Trust Standard Operating Procedure

Management of EZ-IO Intraosseous Catheter

Issue Date	Review Date	Version
March 2020	March 2023	2.1

Purpose

To instruct staff on EZ-IO Intraosseous catheter insertion, administration of therapy, monitoring of the indwelling catheter and safe removal of the device.

Who should read this document?

All clinical staff especially members of the emergency teams working within the Trust.

Key Messages

All clinical staff working for University Hospitals Plymouth NHS Trust who are involved in the use of EZ-IO Intraosseous Access must do so in accordance with this Standard Operating Procedure.

Core accountabilities

Owner	Tara Bowman
Review	Resuscitation Committee
Ratification	Dr Annette Rickard, Resuscitation Lead S Dormor
Dissemination (Raising Awareness)	Resuscitation Committee
Compliance	Resuscitation Committee (Meetings held quarterly)

Links to other policies and procedures

Hand Hygiene Guidelines
Safe Disposal of Sharps Policy
Infection Control Manual
ANTT Poster for Peripheral Cannulation and for Peripheral and Central Venous Therapy
Care Plan for Patients with EZ-IO Intraosseous Catheter
Intraosseous Blood Samples for Laboratory Analysis.

Version History

1	August 2015	Tara Bowman Resuscitation Officer
2	August 2018	Tara Bowman Resuscitation Officer
2.1	March 2020	Minor Amendments

The Trust is committed to creating a fully inclusive and accessible service. Making equality and diversity an integral part of the business will enable us to enhance the services we deliver and better meet the needs of patients and staff. We will treat people with dignity and respect, promote equality and diversity and eliminate all forms of discrimination, regardless of (but not limited to) age, disability, gender reassignment, race, religion or belief, sex, sexual orientation, marriage/civil partnership and pregnancy/maternity.

An electronic version of this document is available on Trust Documents on StaffNET. Larger text, Braille and Audio versions can be made available upon request.

Standard Operating Procedures are designed to promote consistency in delivery, to the required quality standards, across the Trust. They should be regarded as a key element of the training provision for staff to help them to deliver their roles and responsibilities.

Standard Operating Procedure (SOP)

Management of EZ-IO Intraosseous Catheter

1 Introduction

Intraosseous (IO) catheter placement is an alternative standard for vascular access when peripheral intravenous access is difficult or impossible during resuscitation at cardiac arrests or medical emergencies. IO cannulation is the insertion of a needle into a bone to allow the delivery of medications and fluids. IO access provides rapid entry into the medullary cavity of a bone creating an immediate conduit to the central circulation. The Resuscitation Council (UK) Guidelines 2015 states for adult cardiac arrests that if intravenous access is difficult or impossible, consider the (IO) route and for Paediatric cardiac arrests, if there is no circulatory access, obtain (IO) access.

2 Definitions

Standard Operating Procedure (SOP) – Is a documented method of working or instruction.

Intraosseous (IO) – Situated within, occurring within or administered by entering a bone.

Aseptic Non Touch Technique (ANTT) – Asepsis is achieved by protecting key parts And key sites from microorganisms transferred from the healthcare worker and the immediate environment.

3 Regulatory Background

This SOP is based on the guidance provided by Teleflex, The Science & Fundamentals of Intraosseous Vascular Access 2017 Third Edition

4 Key Duties

Staff should:

- Only insert, manipulate or remove the EZ-IO catheter if trained to do so.
- Only administer medications and fluids through the EZ-IO catheter if trained to administer intravenous therapy.
- Document any insertion, monitoring and removal details on the EZ-IO Intraosseous care plan.

5 Insertion Procedure to Follow

Ascertain the need for IO cannulation.

An aseptic technique (ANNT) must be maintained throughout the procedure.

Rule out any possible contraindications to insertion which are:

- Fracture in target bone.
- Excessive tissue or absence of adequate anatomical landmarks.
- Infection at insertion site.
- Previous significant orthopaedic procedure at insertion site, prosthetic limb or joint.
- IO access or attempted IO access in targeted bone within past 48 hours.

Prior to use check the battery light on the EZ-IO driver by depressing the trigger.The EZ-IO driver LED will be solid green when the trigger is activated indicating sufficient power.

The EZ-IO LED will blink red when the trigger is activated indicating the driver is approaching the end of its battery life and requires replacing. As per National Patient Safety Alert Reference No: NatPSA/2019/001/NHSPS. New drivers may be sourced from the Resuscitation Department or by the Trust's ordering system.

