapy.
Signs	○ Pain ○ Reluctance to move affected limb ○ Blistering, burning sensation, ischemia, necrosis and tissue sloughing
Prevention	○ Early detection and immediate action is crucial, with at least hourly monitoring of the cannulation site. ○ Ensure the cannula is secured correctly
Treatment	○ Immediately remove the cannula and apply an appropriate dressing ○ Administer analgesia as prescribed ○ Consult with medical personnel about specific solutions and their treatment

Venous Spasm	**Venous Spasm is a sudden involuntary contraction of the vein, resulting in temporary cessation of blood flow in the vein.**
Cause	Venous spasm is caused by fear and anxiety and is usually stimulated by cold infusates, and mechanical or chemical irritation
Signs	○ Expressions of pain ○ Cramping ○ Numbness above the infusion site
Prevention	○ Explain the procedure to reduce fear and anxiety ○ Give infusions at room temperature (commence infusions slowly)
Treatment	○ Gently massage or warm the limb and retry ○ Slow down the process of cannulation (there is no need to remove the cannula) ○ Wait for the vein to relax and wait for blood to return into the flash chamber before processing ○ During intravenous therapy, reduce the rate of infusion flow, especially in solutions known to be irritant

Phlebitis	**Phlebitis is an acute inflammation of the intima of a vein (Dougherty, 2008)**
Cause	○ **Mechanical phlebitis**: vein irritation caused by too large a cannula, a fast rate of infusion, excessive bending of the arm or manipulation of the cannula. ○ **Chemical phlebitis**: can be caused by medications or solutions (acid or alkaline). Risk of phlebitis increases with an abnormal pH. ○ **Bacterial / Septic phlebitis**: introduction of an infectious agent at the cannula site; migration of common skin organisms through the cannula.
Signs	○ Expressions of pain ○ Loss of mobility or reluctance to move the affected limb ○ Redness, inflammation or purulent ooze at the cannula site
Prevention	○ Early detection is crucial, with at least one hourly monitoring of the cannulation site. If vesicant, solutions are infusing, increase the monitoring of the site.
Treatment	○ Stop the infusion and remove the cannula ○ Assess the degree of phlebitis (Phlebitis Score – Jackson, 1998) ○ Take a swab of the site for culture and sensitivity ○ Clean and apply a dressing, to the affected area and administer analgesia as prescribed ○ Report the incident of this complication ○ Treat as prescribed and document the care given

Thrombophlebitis	**Thrombophlebitis is the inflammation of a vein with a thrombus formation**
Cause	○ Traumatic cannulation by an unskilled practitioner or multiple attempts ○ Use of too large a cannula for the size of the vein ○ Infusion of high pH solution or poor circulation with venous stasis
Signs	○ Local redness, hard and torturous feel of the vein, heat, painful to touch or move ○ Expressions of pain
Prevention	○ Early detection is crucial with at least one hourly monitoring of the cannulation site ○ Appropriate site selection ○ Appropriate selection of equipment for size of vein ○ Skilled technique
Treatment	○ Discontinue infusion, remove the cannula, and elevate the extremity ○ Report the incident of this complication as per local organisational policy ○ Treat as prescribed and document the care

Haematoma	**Haematoma is the formation of a painful and hard swelling at the site of the cannula**
Cause	○ Infiltration of fluid into the tissue at the site of the cannula, resulting in the formation of a painful and hard swelling ○ Inappropriate use of a small fragile vein, or too large a needle ○ Excessive probing to find the vein ○ Removing the needle prior to releasing the tourniquet ○ The needle going all the way through the vein ○ The needle only partially entering the vein, allowing leakage
Signs	○ Expressions of pain, loss of mobility or reluctance to move the affected limb ○ Swelling, discolouration or coolness of the area adjacent to the cannula
Prevention	○ Selection of appropriate equipment for the size of the vein ○ Skilled technique
Treatment	○ Release the tourniquet, remove the cannula and apply pressure until haemostasis has been achieved ○ Elevate the limb and apply a cool compress if necessary, avoiding an ice burn ○ Apply a pressure dressing if bleeding is persistent ○ Explain what has happened and request that staff are informed if the area becomes painful as the haematoma may be pressing on a nerve ○ Do not reapply the tourniquet to the affected limb ○ Request a medical review, if required ○ Monitor, treat as prescribed and document in the nursing care plan ○ Report the occurrence of this complication, as per local organisational policy

Speedshock	**Speedshock is a systemic reaction that occurs when a substance foreign to the body is rapidly introduced to the circulation (Perdue 2001; Weinstein 2007)**
Cause	○ Administration of a bolus medication or an infusion containing a medication at a rapid rate ○ Can occur if even a small volume of medication is given ○ Rapid injections enter the serum in toxic proportions and flood the heart and brain with medication (Perdue 2001; Phillips 2005)
Signs	○ When medications are administered the patient should be observed for dizziness, facial flushing, headache and medication-specific symptoms. ○ Tightness in the chest ○ Hypotension ○ Irregular pulse ○ And anaphylactic shock (Perdue 2001)
Prevention	○ Speedshock can be prevented. Practitioners should know the medication being administered and ensure that it is delivered at the manufacturers recommended rate. (Perdue 2001; Philips 2005) ○ Gravity flow administration sets, electronic flow control devices and volumetric chambers are available for use and the most suitable appliance should be used for those patients who are at risk of developing complications . (Perdue 2005)
Treatment	○ The administration of medicine and/or infusion should be performed over the specified time. The practitioner administering the medication and/or infusion should have the knowledge of the speed or rate over which to perform administration. ○ He/She must be able to recognise the clinical features of Speedshock and should it occur be able to act accordingly and notify the doctor (RCN 2005) ○ Immediately discontinue the infusion on recognition of the first symptom of Speedshock and maintain the IV device for emergency intervention (Perdue 2001)

Appendix IV [6]

Anaphylaxis information, recommended Anaphylaxis Kit and Anaphylaxis Algorithm and how to reduce the risks.

Definition of anaphylaxis

A precise definition of anaphylaxis is not important for the emergency treatment of an anaphylactic reaction. There is no university agreed definition. The European Academy of Allergology and Clinical Immunology Nomenclature Committee proposed the following broad definition[7].

