INTRAOSSEOUS CANNULATION POLICY
(For adult, maternity and paediatric patients)

POLICY

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Approving Body	Deteriorating Patient Group		
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	X		
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Date of Completion of Equality Impact Assessment	28th October 2021		
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Author (Position & Name)	James Andrews – Resuscitation Officer		
Lead Division/ Directorate	Corporate		
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Position of Person able to provide Further Guidance/Information	Resuscitation Officer		

Associated Documents/ Information	**Date Associated Documents/ Information was reviewed**
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CONTENTS

1.0 INTRODUCTION

Intraosseous (IO) cannulation involves insertion of a needle into the marrow space of a long bone, providing a non-collapsible entry point into the systemic vascular system. This will allow the delivery of medicines and fluids. It is now a well-established alternative method of gaining vascular access in emergency situations, i.e. when peripheral intravenous cannulation is difficult or impossible in a patient who is in cardiac arrest or critically unwell. An IO needle can be rapidly inserted and used for the administration of medicines and fluids. IO cannulation is safe, effective and relatively straightforward.

If intravenous (IV) access has failed, is unlikely to be achieved or would significantly delay time-critical treatment in the peri-arrest or cardiac arrest situation, the IO route should be considered. Resuscitation Council (UK) Advanced Life Support Guidelines 2015 recommend its use if IV access cannot be established within two minutes in adult cardiac arrest, and that it should be the first choice for access in paediatric cardiac arrest.

The SFH-preferred medical device for IO cannulation is currently the EZ-IO® Vascular Access System (EZ-IO). In use the EZ-IO system comprises a hand-held power driver and magnetically attached needle. Other accessories are provided for securing it and administering therapy.

2.0 POLICY STATEMENT

This policy applies to all clinical staff that insert, maintain and remove intraosseous cannulae for any patient at SFH NHS Trust.

It includes the responsibilities of staff involved in IO cannulation and care and maintenance of intraosseous cannulae and the standards that should be adopted for each step in the process.

Clinical area(s)

- This policy applies across all areas of the trust and all sites (KMH, NH, MCH).

Patient group(s)

- Any patients who require emergency medicines and/or fluids, and for whom rapid IV access cannot be obtained (adult, maternity and paediatric patients)

Exclusions

- None

3.0 DEFINITIONS/ ABBREVIATIONS

SFH	Sherwood Forest Hospitals NHS Foundation Trust
Intravenous (IV)	Situated within, occurring within, or administered by entering a vein.
Intraosseous (IO)	Situated within, occurring within, or administered by entering a bone.
Lidocaine	1% lidocaine free from preservative or adrenaline
Parenteral	Taken into the body or administered by any route other than the digestive tract, e.g. intramuscular or intravenous injections, gas inhalation etc.
A Practitioner	A person who is legally accountable or responsible for their practice e.g. Doctors, Nurses, Operating Department Practitioners, Radiographers, Midwives
KMH	Kings Mill Hospital
NH	Newark Hospital
MCH	Mansfield Community Hospital
APL	Accreditation of Prior Learning

4.0 ROLES AND RESPONSIBILITIES

The Chief Executive

Will ensure Intraosseous Cannulation Policy is in place, accessible and that staff are aware of its existence. This policy is subject to appropriate audit and monitoring arrangements.

Management Teams:

Will ensure the Directorate or Division for which they are responsible complies with this policy.

Ward Leaders, Department Managers and Consultants will:

- Ensure that all staff who insert IO cannulae receive training and competency assessment in the procedure*.
- Ensure that all staff who maintain IO cannulae receive education and guidance in IO maintenance.
- Maintain via Online Learning Management (OLM) a record of all staff receiving education/training.
- Ensure any staff who administer IO therapy have adequate cover for Hepatitis B. If Practitioners do not have cover, they must be referred to Occupational Health.
- Ensure the required notices that comply with Trust's Sharps Injury Prevention Procedure are displayed in their areas to inform employees on procedures to be followed after incidents involving exposure to body fluids.

*__NOTE__: *As the EZ-IO device is intended almost exclusively for use in emergency situations, and furthermore will not always be required, assessing competence in clinical practice is not realistically possible. Therefore competence will be assessed in a simulated environment on the day of training. Staff will be advised that, if possible, their first use of the device in practice should be under the supervision of a more experienced practitioner, if present. Obviously this may not be possible and is not an absolute requirement.*

Staff members who perform intraosseous cannulation must:

- Have a current certificate in one of the following courses, and/or have been identified as potentially benefiting from IO training as part of their professional development by the Resuscitation Department.

  Advanced Life Support (ALS)
  Immediate Life Support (ILS)
  European Advanced Paediatric Life Support (EPALS)
  Advanced Paediatric Life Support (APLS)
  Paediatric Immediate Life Support (pILS)
  Acute Illness Management (AIM)
  Advanced Trauma Life Support (ATLS)
  Management of Obstetric Emergencies and Trauma (MOET)
  Care of the Critically Ill Surgical Patient (CCrISP)

- Have received EZ-IO training (either from the Resuscitation Department at SFH, or other training which is deemed by the same as suitable for APL) and been assessed as competent in the use of the device by SFH Resuscitation Department staff.
- Take responsibility for arranging further education/training to maintain and increase competency within the work place.
- Understand the Trust policy on Intraosseous Cannulation.
- Have knowledge of other relevant policies and procedures, specifically: Standard Precautions, Health and Safety and Infection Prevention & Control.
- Understand their legal and professional responsibilities.
- Have a working knowledge of anatomy and physiology of IO cannulation.
- If not sufficiently confident to perform the procedure clinically, hand over the responsibility to a more experienced practitioner. A staff member should not feel obliged to perform the procedure if they are not confident. They must however ascertain that another person delegated to perform the task is trained to do so.
- If unsuccessful after two IO insertion attempts, ask for a more experienced practitioner to make further attempts (as above).
- Ensure that attempts to gain intravenous (IV) access are resumed when clinically appropriate. If secure and adequate IV access is gained, the IO device should be removed.
- Ensure that the supplied EZ-IO wristband is labelled with date and time of insertion (or attempted insertion) and applied to the patient.