The battery indicator LED should be routinely checked on the first day of each month during the cardiac arrest trolley check.

Apply non – sterile latex free gloves and an apron, then palpate and locate appropriate site.

Assess and landmark the chosen site for insertion. **(Refer to appendix B)**

Assess the tissue depth at the insertion site and select the appropriate needle set **(Refer to appendix A)** Prior to using the needle set, check that the safety cap covers the needle. If after inspection the cap is not in place then note the batch number and discard the device and inform Teleflex as per Medical device Alert MDA/2019/046.

Prime EZ- Connect with 0.9% saline flush, leave syringe attached.

Cleanse skin with Chloraprep, allow to dry.

Connect EZ-IO needle set to the driver, remove cap and stabilize the insertion site.

Gently pierce skin with the EZ-IO needle until the needle tip touches the bone. Check that at least one black line is visible on the needle above the skin. This indicates enough needle length to penetrate the medullary space. If a black line is not visible above the skin then select a longer needle or alternative site.

Proceed to squeeze the driver trigger and apply steady and downward pressure. For tibia and femur insertion, insert needle set at a 90 degree angle to the surface of the bone.

For Paediatrics: Gently drill, stop advancing and release trigger when a sudden 'give' or 'pop' is felt, indicating entry in to the medullary space.

For Adults: Gently drill advancing the needle 1-2cm after entry into the medullary space, (felt as a loss of resistance) or until the needle hub is close to the skin.

Stabilize the hub, pull the driver off and twist the stylet off the hub with counter clockwise rotations. Dispose of the stylet in a sharps container.

The catheter should feel firmly seated in the bone **(First confirmation of placement).**

Do not use excessive force during insertion, allow the driver to do the work. Excessive force may cause the user to perceive that the driver is losing power during insertion.

In the event of a driver failure / inoperable, manual insertion of the needle may be performed as follows:

Hold the needle set with the catheter hub and stylet as one piece, rotate clockwise/counter-clockwise while applying gentle, moderate downward pressure without rocking the needle set. Allow rotation and pressure to penetrate the bone cortex. Stop insertion when a change in resistance is felt. Stabilize the needle set, remove stylet and proceed as usual.

Place the EZ-Stabilizer dressing over the hub and attach the primed EZ-Connect extension set, twisting clockwise to secure. Remove the tabs off the EZ-Stabilizer dressing and apply to the skin.

Aspirate for blood / bone marrow **(Second confirmation of placement).** Inability to aspirate does not mean the placement has been unsuccessful. Consider aspirating again following the saline flush.

Sample may be sent for laboratory analysis. (Refer to guidance on Trust Documents, Healthcare Governance – Intraosseous Blood Samples for Laboratory Analysis).

Flush the IO catheter with 0.9% normal saline, (5-10mls for Adults and 2-5mls for Paediatrics). Flushing will help clear the marrow and fibrin from the medullary space, allowing for effective infusion rates.

Administer medications and fluids as prescribed, these will need to be given under pressure to achieve adequate flow rates. **NO FLUSH = NO FLOW**

For Adults: Use either a syringe bolus or pressure bag capable of generating 300mmHg pressure.

For Paediatrics: Use a syringe bolus.

Please note the EZ-Connect extension set volume is 1ml.

Attach EZ-IO pink wrist band to the patient. Write the date and time of insertion on the IO wrist band and attach it to the patient, this will highlight they have an IO catheter in situ. Document insertion details on the EZ-IO care plan. **(Refer to appendix D for Care Plan)**

Use in patients responsive to pain:

The pain associated with IO infusion under pressure may be very painful. IO administration of Preservative and Epinephrine free Lidocaine may limit or alleviate the IO infusion pain. This must be prescribed by a doctor and administered by either the doctor or a member of the acute care team who has completed the EZ-IO insertion competency. **(Refer to appendix C for IO Analgesia Guidance)**

Monitoring of the IO Catheter:

The EZ-IO catheter must be closely monitored whilst it remains in the bone allowing early detection of any complications.

Inspect the site closely during the first 30 minutes after insertion and continuously during infusion therapy. Then continue to inspect catheter hourly until it is removed.

Complications may include Extravasation, Localized Inflammation / Infection at the site, Swelling around the site or limb, Catheter Dislodgement, Leakage around the site and Compartment Syndrome.

Document findings on the EZ-IO care plan. **(Refer to appendix D for Care Plan)** Refer any concerns or potential complications to the Medical team responsible for the patient and the Acute Care Team.