Anaphylaxis is a severe, life-threatening, generalised or systemic hypersensitivity reaction.

This is characterised by rapidly developing life-threatening airway and/or breathing circulation problems usually associated with skin and mucosal changes.

Epidemiology

One of the problems is that anaphylaxis is not always recognised, so certain UK studies may underestimate the incidence. Also, as the criteria for inclusion vary in different studies and countries, a picture has to be built up from different sources.

Incident rate

The American College of Allergy, Asthma and Immunology Epidemiology of Anaphylaxis Working group summarised the findings from a number of important international epidemiological studies and concluded that the overall frequency of episodes of anaphylaxis using current data lies between 30 and 950 cases per 100,000 persons per year[8].

Lifetime prevalence

The same group provided data indicating a lifetime prevalence of between 50 and 2000 episodes per 100,000 persons or 0.05-2.0%. More recent UK primary care data concur, indicating a lifetime age-standardised prevalence of a recorded diagnosis of anaphylaxis of 75.5 per 100,000 in 2005[9]. Calculations based on these data indicate that approximately 1 in 1,333 of the English population have experienced anaphylaxis at some point in their lives.

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[6] Source: Emergency treatment of anaphylactic reactions Guidelines for healthcare providers Working Group of the Resuscitation Council (UK) January 2008. Reproduced with kind permission of the Resuscitation council (UK).

[7] Johansson SG, Bieber T, Dahl R, Friedmann PS, Lanier BQ, Lockey RF, et al. Revised nomenclature for allergy for global use: Report of the Nomenclature Review Committee of the World Allergy Organization,
October 2003. *J Allergy Clin Immunol* 2004;113(5):832 6.

[8] Lieberman P, Camargo CA, Jr., Bohlke K, Jick H, Miller RL, Sheikh A, et al. Epidemiology of anaphylaxis: findings of the American College of Allergy, Asthma and Immunology Epidemiology of Anaphylaxis Working Group. *Ann Allergy Asthma Immunol* 2006;97(5):596-602.

[9] Sheikh A, Hippisley-Cox J, Newton J, Fenty J. Trends in national incidence, lifetime prevalence and adrenaline prescribing for anaphylaxis in England. *Journal Royal Society of Medicine.* In press.

A retrospective study of Emergency Department attendances, identifying only the most severe cases, and relating this number to the population served, estimated that approximately 1 in 3,500 patients had an episode of anaphylaxis during the study period 1993-4[10]. Taking specific causes of anaphylaxis where prevalence and severity data are available, there are 1 million cases of venom anaphylaxis and 0.4 million cases of nut anaphylaxis up to age 44 years worldwide.

Triggers

Anaphylaxis can be triggered by any of a very broad range of triggers, but those most commonly identified include food, drugs and venom[11]. The relative importance of these varies very considerably with age, with food being particularly important in children and medicinal products being much more common triggers in older people[12]. Virtually any food or class or drug can be implicated, although the classes of foods and drugs responsible for the majority of reactions are well described. Of foods, nuts are the most common cause; muscle relaxants, antibiotics, NSAIDs, and aspirin are the most commonly implicated drugs. It is important to note that, in many cases, no cause can be identified. A significant number of cases of anaphylaxis are idiopathic (non IgE mediated).

Stings	**47**	29 wasp, 4 bee, 14 unknown
Nuts	**32**	10 peanut, 6 walnut, 2 almond, 2 brazil, 1 hazel, 11 mixed or unknown
Food possible cause	**13**	5 milk, 2 fish, 2 chickpea, 2 crustacean, 1 banana, 1 snail
Antibiotics	**27**	11 penicillin, 12 cephalosporin, 2 amphotericin, 1 ciprofloxacin, 1 vancomycin
Anaestethic drugs	**39**	19 suxamethonium, 7 vecuronium, 6 altracurium, 7 at induction
Other drugs	**24**	6 NSAIDs*, 3 ACEI**, 5 gelantins, 2 protamine, 2 vitamin K, 1 each-etoposide, acetazolaminde, pethadine, local anaestethic, diamorphine, streptokinase
Contrast media	**11**	9 iodinated, 1 technetiu, 1 fluorescein
Other	**3**	1 latex, 1 hair dye, 1 hyatid

Suspected triggers for fatal anaphylactic reaction in the UK between 1992 – 2001[6].
***NSAIDs = Non-Steroidal Anti-Inflammatories**
****ACEIs = Angiotensin-converting Enzyme Inhibitors**

[10] Stewart AG, Ewan PW. The incidence, aetiology and management of anaphylaxis presenting to an accident and emergency department. *QJM* 1996;89(11):859-64.
[11] Pumphrey RS. Fatal anaphylaxis in the UK, 1992-2001. *Novartis Found Symp* 2004;257:116-28; discussion 128-32, 157-60, 276-85.
[12] Alves B, Sheikh A. Age specific aetiology of anaphylaxis. *Arch Dis Child* 2001;85(4):348.

Mortality
The overall prognosis of anaphylaxis is good, with a case fatality ratio of less than 1% reported in most population-based studies. Risk of death, is, however, increased in those with pre-existing asthma, particularly if the asthma is poorly controlled or in those asthmatics who fail to use, or delay treatment with, adrenaline[13]. There are approximately 20 anaphylaxis deaths reported each year in the UK, although this may be a substantial under-estimate.