5.0 APPROVAL

This policy was approved at a meeting of the Deteriorating Patient Group on 21st October 2021.

6.0 DOCUMENT REQUIREMENTS (POLICY NARRATIVE)

Principles for practice

Indications

IO access should be considered:

- If, in a cardiac arrest or peri-arrest situation: intravenous (IV) access has not been established, or is unlikely to be, within two minutes of attempting it; or if these attempts would significantly delay essential time-critical medicine or fluid administration.
- As the first choice of vascular access where a child is in cardiac arrest or a peri-arrest condition.

  This is outlined further in Appendix 5 (Failed vascular access algorithm).
  Please also see associated local Vascular Access Policy:

The decision to use IO access should be recorded in the medical and nursing notes, and details of consent (or more probably a best interests decision) documented. The supplied proprietary wristband should be affixed to the patient with time and date of insertion. An EZ-IO care pathway document (see Appendix 4) should be started and should accompany the patient to form part of handover documentation at the patient's clinical destination.

> **NOTE:** *IO devices are intended for use in the **short term** as described above, and that is the general view of this policy. The practitioner or team using it should continue attempts to establish secure intravenous access, and if that is successful then remove the IO device before the patient's care is handed over and passes out of their oversight. Failing that, they should ensure that an appropriate handover is given to the staff who will continue to care for the patient.*
> *It is recognised that, in* exceptional *circumstances, the device may be used in less urgent/semi-elective situations, but this should be a decision carefully considered by the patient's multi-disciplinary team and sanctioned by the senior doctor responsible for that patient at the time. All other considerations and guidelines will still apply.*
> It is not appropriate for an IO device to remain in situ for an extended period when it is no longer clinically required. It must always be removed by 72 hours post-insertion.

For detailed information on the clinical use of the EZ-IO device please see Appendices 1-3.

7.0 MONITORING COMPLIANCE AND EFFECTIVENESS

Minimum Requirement to be Monitored (WHAT – element of compliance or effectiveness within the document will be monitored)	Responsible Individual (WHO – is going to monitor this element)	Process for Monitoring e.g. Audit (HOW – will this element be monitored (method used))	Frequency of Monitoring (WHEN – will this element be monitored (frequency/ how often))	Responsible Individual or Committee/ Group for Review of Results (WHERE – Which individual/ committee or group will this be reported to, in what format (eg verbal, formal report etc) and by who)
Successful completion of training	Resuscitation Training Department	Attendance and assessment records	Continuous	Resuscitation Advisory Group. Report from Resuscitation Training Dept.
Appropriate use of Care Pathway Document	Resuscitation Training Department	Return of carbon copy to Resuscitation Training Dept.	Continuous (when copies received)	Resuscitation Advisory Group. Report from Resuscitation Training Dept.

8.0 TRAINING AND IMPLEMENTATION

Insertion, use and removal of intraosseous cannulae require training and assessment in simulated conditions prior to use in clinical practice (see note in section 4 above regarding competency assessment).

The Resuscitation Department will provide this training and assessment, which will be recorded on the electronic staff record.

Training in the use of the device will initially be targeted at several specific staff groups (see Appendix 6), with the intention that they will represent a resource pool to provide support and advice, if required, to other staff caring for patients with an IO device in situ. Considering the likely numbers of IO cannulations, requests for assistance are anticipated to be infrequent and therefore unlikely to place significant extra workload upon these groups.

Thereafter training will be extended to other staff groups considered to work in the higher "acuity" areas where there is more potential for use of the device. IO cannulation is considered an extended role. As such, training in the skill is not compulsory and will be provided for staff who would like to receive it.

An introductory IO awareness training session for other staff will be incorporated within the current IV training programme, as many of the general principles of parenteral administration are similar. This session will cover the differences and peculiarities surrounding the monitoring of IO devices and the administration of therapies through them.

Staff who have received formal EZ-IO-specific training outside the Trust and are confident with it should be eligible for APL and can be competency-assessed by the Resuscitation Department. Should they wish to have refresher training first this will of course be made available.

Regular refresher training is not mandatory but practitioners must be satisfied that they are meeting their professional requirements and seek training if they have any doubt about their confidence/skill retention. The Resuscitation Department recommends annual refresher training.