Note the EZ-IO catheter is not MRI compatible and may remain in place for up to 72hrs.

Cleaning and decontamination of the driver:

Take PPE precautions wearing gloves and apron.

Wipe the entire surface of the EZ-IO driver with a cloth moistened with an Actichlor plus solution following the manufacturer's instructions. Continue to clean and manipulate the trigger ensuring the metal drive shaft is clean. Do not immerse or use excessive amount of cleaning liquid solution.

Removal of the catheter:

Ascertain the need for alternative vascular access.

Remove the EZ-Connect extension set and EZ-Stabilizer dressing. Stabilize the catheter hub and attach a luer lock syringe. Twist the syringe and catheter in a clockwise direction while pulling straight out. Do not rock or bend the catheter during removal and dispose of the sharp as per hospital policy.

Apply pressure to the site if required and then apply a sterile dressing.

Document the date and time of the catheter removal on the EZ-IO care plan and the EZ-IO wrist band. **(Refer to appendix D for Care Plan)**

Ensure the EZ-IO wrist band remains in situ for 48 hours post removal of the catheter and check site daily

6 Document Ratification Process

The design and process of review and revision of this procedural document will comply with The Development and Management of Formal Documents.

The review period for this document is set as default of five years from the date it was last ratified, or earlier if developments within or external to the Trust indicate the need for a significant revision to the procedures described.

This document will be reviewed by the Resuscitation Committee and ratified by the Resuscitation Committee Chairperson and Resuscitation Matron.

Non-significant amendments to this document may be made, under delegated authority from the Resuscitation Committee Chairperson and Resuscitation Matron by the nominated author. These must be ratified by the Resuscitation Committee

Chairperson and Resuscitation Matron and should be reported, retrospectively, to the Resuscitation Committee.

Significant reviews and revisions to this document will include a consultation with named groups, or grades across the Trust. For non-significant amendments, informal consultation will be restricted to named groups, or grades who are directly affected by the proposed changes.

7 Dissemination and Implementation

Following approval and ratification, this procedural document will be published in the Trust's formal documents library and all staff will be notified through the Trust's normal notification process, currently the 'Vital Signs' electronic newsletter.

Document control arrangements will be in accordance with The Development and Management of Formal Documents.

The document author(s) will be responsible for agreeing the training requirements associated with the newly ratified document with the Resuscitation Committee Chairperson and Resuscitation Matron and for working with the Trust's training function, if required, to arrange for the required training to be delivered.

8 Monitoring and Assurance

The Acute Care Team

- Will be responsible for reviewing the patient and EZ-IO care plan each day as part of their caseload providing advice and support to wards and departments.
- They will report any incidents related to the EZ-IO device through Datix, the Risk and Incident Team and disseminate this information to the Resuscitation Department for further investigation.

The Resuscitation Department

- The Resuscitation Officers will investigate the incident, report findings to Teleflex and the Resuscitation Committee.
- The Resuscitation Committee will review the incident, identify actions to be implemented and disseminate this information to the appropriate teams.
- The Resuscitation Officers will audit the cardiac arrest and medical emergency calls on a daily basis, further highlighting any issues related to EZ-IO insertion or removal.

All Staff

- All staff caring for patients with an EZ-IO catheter should monitor the site as directed by the EZ-IO care plan and report any issues to the medical team

responsible for the patient, the acute care team and Resuscitation Department.

9 Reference Material

- The Science & Fundamentals of Intraosseous Vascular Access 2017 Third Edition.
- Resuscitation Council (UK) Guidelines 2015 for Adult and Paediatric Advanced Life Support.
- www.teleflex.com/ezioeducation
- National Patient Safety Alert Reference No:NatPSA/2019/001/NHSPS – Depleted batteries in Intraosseous Injectors
- Medicines and Healthcare Products Regulatory Agency Medical Device Alert MDA/2019/046 – Arrow EZ-IO Intraosseous Vascular Access Needlesets.