Risk of recurrence
The risk of an individual suffering recurrent anaphylactic reaction appears to be quite substantial, being estimated at approximately 1 in 12 per year. [8]

Trends over time
There are very limited data on trends in anaphylaxis internationally, but data indicate a dramatic increase in the rate of hospital admissions for anaphylaxis, this increasing from 0.5 to 3.6 admissions per 100,000 between 1990 and 2004: an increase of 700% (Figure 1)[14] [15]

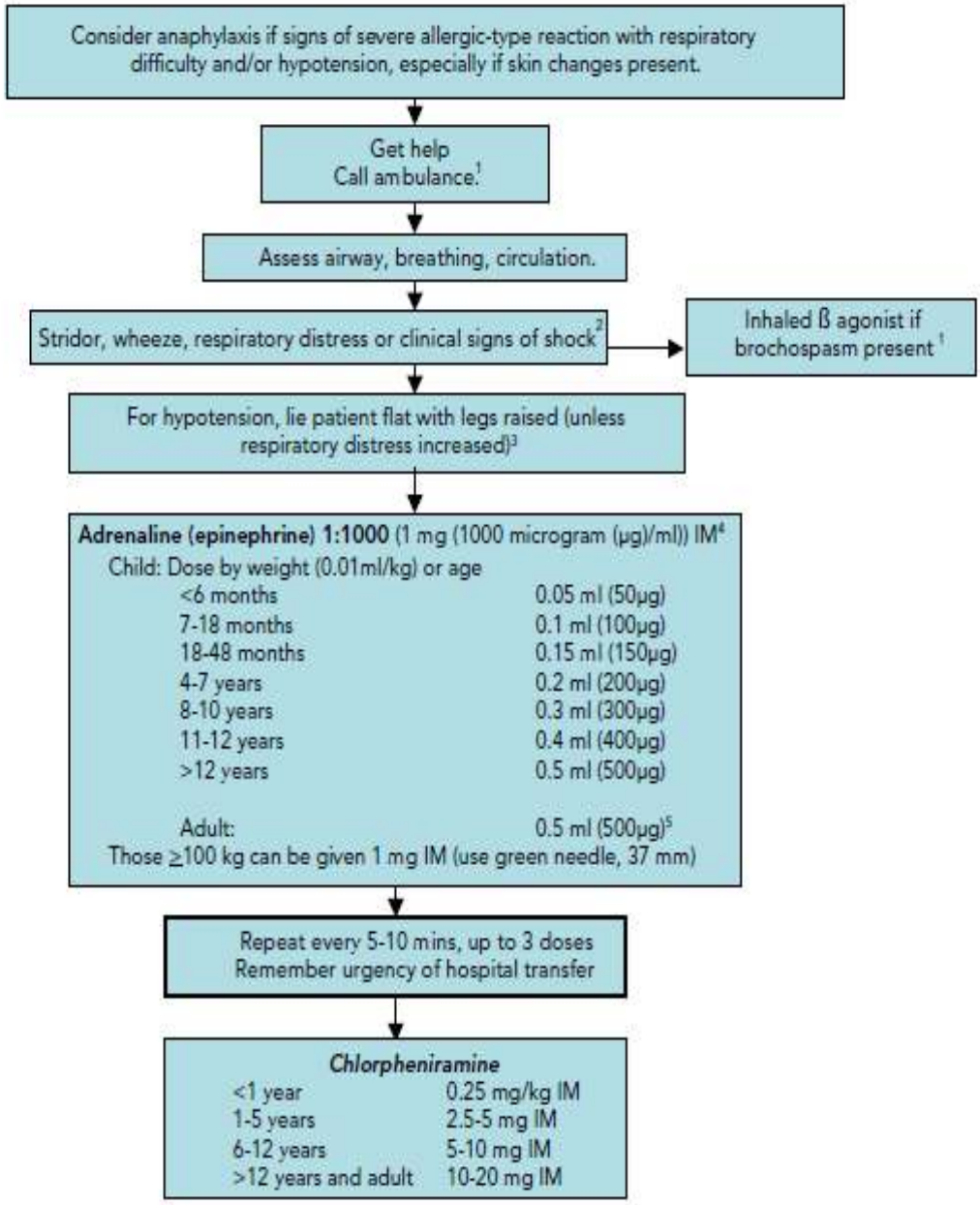
Example of Anaphylaxis Kit:

1. Adrenaline 1mg 1:1000 Ampoules x 2
2. 1ml syringes x 4
3. 5ml syringes x 4
4. 23g needles x 4
5. Hydrocortisone 100mg x 4 Ampoules
6. Water for injection 10mls x 2
7. Chlorphenamine 10mg x 2 Ampoules
8. Pocket face mask x 2 (1 adult / 1 child)
9. Clearly marked kit box
10. Copy of Anaphylactic guidelines

Consider storage in relation to light sensitivity of adrenaline and medication reconstitution. It is recommended that medications are available in their original boxes.

[13] Gupta R, Sheikh A, Strachan DP, Anderson HR. Burden of allergic disease in the UK: secondary analyses of national databases. *Clin Exp Allergy* 2004;34(4):520-6.
[14] Mullins RJ. Anaphylaxis: risk factors for recurrence. *Clin Exp Allergy* 2003;33(8):1033-40.
[15] Gupta R, Sheikh A, Strachan DP, Anderson HR. Time trends in allergic disorders in the UK. *Thorax* 2007;62(1):91-6.