9.0 IMPACT ASSESSMENTS

- This document has been subject to an Equality Impact Assessment, see completed form at Appendix 8
- This document has been subject to an Environmental Impact Assessment, see completed form at Appendix 9

10.0 EVIDENCE BASE (Relevant Legislation/ National Guidance) AND RELATED SFHFT DOCUMENTS

Evidence Base:

- Resuscitation Guidelines 2015, Resuscitation Council (UK) **Advanced Life Support guidelines**
  https://www.resus.org.uk/resuscitation-guidelines/adult-advanced-life-support/
  Accessed 24/05/2017

- Resuscitation Guidelines 2015, Resuscitation Council (UK) **Paediatric Advanced Life Support guidelines** https://www.resus.org.uk/resuscitation-guidelines/paediatric-advanced-life-support/- Accessed 01/06/2017
- Philbeck TE, Miller LJ, Montez D**. Hurts so good. Easing IO pain and pressure** http://www.ncbi.nlm.nih.gov/pubmed/20868946# - Accessed 24/04/2015
- Ong MEH, Chan YH, Oh JJ, Ngo AS-Y.(2009)_ **An observational, prospective study comparing tibial and humeral intraosseous access using the EZ-IO®.** American Journal of Emergency Medicine 2009;27:8-15.
- Horton M.A., Beamer C. (2008) **Powered intraosseous insertion provides safe and effective vascular access for emergency patients** . http://www.ncbi.nlm.nih.gov/pubmed/18562874# Accessed 24/04/2015
- Paxton JH, Knuth TE, Klausner HA. **Humeral head intraosseous insertion: The preferred emergency venous access.** Annals of Emergency Medicine 2008;52(4):S58.
- Wayne MA**. Intraosseous vascular access: devices, sites and rationale for IO use**. JEMS 2007;32:s23-5.
- Miller L, Kramer GC, Bolleter S. **Rescue access made easy**. JEMS 2005;30(10):s8-18.
- Davidoff J, Fowler R, Gordon D, et al. **Clinical evaluation of a novel intraosseous device for adults: prospective, 250-patient, multi-center trial.** JEMS 2005;30(10):s20- 23.
- Hixson R**, Intraosseous Vascular Access and Lidocaine**, http://www.pawz.net/index_htm_files/IO%20Lidocaine.pdf, May 2011
- NMC 2015, The Code - http://www.nmc.org.uk/standards/code/read-the-code-online/ - Accessed 01/06/2017
- Lewis GC, Crapo SA, William JG. **Critical skills and procedures in emergency medicine- vascular access skills and procedures**. Emerg Med Clin N Am 2013;31:59-86. Http://dx.doi.org/10.1016/j.emc.2012.09.006
- Weiser G, Hoffmann Y, Galbraith R, Shavit I. **Current advances in intraosseous infusion - a systematic review**. Resuscitation 2012;83(1):20-6. doi:10.1016/j.resuscitation.2011.07.020
- New South Wales Institute for Clinical Innovation & Emergency Care Institute New South Wales**, Lignocaine for local anaesthetic pre-intraosseous infusion**

Related SFHFT Documents:

Operating Policy for Infection Prevention and Control	http://sfhnet.nnotts.nhs.uk/content/showcontent.aspx?contentid=22681
Sharps, Needlestick & Post-Exposure Prophylaxis (PEP) Policy (Including disposal and any bodily fluid exposures or inoculation injury)	http://sfhnet.nnotts.nhs.uk/content/showcontent.aspx?contentid=23430
Policy for managing intravenous (IV) fluid therapy in adult patients in hospital	http://sfhnet.nnotts.nhs.uk/content/showcontent.aspx?contentid=41488
Vascular Access Policy	Vascular Access Policy
Cardiopulmonary Resuscitation (CPR) Policy	http://sfhnet.nnotts.nhs.uk/content/showContent.aspx?contentId=15124

Massive Haemorrhage Protocol in Adults (Appendix of Transfusion Policy)	http://sfhnet.nnotts.nhs.uk/content/showcontent.aspx?contentid=19273
Policy for Consent to Examination, Treatment and Care	http://sfhnet.nnotts.nhs.uk/content/showcontent.aspx?contentid=19264

11.0 KEYWORDS

IO, EI-IO, care pathway,

12.0 APPENDICES

Appendix 1	EZIO procedure for use	
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Appendix 1 – EZ-IO procedure for use

Contraindications

The following are contraindications to insertion of IO devices:

- Previous, significant orthopaedic surgery at the insertion site; prosthetic limb or joint.
- IO (or attempted IO) access in past 48 hours in the target bone.
- Infection at the area of insertion.
- Excessive tissue (severe obesity) and/or absence of adequate anatomical landmarks.
- Injury or fracture in the target limb proximal to the insertion site.

Cautions

The EZ-IO stylet and catheter are **not** MRI compatible.

IO access into the sternum must not be attempted using the current Trust EZ-IO device – the result may be fatal. (Certain other devices and needles on the market are designed for this purpose.) For a discussion of appropriate EZ-IO site selection see Appendix 2.

Complications

The following are potential complications of use and should be observed for:

- Extravasation of administered fluid
- Compartment syndrome
- Infection/osteomyelitis
- Fat embolism
- Penetration through posterior cortex of bone (transfixing the bone completely)
- Cannula bending or clogging

Equipment required

EZ-IO® Power Driver

The EZ-IO® Driver is a sealed, hand-held, battery powered medical drill.

EZ-IO® Needle Sets

Needle sets are 15 gauge and available in three lengths:

- 15mm (pink hub)
- 25mm (blue hub)
- 45mm (yellow hub)

Each needle set pack contains the following items:

- Needle set
- EZ-Connect® extension set
- NeedleVISE® sharps disposal device
- Patient wrist band – to alert other health professionals to the use of an IO needle

Notes:

- Each EZ-IO® needle set has a patient weight range guideline; however, clinical judgement should be used to determine appropriate needle selection based on patient anatomy, weight and tissue depth at the site. Generally speaking the longer 45mm needle set should be used when there is excessive tissue overlying the insertion site, and for the proximal humerus site in adults. The EZ-IO needle is marked with a black line 5mm from the plastic hub. If, when the EZ-IO needle set is inserted through the soft tissue as far as the bone surface, the 5mm needle mark is not visible above the skin, a longer needle set or alternative site should be chosen prior to drilling.
- Red needles are non-sterile and for training only.

EZ-Stabilizer® dressing

- After insertion of the EZ-IO, use the EZ-Stabilizer dressing to secure the needle and prevent accidental dislodgement.

Other equipment required:

- 10mls 0.9% saline flush
- Sterile 10ml syringe for flushing
- Non-sterile non-latex gloves
- Skip preparation solution in accordance with local policy
- Sharps container

Insertion Procedure

- An aseptic technique must be maintained throughout.
- Make a positive identification of patient and check name, address, date of birth and identification number.
- Ascertain the need for IO cannulation and if possible obtain consent as per the Trust consent policy.
- Assess and landmark the chosen site (see appendix 2). Assess for any contraindications to IO use at this site. (See notes above.)
- Assess tissue depth at insertion site and select the appropriate needle set.
- Open equipment into the clean tray. Packaging must not be placed into the tray.
- Prime EZ-Connect extension set with 0.9% saline and leave syringe attached.
- Apply non-sterile latex free gloves. Palpate site to locate appropriate anatomical landmarks for needle placement (see appendix 1).
- Cleanse site with PDI Sanicloth CHG 2% and allow to air dry thoroughly.
- Connect needle set to driver.
- Remove needle cap. Stabilise insertion site.
- Gently pierce the skin with the EZ-IO® needle and advance **without drilling** until it touches the bone.
- *Before* activating the driver to insert the needle into the bone check that at least one black line is still visible on the needle. If at this point the 5mm needle mark is not visible above the skin, a longer needle set or alternative site should be chosen.
- If there is at least one black line visible, squeeze driver trigger and apply *moderate*, steady pressure, allowing the drill to do the work.
- **CAUTION:** Keep hand and fingers away from the needle set. Avoid supporting a limb manually immediately behind the drilling site.
- Caution: Applying excessive pressure may cause the driver to slow down and stop. If this happens ease off and let the speed and sharpness of the needle do the work.
- Paediatrics: Release trigger when sudden “give” or “pop” is felt, indicating entry into medullary space.

- Adults: Advance needle set approximately 1 cm after contact with bone/or after entry into medullary space; in proximal humerus for most adults the needle should be advanced until needle hub is virtually flush with the skin, but not pressing tightly against it.
- Stabilise the hub and pull the driver straight off.
- Continue to hold the hub while twisting the stylet off the hub with counter clockwise rotations
- The needle should feel firmly seated in the bone (1st confirmation of placement)
- Place the stylet in a sharps container.
- Place the EZ-Stabilizer dressing over the hub.
- Attach the primed EZ-Connect extension set to the hub and firmly secure by twisting clockwise .
- Pull the tabs off the EZ-Stabilizer dressing to expose the adhesive, apply to the skin.
- Aspirate for blood/bone marrow (2nd confirmation of placement).
- Secure the arm in place across the abdomen for humeral insertions.
- If used, secure IV giving set tubing to the patients' limb to reduce the risk of displacing the IO needle and continue to monitor the extremity for complications.
- Write the date and time of insertion on the EZ-IO® wristband and attach it to the patient to highlight that the patient has an IO device in situ.
- Use the IO Care Pathway form (see appendix 4) to document the use of the device in the patient's notes.

Use in patients unresponsive to pain:

- Prime EZ-Connect extension set with sodium chloride 0.9% injection
- Flush the IO device with 5 to 10 ml of sodium chloride 0.9% injection in adults and larger children or 2-3ml in infants and small children. This must be prescribed as per Trust Medicines Policy
- Should patient develop signs that indicate responsiveness to pain, refer to section "Use in patients responsive to pain" below.

Use in patients responsive to pain:

- Consider IO infiltration with 1% adrenaline-free Lidocaine injection. This must be prescribed as per Trust Medicines Policy
- Prime EZ-Connect extension set with Lidocaine
- Slowly infuse Lidocaine over 90 seconds
- Allow Lidocaine to dwell in IO space for 60 seconds
- Flush the IO catheter with 5 to 10 ml of sodium chloride 0.9% injection in adults and larger children or 2-3ml in infants and small children.

Maintenance of the IO cannula

- IO cannulas are only to be accessed (for medicine and fluid therapy) by staff who have received training in IO cannula maintenance.
- Following insertion of the IO device, the site should be checked for signs of complications (see above) every 15 minutes for the first 2 hours. Check site regularly thereafter until device is removed. Record these checks in the nursing notes. If any sign of complications is seen, discuss with the patient's medical team and consider removal of the device.

Administering therapy via IO device

- Before administering medicine /fluid therapy via the IO device, the practitioner must establish that IO access is still necessary (i.e. no IV access can be obtained and the patient continues to need IV fluids and/or IV medication). It is not acceptable to continue using IO access if it is no longer required.
- When accessing IO an aseptic technique must be maintained.
- Most medication / fluids that can be safely given through a peripheral vein may be given IO. IO doses, rates and compatibility precautions are the same as with the IV route.
- The patient may experience extreme discomfort with infusions via the IO route. In this circumstance Lidocaine can be prescribed and instilled into the IO before use (see appendix 3).