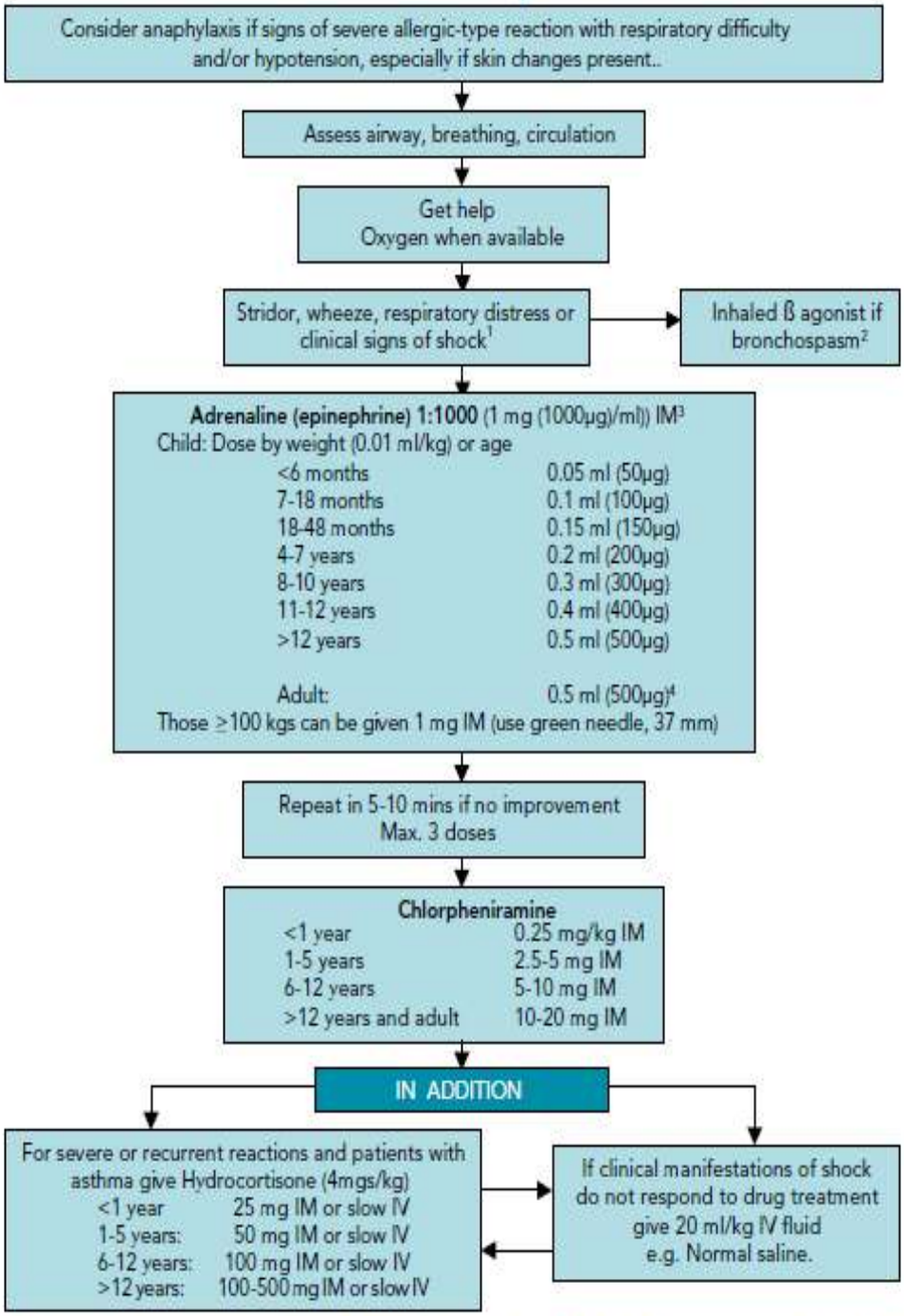
Anaphylactic Reactions: Treatment in the Community



1. Ambulance will be equipped with oxygen, salbutamol and fluids.
2. If profound shock judged **immediately** life-threatening, give CPR if necessary.
3. If respiratory distress present, elevate head, provided BP adequate to prevent loss of consciousness.
4. Adrenaline maximum effect 10 minutes after IM injection.

Note: Microgram = µg

Anaphylactic Reactions: Treatment Algorithm for First Medical Responders



1. If profound shock judged **immediately** life-threatening, give CPR/ALS if necessary. Consider slow IV adrenaline (epinephrine) 1:10,000 solution if severe hypotension. Dose 10 microgram/kg., max. 500 micrograms, over several minutes. This is **hazardous** and is recommended only for hospital setting. Note the different strength for IV use.
2. An inhaled beta$_2$-agonist such as salbutamol may be used if bronchospasm is severe and does not respond rapidly to other treatment.
3. Adrenaline maximum effect 10 minutes after IM injection.
4. If a patient on beta-blockers has not improved after 2-3 doses of Adrenaline, consider giving Glucagon, 2-3 micrograms/kg (max.1-2mgs) IV over 5 minutes, IV salbutamol, and/or IV atropine.

Note 4 replaced. Updated December 2009

Table 1 Vasovagal episode v. Anaphylaxis

		Vasovagal episode	Anaphylaxis
Onset		Immediate	Usually within 5 mins, but can occur within 1-2 hours
Symptoms/ signs	**Skin**	Generalised pallor; cold, clammy skin	Itch, generalised erythema, urticaria or angio-oedema (localised swelling of face, mouth, etc.)
	Respiratory	Normal or shallow, not laboured	Cough, wheeze, stridor, tachypnoea, recession, cyanosis
	Cardiovascular	Bradycardia but strong carotid pulse Hypotension corrected when lying down	Tachycardia, weak/ absent pulse Sustained hypotension unless specific treatment
	Neurological	Light-headed Possible loss of consciousness Improves on lying down	Severe anxiety and distress Loss of consciousness

The tables above are examples have been reproduced from the Royal College of Physicians, Ireland, National Immunisation Advisory Committee[16]. The management of anaphylaxis needs to be explicit in each service therefore it is recommended that the above algorithms are provided by way of example and it is the responsibility of each service to ensure that they have an appropriate up to date algorithm for their service and the Registered Nurse must maintain necessary competence.

It is understood as of December 2012 the NIAC is currently updating the algorithms.

[16] Immunisation Guidelines for Ireland. Royal College of Physicians of Ireland. National Immunisation Advisory Committee. Pages II, III and V

How to reduce the risk[17]

1. **Ensure patients understand their allergies**

   Patients must be aware of the medication(s) to avoid and the nature of their reaction and carry this information with them, e.g. in a Medic-Alert bracelet or similar. Referral to an allergy specialist may be helpful, particularly where there is doubt as to which medication a patient is allergic to.

2. **Check allergy status immediately before prescribing, dispensing or administering medication: Every drug, every patient, every time**.

   Failure to consider allergies when prescribing, dispensing or administering medication is the crucial contributory factor to this error type. A shift in practice is needed to ensure allergy status is considered at the essential point, i.e. immediately before prescribing, dispensing or administering any medication. A known allergen was prescribed and/or administered, despite the allergy being documented on the front of the Prescription and Administration
   Record in 63 of 66 reported incidents/near misses in an Irish teaching hospital[18]. 50% of doctors and pharmacists and 35% of nurses stated they would not always check the patient's allergy status before prescribing/administering/endorsing a new antibiotic to/for a patient with no documentation in the allergies section on the Prescription and Administration Record[19]. This highlights the key process issues, i.e. allergies are not always considered at the essential point.

3. **Check reliable reference for cross-allergies**

   Lack of knowledge or information regarding cross-sensitivity, i.e. which medications are contra-indicated when an allergy is documented, is common among healthcare professionals.
   19/30 doctors, 11.38 nurses and 18/18 pharmacists correctly identified Tazocin © from a list of medications as being contra-indicated in penicillin allergy[17].
   Referring to reliable drug references, e.g. British National Formulary or Summaries of Product Characteristics (product information) on www.imb.ie or www.medicines.ie, is necessary.

[17] Clinical Indemnity Scheme Newsletter March 2011, reproduced with kind permission from the State Claims Agency.
[18] Personal Communication, 2010
[19] Morris, C, Gowing C, Seoighe A, Kirke C. Can we improve the management of drug allergies and anaphlyaxis? Hospital Pharmacists' Association of Ireland (HPAI) Annual Educational Meeting, April 2008.

4. **Document / record allergies to medication**

Lack of availability / accessibility of reliable information regarding patient's allergy history at the point of prescribing, dispensing or administering medication can result in this error type. This may be due to the patient's record/documentation being inaccessible, incorrect or incomplete, or when the patient is not able to communicate or their knowledge is incorrect (e.g. state allergy to the wrong medication) or incomplete (e.g. unsure of nature of the reaction or to which medication)
The Drug Prescription and Administration Record and all prescription forms should include a section to document allergies/intolerances to medication.
The allergy section should always be completed, with the allergy or NKDA (No Known Drug Allergies) before prescribing and/or administering any medication. Allergy wristbands are used is some hospitals as an extra warning that a patient has an allergy. They should act as a trigger to confirm the allergy status with the patient's chart. The efficacy of this strategy varies and care must be taken if implementing this to ensure that it has maximum impact and avoids the problems identified in many areas, i.e. failure to consider wristband warning when prescribing and administering known allergens, confusion with other wristband alerts, failure to apply wristbands, lack of clarity regarding responsibilities to apply wristbands.

5. **Maximise the impact of computerised systems**.

Computerised prescribing systems can eliminate the risk of this error type, if they are configured to:

a. Require the entry of allergies of NKDA (No Known Drug Allergies) before the first medication is prescribed.
b. Cross-reference allergens with alerts to prescribers if an allergen is prescribed.
c. Ensure that alerts cannot be over-ridden, or that they can be over-ridden only if the allergy status is updated (e.g. if documented allergy status was incorrect)

However, if systems are not configured in this way, healthcare professionals may rely on them to prevent the errors with known allergens and an error may therefore not be intercepted by the computerised system.

6. Treatment of anaphylaxis

Rapid diagnosis and evidence based treatment of allergies and anaphylaxis can minimise the impact on the patient. Anaphylaxis to medication can be rapidly fatal. Analysis of fatal anaphylactic reactions[20] included 21 patients who suffered reactions to drugs. They found anaphylaxis occurred a median of 5 minutes following contact with the drug (range 1 – 120 minutes), with immediate deaths in 10 and delayed deaths in 11. Shock without respiratory compromise occurred in 12 of the 21 drug related anaphylactic deaths. Pulmonary oedema was present at post-mortem in 18 of 21 deaths, but in many cases of fatal anaphylaxis, no specific findings are present at post-mortem.

- Ensure that treatment guidelines are accessible, clear and that healthcare professionals are trained in their use
- Ensure that facilities for the treatment of anaphylaxis (including availability of oxygen, adrenaline for intramuscular injection, chlorpheniramine, hydrocortisone and intravenous fluids) are available in all areas that medication is administered.

Is it a "True" Allergy?

Occasionally, a patient may believe that they have an allergy or intolerance, but the history is inconsistent with this. Healthcare professionals may be faced with a dilemma, as using the medication may risk a serious or fatal adverse reaction or anaphylaxis, while avoiding the medication unnecessarily may lead to the use of more expensive and less effective drugs.

In this circumstance, healthcare professionals must ensure that medication is not prescribed, dispensed or administered unless the following process is followed:

a. The allergy or intolerance has been outruled (this may include allergy testing where available)
b. A discussion has taken place with the patient detailing the risks and benefits of proposed treatments and alternatives
c. The patient expressly agrees to receiving treatment with the proposed medication
d. The discussion with the patient and risk/benefit consideration is documented in the Healthcare Record.
e. All documentation of the allergy is amended to indicate the patient's true status.
f. The patient (and/or parents, carers) and healthcare professionals providing care to them (e.g. GP, nursing home, hospitals) are informed of the updated information.