When to remove the cannula

- The cannula must be removed within 72 hours after insertion. It should be removed earlier if substantive IV access is gained, if the needle fails to work, it is no longer required, or signs of infection or extravasation are seen.

Removal guidelines

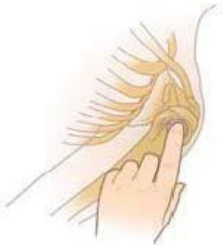
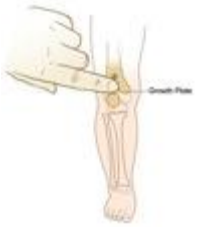
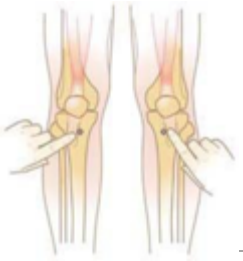
- IO cannulas should only be removed by staff who have received training in IO cannula removal.

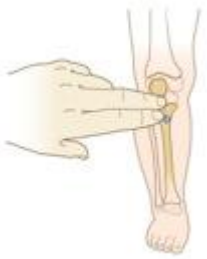
To remove the cannula:

- Aseptic technique must be maintained.
- Remove the EZ-Connect extension set from the needle hub.
- Lift & remove EZ-Stabilizer adhesive dressing.
- Attach Luer-lock syringe to hub of needle. Rotate syringe and needle clockwise while using traction to withdraw needle. Maintain vertical alignment during removal. **Do not** rock or bend the needle as it may snap.
- Dispose of the cannula/syringe into a sharps container.
- Apply pressure to the site as needed and dress as appropriate.
- Insertion site should be assessed after removal for signs of complications.
- Document removal on the “IO care Pathway” and ensure the IO wristband stays on the patient for 48 hours following removal of the cannula.

Appendix 2 – IO Insertion Sites

Ensure thorough education & training in the correct land marking techniques for the sites is undertaken prior to practitioner's first use of IO access equipment.

Proximal Humerus Place the patient's hand over the abdomen (elbow adducted and humerus internally rotated) Place your palm on the patient's shoulder anteriorly The area that feels like a "ball" under your palm is the general target area You should be able to feel this ball, even on obese patients, by pushing deeply Place the ulnar aspect of one hand vertically over the axilla Place the ulnar aspect of the opposite hand along the midline of the upper arm laterally Place your thumbs together over the arm This identifies the vertical line of insertion on the proximal humerus Palpate deeply as you climb up the humerus to the surgical neck It will feel like a golf ball on a tee – the spot where the "ball" meets the "tee" is the surgical neck The insertion site is on the most prominent aspect of the greater tubercle, 1 to 2 cm above the surgical neck If necessary, for further confirmation, locate the inter-tubercular groove: With your finger on the insertion site, keeping the arm adducted, externally rotate the humerus 90^0 You may be able to feel the inter-tubercular groove Rotate the arm back to the original position for insertion The insertion site is 1-2 cm lateral to the inter-tubercular groove **Insertion technique**: Aim the needle tip downward at a 45^0 angle to the horizontal plane The correct angle will result in the needle hub lying perpendicular to the skin	
Distal Femur - **Paediatric** (below the age of 6) Insertion site is located approximately 2cm above the patella (depending on patient anatomy) on the anterior femur and 1 cm medially to avoid the patellar tendon.	
Proximal Tibia - Adult Insertion site is approximately 1-2cm medial to the tibial tuberosity. If tibial tuberosity cannot be identified site is approximately 3cm distal to the patella and medial 1-2cm.	

Proximal Tibia - Paediatric Insertion site is located slightly medial to the tibial tuberosity (if palpable) or 2cm below the patella and slightly medially, on the flat aspect of the bone.	
Distal Tibia - Adult Insertion site is located approximately 3 cm proximal to the most prominent aspect of the medial malleolus. Place one finger directly over the medial malleolus; move approximately 2 cm (depending on patient anatomy) proximal and palpate the anterior and posterior borders of the tibia to assure that your insertion site is on the flat centre aspect of the bone.	
Distal Tibia - Paediatric Insertion site is located approx. 3 cm proximal to the most prominent aspect of the medial malleolus. Place one finger directly over the medial malleolus; move approx. 2 cm (depending on patient anatomy) proximal and palpate the anterior and posterior borders of the tibia to assure that your insertion site is on the flat centre aspect of the bone. Please note: in paediatrics this distance may be slightly less.	

Appendix 3 – Local Anaesthesia

In the situation where the IO route is used and the patient is responsive to pain, the doctor may consider analgesia after insertion and prior to medication/fluid administration.

This may also apply following successful resuscitation and subsequent improvement in the patient's conscious level; if the IO catheter is still being utilised then analgesia may be required to maintain patient comfort.

Dr Hixson IO Anaesthesia Protocol (reproduced with permission)
Source: Hixson R, Intraosseous Vascular Access and Lidocaine, May 2011

Anaesthesia: For the patient responsive to pain consider giving initial and subsequent doses of prescribed 1% adrenaline-free Lidocaine via the IO device prior to flushing and in the absence of published contra-indications.

Contra-indications: Sino-atrial disorders, all grades of AV block, severe myocardial depression, acute porphyria.

Dose: 0.5mg/kg given slowly over 1-2 minutes via the IO.
Usual adult dose range: 20mg – 40mg
Dose calculation: 1% Lidocaine (ml) = $\frac{0.5 \times \text{Weight (kg)}}{10}$

Note: The EZ-Connect has an internal volume of 1ml which needs to be completely primed to remove any air in the set.

Process

- Exclude contra-indications to Lidocaine
- Monitor patient clinically. Consider additional monitoring as indicated e.g. 3 lead ECG
- Administer initial dose (0.5mg/kg) slowly (over 1-2 minutes).
- Flush with 5-10 mL sodium chloride 0.9% injection for adults and larger children or 2-3 ml for smaller children, over 5 seconds.
- Administer subsequent lower dose over 30 seconds if further analgesia is required during the *initial* administration process.
- Inject or infuse fluids/medications under pressure as required.

Note: If patient discomfort recurs, consider repeating the lower subsequent dose no more often than every 45 minutes.

Total cumulative dose of lidocaine should not exceed 2mg/kg per patient episode. (Limited guidance available for the use of lidocaine for local anaesthesia during IO administration. Please see reference document hyperlink on page 11 *Lignocaine for local anaesthetic pre intraosseous infusion*)

Recommended protocol for administration of **1%** adrenaline-free lidocaine

Age	Weight(kg)	Initial dose in ml	Subsequent dose in ml
Neonate	3	0.15	0.07
Neonate	4	0.2	0.1
7 weeks	5	0.25	0.12
3 months	6	0.3	0.15
5 months	7	0.35	0.17
7 months	8	0.4	0.2
1 year	9	0.45	0.22
15 months	10	0.5	0.25
2 years	12	0.6	0.3
3 years	14	0.7	0.35
4 years	16	0.8	0.4
5 years	18	0.9	0.45
6 years	20	1.0	0.5
7 years	23	1.1	0.57
8 years	26	1.3	0.65
9 years	29	1.4	0.7
10 years	32	1.6	0.8
11 years	35	1.7	0.9
12 years	39	1.9	1.0
13 years	44	2.2	1.1
14 years	50	2.5	1.2
15 years	54	2.6	1.3
16 years	58	2.8	1.4
Adult 60kg	60	3.0	1.5
Adult 70kg	70	3.4	1.7
Adult 80kg +	80	4.0	2.0

Adapted from Source: Hixson R, Intraosseous Vascular Access and Lidocaine, May 2011If only 2% lidocaine is available it may be used, with appropriate dosing adaptations made, at the discretion of the doctor in charge.

This is a suggested dosing regimen based on average patient weight for age. Final responsibility for drug dosages used rests with the prescribing doctor.

Monitoring

Observe for extravasation and hypersensitivity reaction with every IO Lidocaine injection. If these occur immediately stop administration and treat as appropriate.

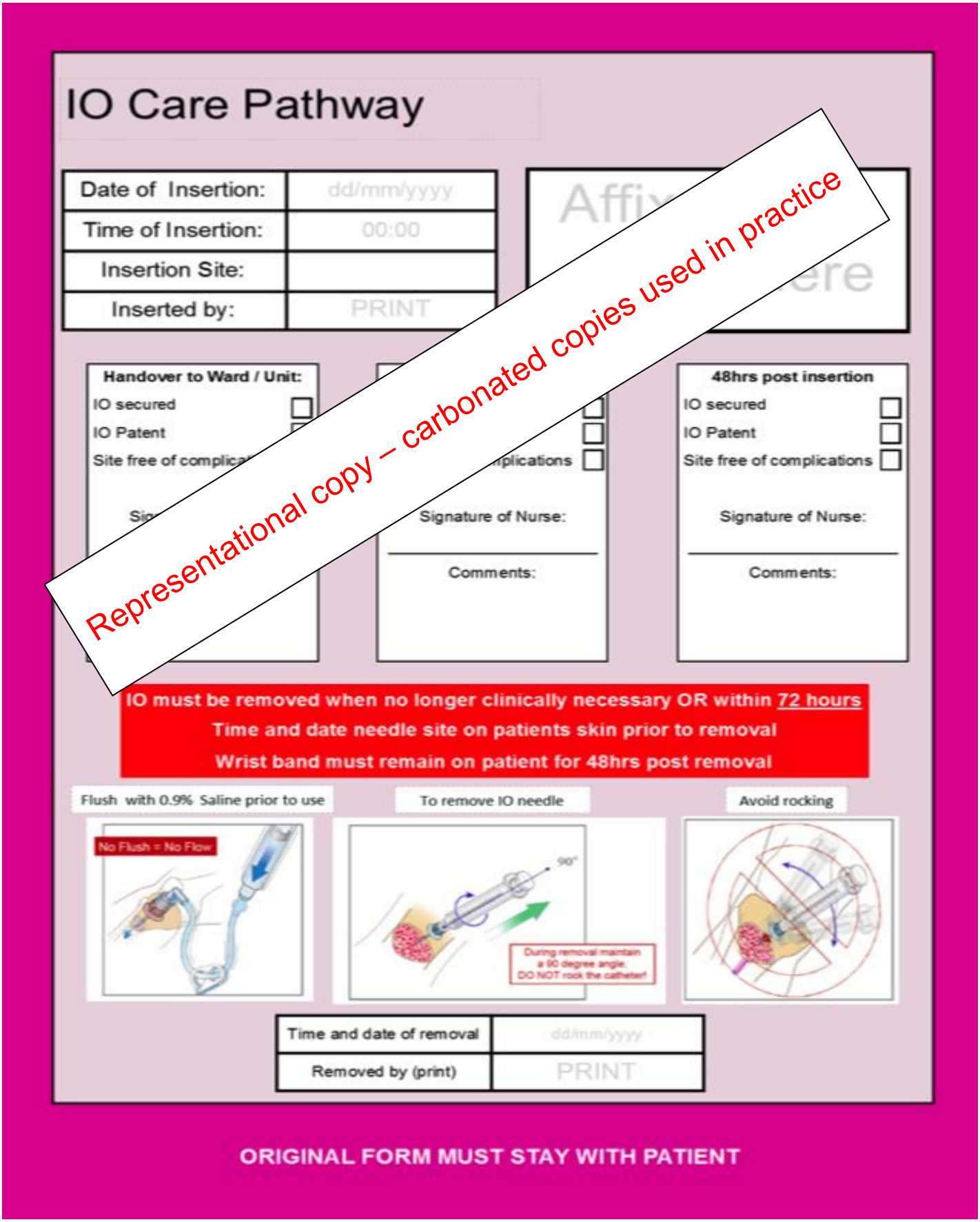
If extravasation occurs remove IO and place another IO needle in a different bone. Consult policy on extravasation.