20 Pumphrey, RSH, Roberts ISD. Postmortem findings after fatal anaphylactic reactions. J Clin Pathol 2000; 53: 273-276.

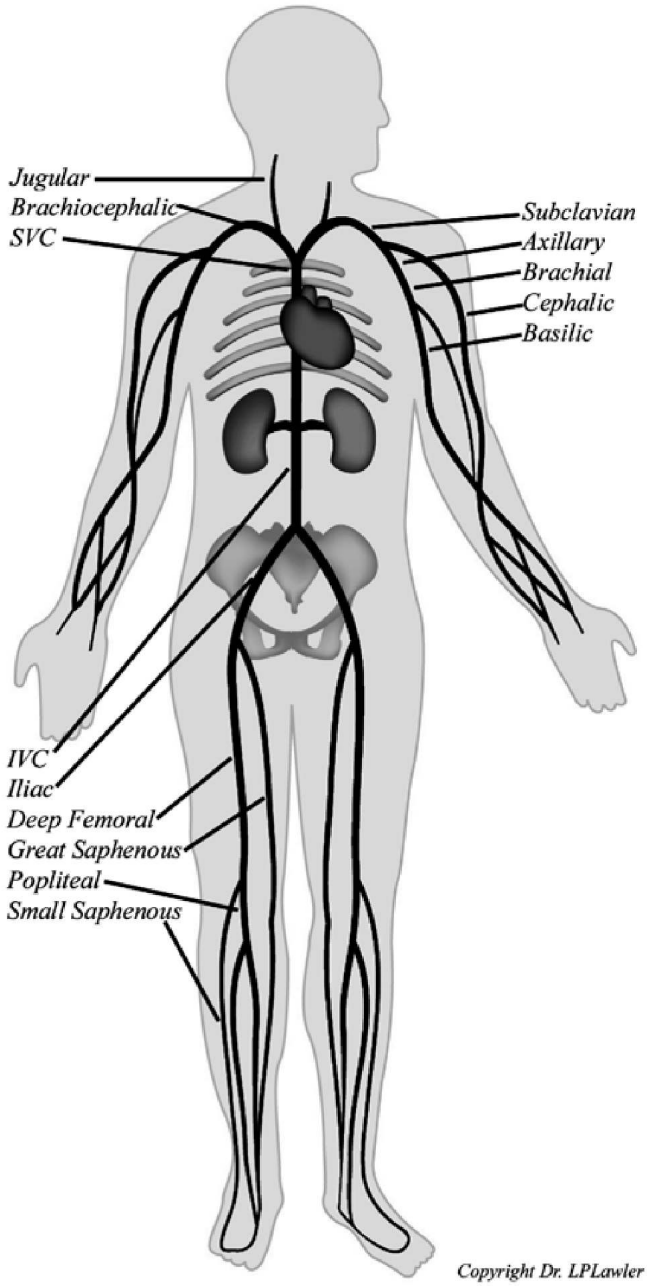
Further Information

The Irish Medication Safety Network is preparing "Best Practice Guidelines for Reducing Preventable Harm to Patients with Known Drug Allergies in Irish Hospitals" which will be available shortly on their website: www.imsn.ie.

Appendix V:

Vascular Access Devices[21]

Anatomic Points of Access for Intravascular Catheters



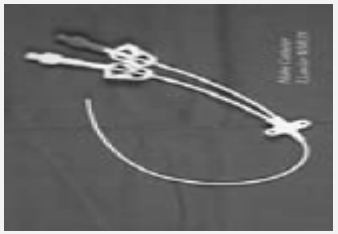
[21] Taken directly from Appendix 4 & Appendix 5 SARI Prevention of Intravascular Catheter-related Infection Sub-Committee. Health Protection Surveillance Centre December 2009 Updated February 2010. Published on behalf of SARI by HSE Health Protection Surveillance Centre. Reproduced for this policy document with kind permission from Dr. LP Lawlor.

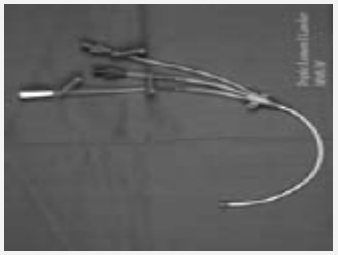
Vascular Access Device[22]

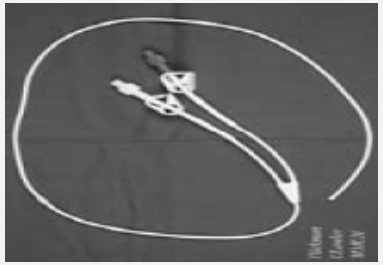
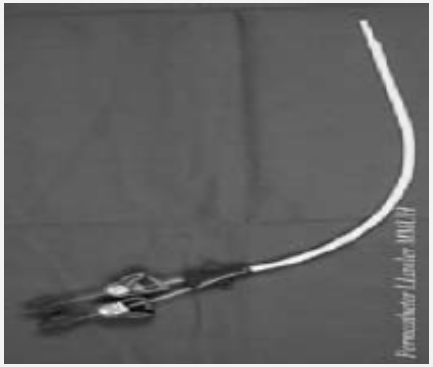
Description	Catheter type		Common Use	Characteristics	Common site of access	Common site of tip	Anticipated duration/ Term
Peripheral Vascular Catheters (PVC)	Angiocath		Medication Fluids	Short Peripheral Single Lumen	Arm Forearm Hand	Peripheral Arm	Short 7-10d
	Vascular Sheath		Artery Monitor Intravascular Catheter Access Medication Fluid Blood draw	Single Lumen Large Calibre Possible Side arm	Common Femoral Vein Basilic Cephalic Femoral artery Radial artery	Iliac vein	Short 7-10d

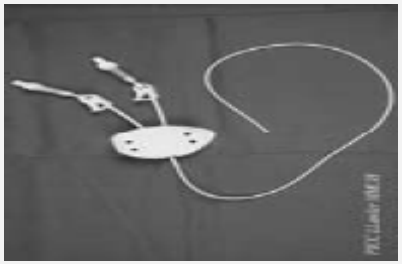
PVC = Peripheral Vascular Catheter.
CVC = Central Venous Catheter.
PICC = Peripherally Inserted Central Catheter
SVC = Superior Vena Cava
TPN = Total Parenteral Nutrition

[22] Source: Reproduced with kind permission from St. James's Hospital Intravenous Practice Steering Committee Intravenous Medication Administration Protocol. Protocol No.-SJH:NA(Pt)16

Description	Catheter type		Common Use	Characteristics	Common site of access	Common site of tip	Anticipated duration/ Term
Non tunnelled CVC Most commonly used CVC. Inserted percutaneously via either the subclavian or jugular vein into the SVC. Unlike tunnelled CVCs the CVC enters the skin at a site close to the entry point into the vein with no bacteriostatic cuff	Hohn catheter		Medication Fluid Blood Draw	3 or 4 Lumen Moderate Calibre Possible Side arm	Subclavian Internal Jugular	Central SVC	Short 7-14 d

Description	Catheter type		Common Use	Characteristics	Common site of access	Common site of tip	Anticipated duration/ Term
	Triple lumen		Medication Fluid Blood draw TPN	3 or 4 Lumen Moderate Calibre Defined Length	Subclavian Internal Jugular	Central SVC	Short 7 – 10 d
	Vascath		Acute Pheresis Acute Stem Cell Harvest Acute Dialysis	2 Lumen Large Calibre	Subclavian Internal Jugular Femoral vein	Central SVC Iliac vein	Short 7 – 10 d