See summary of product characteristics (SPC) for other known side effects of Lidocaine.

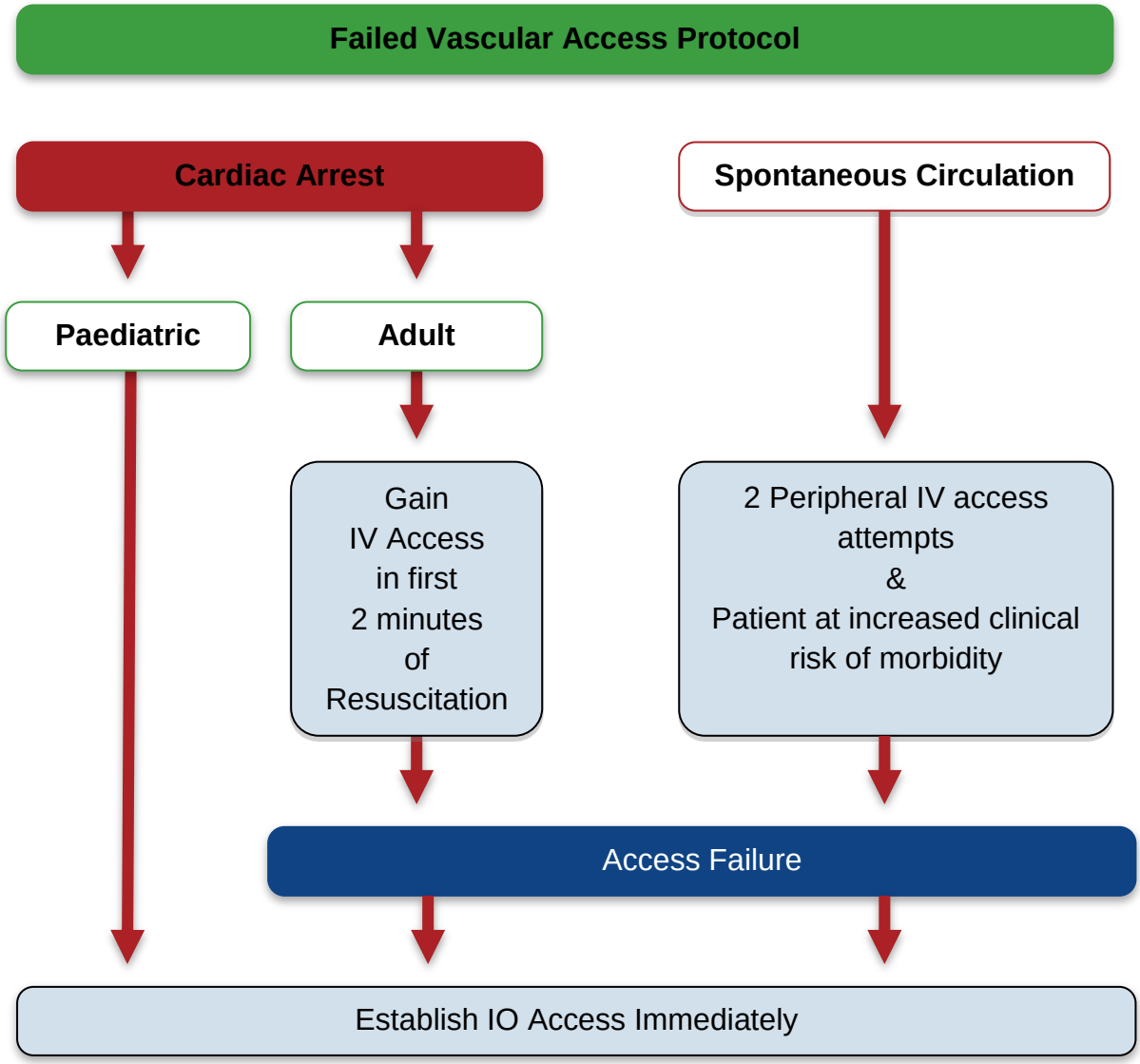
1% Lidocaine ampoules can be found in the Emergency Department, Theatres, Intensive Care, Coronary Care and the Urgent Care Centre at Newark.