Description	Catheter type		Common Use	Characteristics	Common site of access	Common site of tip	Anticipated duration/ Term
Tunnelled CVCs Long term CVCs, the proximal end of which exits via a subcutaneous tunnel from the lower anterior chest wall, remote from the point of entry to the vein. A felt Dacron cuff is used to anchor the CVC in place subcutaneously, where it becomes enclosed by fibrous tissue, which not only makes the CVC more stable but also creates a tissue interface that acts as a barrier against the migration of micro-organisms.	Hickman		Medication Chemotherapy TPN Stem Cell Infusion Blood draw	Image guided or Surgical placement	Subclavian Internal Jugular	Central SVC	Long months - years
	Permcath		Chronic Pheresis Stem Cell Harvest Chronic dialysis	Image guided or Surgical placement Defined length	Subclavian Internal Jugular Femoral vein	Central SVC	Long Months – Year

Description	Catheter type		Common Use	Characteristics	Common site of access	Common site of tip	Anticipated duration/ Term
PICC Provides an alternative or jugular vein catheterisation. Inserted peripherally at or above the antecubital space into the cephalic, basilic, medial cephalic or medial basilic vein, after which it is advanced into the superior vena cava.	PICC		Medication TPN Fluid Blood draw	1 or 2 Lumen Small calibre Patient defined length	Arm Basilic / Cephalic	Central SVC	Medium to long term
Totally Implantable Central Venous Access Ports Inserted completely beneath the skin and surgically placed as either a central subclavian port or as a peripheral port in the antecubital fossa. Available as a single or double-lumen CVCs; with or without the Grohong valve (a two-slit valve that remains closed unless the CVC is in use)	Intraport		Medication Chemotherapy	Image Guided or Surgical Placement Patient defined Length	Subclavian Internal Jugular Femoral Vein	Central SVC	Long Months - Years

Appendix VI

Infusion Pumps[23]

External infusion pumps are medical devices that deliver fluids, including nutrients and medications such as antibiotics, chemotherapy drugs, and pain relievers, into a patient's body in controlled amounts. Many types of pumps, including large volume, patient controlled analgesia, elastomeric, syringe and enteral.

PATIENT CONTROLLED ANALGESIA (PCA) INFUSION PUMP
An infusion pump intended for the delivery of analgesics (pain relievers), which is equipped with a feature that allows for additional limited delivery of medication upon patient demand.

ELASTOMERIC INFUSION PUMP
An infusion pump which utilises the energy in an elastic membrane to provide the force for fluid delivery.

SYRINGE INFUSION PUMP
An external infusion pump which utilises a piston syringe as the fluid reservoir and to control fluid delivery.

ENTERAL INFUSION PUMP
An infusion pump that delivers liquid nutrients and medicines into the patient's digestive tract.

[23] http://www.fda.gov/MedicalDevices/ProductsandMedicalProcedures/GeneralHospitalDevicesandSupplies/InfusionPumps/ucm202495.htm [accessed 5th November 2011]

Appendix VII

Units and Equivalences – Reproduced with permission from John Kelly BSc. (Pharm), PgDip. (Clinical Pharmacy), Pharmacist, Mayo General Hospital.

Equivalences of Weight

Unit	**Equivalent**
1 kilogram (kg)	1,000grams (g)
1 gram (g)	1,000milligrams (mg)
1 milligram (mg)	1,000 micrograms
1 microgram	1,000 nanograms (ng)

Equivalences of Volume

Unit	**Equivalent**
1 litre (l)	1,000 millilitres (ml)

Equivalences of Substance

Unit	Equivalent
1 mole (mol)	1,000 millimoles (mmol)
1 millimole (mmol)	1,000 micromoles (mcmol)

To convert from a larger unit to the next smaller unit multiply by 1,000
To convert from a smaller unit to the next larger unit divide by 1,000

Lapham and Agar, 2009.

Appendix VIII

Displacements Values – Reproduced with permission from John Kelly BSc.(Pharm), PgDip.(Clinical Pharmacy), Pharmacist, Mayo General Hospital.

When reconstituting a powder for injection with a solvent, the increase in volume caused by the displacement value of a powder has no bearing on the amount of drug administered to a patient provided the entire contents of a vial are administered to a single patient following reconstitution.

Displacement Values for Powders for Injection become relevant when **part** of a reconstituted vial is to be administered. Such a situation commonly arises when small doses are administered to **children and to infants**. In this situation it is important to know the final drug concentration per ml of the reconstituted injection so that an accurate dose can be withdrawn from the vial. If displacement values are ignored, errors (under dosing) of over 20 per cent are possible between the expected and actual dose administered.

Example:
If 4ml diluent is added to benzyl penicillin 600mg powder for injection, and the resultant solution will be larger than 4ml, due to the additional volume of the drug. If one needs to deliver a smaller dose, e.g. 300mg, the volume of liquid displaced by the drug needs to be taken into account. This volume is indicated by the drugs displacement value which can be obtained from the manufacturer. Benzylpenicillin (600mg) has a displacement volume of 0.4ml. therefore, to obtain a final volume of 4ml, one needs to add 3.6ml of diluent to benzyl penicillin (600mg). Half of this will contain the 300mg dose of drug required i.e. 2.0ml of the reconstituted solution should be drawn up. Note, a different volume of diluent may be added if desired but the final concentration will be affected.

The table below represents displacement values for IV antibiotics and should be considered as an example. When developing local policy documents all displacements values should be checked regarding local products.

Displacement Values for IV Antibiotics

Drug	Displacement Volume	Volume of Diluent To Be Added	Final Volume	Final Concentration
Aciclovir (*Zovirax®*) 250mg	Negligible	10ml	10ml	25mg / ml
Amoxicillin *(Amoxil®)* 500mg	0.4ml	4.6ml	5ml	100mg/ml
Aztreonam (*Azactam®)* *2g*	2.2ml	7.8ml	10ml	200mg/ml
Benzylpenicillin (*Crystapen®)* 600mg	0.4ml	3.6ml	4ml	150mg/ml
Cefotaxime *(Claforan®)* *1g* **	0.5ml	4ml	4.5ml	220mg/ml
Ceftazidime *(Fortum®)* 1g	0.9ml	9.1ml	10ml	100mg/ml
Ceftriaxone (*Wockhardt*) 1g	0.5ml	9.5ml	10ml	100mg/ml
Cefuroxime (*Zinacef)* 750mg	0.5ml	7ml	7.5ml	100mg/ml

Drug	Displacement Volume	Volume of Diluent To Be Added	Final Volume	Final Concentration
Cephradine (*Velosef*®) 500mg 1g	0.4 ml 0.8ml	4.6 ml 9.2 ml	5ml 10ml	100mg/ml 100mg/ml
Co-Amoxiclav (Augmentin ®) 600mg	0.5ml	9.5 ml ---------- 11.5 ml	10ml ---------- 12ml	60mg/ml --------- 50mg/ml
Colomycin ® 0.5/1 million I.U.	Negligible			
Erythromycin (Erythrocin®) 1g	Allowed for	20ml	22ml	50mg/ml
Flucoxacillin *(CP Pharma)* 500mg	0.4ml	9.6ml	10ml	50mg/ml
Meropenem (Meronem®) 500mg 1g	0.4ml 0.9ml	9.6ml 19.1ml	10ml 20ml	50mg/ml 50mg/ml
Piperacillin/ Tazobactam (Hospira)	1.5ml	8.5ml	10ml	225mg/ml
Vancomycin (Hospira) 500mg	0.32ml 0.65ml	9.68ml 19.35ml	10ml 20ml	50mg/ml 50mg/ml

** The values are only approximate since there is a permitted variation in fill volume and overage of 10%. N.B. Displacement values are **brand** specific, therefore, different brands of the same antibiotic may have **different** displacement values. Updated by John Kelly BSc.(Pharm), PgDip.(Clinical Pharmacy), MPSI, May 2010.

Appendix IX

Example of a Visual Phlebitis Score[24]

Condition of Site	Score	Degree of Phlebitis
IV Site appears healthy	**0**	No signs of phlebitis
One of the following is evident: • Slight discomfort at IV site • Slight swelling at IV site	**1**	First signs of phlebitis Observe cannula
Two of the following are evident: • Pain at IV site • Erythema • Swelling	**2**	Early stages of phlebitis *Resite cannula*
All of the following are present: • Pain along path of cannula • Erythema • Induration	**3**	Medium stages of Phlebitis *Resite cannula* *Consider treatment*
All of the following sites are evident: • Pain along path of cannula • Erythema • Induration • Palpable venous cord	**4**	Advanced stages of phlebitis, or the start of Thrombophlebitis Resite cannula Consider treatment
All of the following sites are evident: • Pain along path of cannula • Erythema • Induration • Palpable venous cord • Pyrexia	**5**	Advanced stages of Thrombophlebitis *Initiate treatment* *Resite cannula*

[24] *Jackson, A. A battle in vein-infusion* phlebitis. Nursing Times 1998; 94(4)in SARI Prevention Of Intravascular Catheter related Infection Sub-Committee. Health Protection Surveillance Centre December 2009 Updated February 2010. Published on behalf of SARI by HSE Health Protection Surveillance Centre

Appendix X

List of Stakeholder/reviewers.

Tim Delaney, B.Sc.(Pharm.), M.Sc.Mgmt (O.B.), F.P.S.I.
HSE Medication Safety Programme Lead.
Quality & Patient Safety Directorate
Room 101
Dr Steevens' Hospital
Dublin 8

Mark Dixon
Director of Training
The Academy of Emergency Medical Education
Graduate Entry Medical School
University of Limerick

Dr. Fidelma Fitzpatrick
Consultant Microbiologist
Health Protection Surveillance Centre and
Beaumont Hospital
Dublin

Maureen Flynn
National lead for Clinical Governance Development
Adjunct Senior Lecturer UCD
Office of the Nursing and Midwifery Services Director
Health Service Executive

Muriel Pate
Formulary Development Pharmacist
Tallaght Hospital
Dublin 24

Eileen Relihan
Medication Safety Facilitator
St. James's Hospital
Dublin 8

Professor David Williams
Associate Professor in Geriatric Medicine
Royal College of Surgeons in Ireland and
Beaumont Hospital
Dublin

Director of Nursing and Midwifery Reference Group (National Clinical Programmes), Office of the Nursing and Midwifery Services Director Health Service Executive.

Peer Review Group as listed in Appendix XII

Appendix XI

Membership of Working Group:

Justin Kerr (Chairperson)	Assistant Director of Nursing Nurse Practice Development Coordinator Mayo General Hospital
Ann Marie Loftus	Director of Nursing and Midwifery Sligo General Hospital Representing IADNAM
Catherine Deegan	Director Centre for Learning and Development St James Hospital Representing the Association of Directors of the Centres for Nursing and Midwifery Education
Deirdre Carroll	Clinical Nurse Manager II Community Intervention team Dublin North East
Ina Crowley	Project Officer NMPDU Limerick Representing the ONMSD
Joan Bourke	Assistant Director of Nursing Community Intervention team (CIT) Dublin Mid Leinster
Mary Brosnan	Director of Midwifery National Maternity Hospital, Dublin Adjunct Associate Professor, UCD School of Nursing, Midwifery and Health Systems Representing Directors of Midwifery

Appendix XII

Membership of the Peer Review Group:

Anne Gallen (Chairperson)	Director, Nursing and Midwifery Planning and Development Unit (NMPDU), HSE West (North West)
Annette Cuddy	Assistant Director of Nursing Medicinal Product Prescribing Team HSE West
Carmel Buckley	Project Officer NMPDU South
Dr Karen Robinson	Risk Advisor Clinical Indemnity Scheme
Grainne Nestor	Irish Nursing and Midwifery Practice Development Association (INMPDA)
Helena Hagney	Assistant Director of Nursing, Practice Development, Public Health Nursing, Galway
Irene O'Connor	Director of Nursing St. Ita's Community Nursing Unit Newcastle West Limerick
Randal Parlour	Deputy Director NMPDU North West
Sheila Donlon	Infection Control Manager Health Protection Surveillance Centre

Appendix XIII

Signature Sheet:

I have read, understand and agree to adhere to the attached Policy:

A Policy for the Administration of Intravenous Medication by Registered Nurses and Midwives

Print Name	Signature	Area of Work	ABA Registration Number	Date

Ends.