Source: Hixson R, Intraosseous Vascular Access and Lidocaine, May 2011

Appendix 4 – Intraosseous Care Pathway (Representational copy – carbonated copies used in practice)



Appendix 5 – Failed Vascular Access Algorithm



References

Resuscitation Council (UK) (2015) **Provider Manual for use the UK: Advanced Life Support Course (6th Edition).** *London BMJ*
Resuscitation Council (UK) (2016) **Provider Manual for use the UK: European Paediatric Life Support Course (4th Edition).** *London BMJ*
Advanced Life Support Group (2011) **Advanced Paediatric Life Support: The Practical Approach,** *London BMJ*
Joint Royal Colleges Ambulance Liaison Committee. (2013). **UK Ambulance Service Clinical Practice Guidelines**. *Warwick: JRCALC*.

Appendix 6 – Staff groups for initial EZ-IO training

Critical Care Outreach Team

Emergency Response Team Key Roles

Appendix 7 – Decontamination

CORPORATE HEADQUARTERS
4350 Lockhill Selma Rd, Suite 150
Shavano Park, TX 78249
United States
Telephone: 210 375 8500
Facsimile 210 375 8537
V.dacare.com

vidacare

September 24, 2014

Driver cleaning protocol

EZ-IO® Intraosseous Vascular Access System
Driver

Low Risk
These devices either come into contact with intact skin or do not come into contact with the patient.

Care and Cleaning:

- Maintain BSI or PPE precautions
- After use, wipe with a cleaning and disinfecting wipe and leave to air dry

If visible signs of debris/blood:

- With paper towels, wipe exterior surfaces of the driver with chlorine solution diluted to 10000ppm until visible debris is removed.
- Clean and manipulate trigger & clean inside the opening of the metal shaft using nylon, soft bristled brush with chlorine solution diluted to 10000ppm.
- After cleaning, inspect to ensure no visible debris remains and no damage has occurred.
- Dry driver with paper towels and return to appropriate location.

Chlorine solutions – made with NaDCC (sodium Dichloroisocyanurate) containing adipic acid & Trociene sodium
Cleaning and disinfecting wipes – containing Didecyldimethylammonium chloride & polyhexamthylene biguanide (PHMB)

Robert Titkemeyer
Senior Director QA/RA
Teleflex

This trust uses Clinell wipes which are the wipes specified above

APPENDIX 8 – EQUALITY IMPACT ASSESSMENT FORM (EQIA)

Name of policy being reviewed: Intraosseous Cannulation Policy			
New or existing policy: Existing			
Date of Assessment: 28th October 2021			
For the policy and its implementation answer the questions a – c below against each characteristic (if relevant consider breaking the policy or implementation down into areas)			
Protected Characteristic	**a) Using data and supporting information, what issues, needs or barriers could the protected characteristic groups' experience? For example, are there any known health inequality or access issues to consider?**	**b) What is already in place in the policy or its implementation to address any inequalities or barriers to access including under representation at clinics, screening?**	**c) Please state any barriers that still need to be addressed and any proposed actions to eliminate inequality**
The area of policy or its implementation being assessed:			
Race and Ethnicity	No	N/A	None
Gender	No	N/A	None
Age	No	N/A	None
Religion	No	N/A	None
Disability	No	N/A	None
Sexuality	No	N/A	None
Pregnancy and Maternity	No	N/A	None
Gender Reassignment	No	N/A	None
Marriage and Civil Partnership	No	N/A	None

Socio-Economic Factors (i.e. living in a poorer neighbourhood / social deprivation)	No	N/A	None

What consultation with protected characteristic groups including patient groups have you carried out?

- **None**

What data or information did you use in support of this EqIA?

- **None**

As far as you are aware are there any Human Rights issues be taken into account such as arising from surveys, questionnaires, comments, concerns, complaints or compliments?

- **None**

Level of impact: Low Level of Impact

Name of Responsible Person undertaking this assessment: James Andrews

Signature: 

Date: 28th October 2021

APPENDIX 9 – ENVIRONMENTAL IMPACT ASSESSMENT

The purpose of an environmental impact assessment is to identify the environmental impact, assess the significance of the consequences and, if required, reduce and mitigate the effect by either, a) amend the policy b) implement mitigating actions.

Area of impact	Environmental Risk/Impacts to consider	Yes/No	Action Taken (where necessary)
Waste and materials	• Is the policy encouraging using more materials/supplies? • Is the policy likely to increase the waste produced? • Does the policy fail to utilise opportunities for introduction/replacement of materials that can be recycled?	Yes Yes No	None. Increased material usage will be minimal and infrequent.
Soil/Land	• Is the policy likely to promote the use of substances dangerous to the land if released? (e.g. lubricants, liquid chemicals) • Does the policy fail to consider the need to provide adequate containment for these substances? (For example bunded containers, etc.)	No	
Water	• Is the policy likely to result in an increase of water usage? (estimate quantities) • Is the policy likely to result in water being polluted? (e.g. dangerous chemicals being introduced in the water) • Does the policy fail to include a mitigating procedure? (e.g. modify procedure to prevent water from being polluted; polluted water containment for adequate disposal)	No	
Air	• Is the policy likely to result in the introduction of procedures and equipment with resulting emissions to air? (For example use of a furnaces; combustion of fuels, emission or particles to the atmosphere, etc.) • Does the policy fail to include a procedure to mitigate the effects? • Does the policy fail to require compliance with the limits of emission imposed by the relevant regulations?	No	
Energy	• Does the policy result in an increase in energy consumption levels in the Trust? (estimate quantities)	No	
Nuisances	• Would the policy result in the creation of nuisances such as noise or odour (for staff, patients, visitors, neighbours and other relevant stakeholders)?	No	