Appendix Appendix A

A Equipment Required

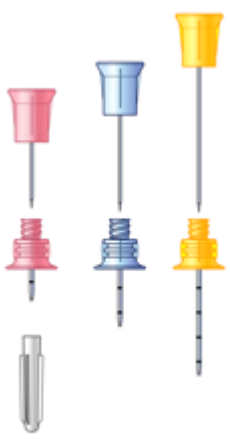
EZ-IO® Power Driver

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

EZ-IO® Needle Sets

Needle sets are 15g and available in three lengths

- 15mm pink hub (3 to 39Kg)
- 25mm blue hub (3Kg or over) First choice for all babies and children
- 45mm yellow hub (40Kg or over and/or excessive tissue depth)



Each needle set pack contains the following items:

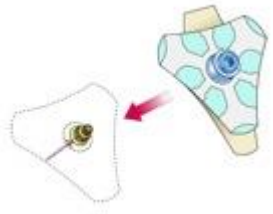
- Needle set
- EZ-Connect® extension set
- NeedleVISE® sharps disposal device
- Patient pink wrist band
- EZ-Stabilizer Dressing

Notes:

Each EZ-IO® needle set has a weight range guideline. Clinical judgment should be used to determine appropriate needle set selection based on patient anatomy, weight and tissue depth. 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 hub. If the EZ-IO needle set is inserted through the soft tissue and does not reach the bone or the 5mm needle mark is not visible above the skin, a longer needle set or alternate site should be chosen prior to penetration of the bony cortex.

EZ-Stabilizer ® Dressing

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



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Other equipment required:

10mls 0.9% saline flush

Sterile 10ml luer lock syringe

Non sterile gloves

Chloraprep

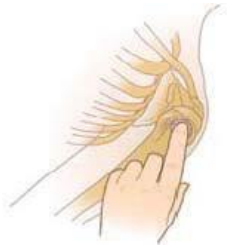
Cannulation tray

Sharps container

Sterile syringe for blood sampling x2

B EZIO Insertion Sites and Land Marking

Proximal Humerus: Adults



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

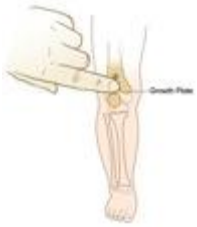
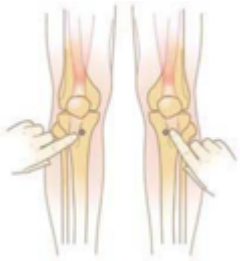
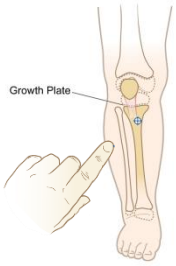
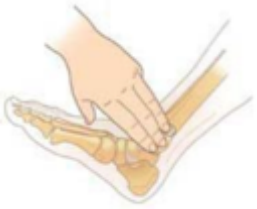
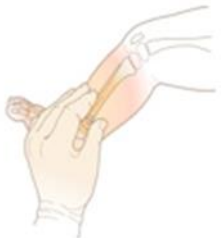
The insertion site is on the most prominent aspect of the greater tubercle, 1 to 2 cm above the surgical neck and lateral to the intertubercular groove, (bicipital groove).

Insertion technique: Insert the needle tip through the skin 45 degrees anterior to the horizontal plane and aim needle set downward 45 degrees.

The correct angle will result in the needle hub lying perpendicular to the skin

Proximal Humerus EZ-IO Insertion Site Identification and Technique – Infants and Children

For optimal insertion, rotate the arm inward and place patient's hand on abdomen. Palpate the greater tubercle of the proximal humerus, just above the surgical neck. The insertion site is the most prominent aspect of the greater tubercle. Gently drill in to the humerus and stop when you feel the "pop" or "give". **The proximal humerus should only be used in paediatric patients when landmarks can be clearly identified.**

Distal Femur - **Neonates, Infants and Small Children only** Secure the leg out-stretched to ensure the knee does not bend. Identify the patella by palpation. Insertion site is just proximal to the superior border of the patella (maximum 1-2 cm) and approximately 1-2 cm medial to the midline.	
Proximal Tibia – Adult, Adolescents and Larger Children Extend the leg. Insertion site is approximately 2 cm medial to the tibial tuberosity or 3 cm below the patella and approximately 2 cm medial, along the flat aspect of the tibia.	
Proximal Tibia - Neonates, Infants and Children Extend the leg. Insertion site is approximately 1 cm medial to the tibial tuberosity. If tuberosity cannot be palpated go below the inferior border of the patella 1 cm and slightly medial by 1 cm along the flat aspect of the tibia. Pinch the tibia between your fingers to identify the medial and lateral borders and insert the needle in the centre of the bone.	
Distal Tibia – Adult, Adolescents and Larger Children Insertion site is located approximately 3 cm proximal to the most prominent aspect of the medial malleolus. Palpate the anterior and posterior borders of the tibia to assure that your insertion site is in the flat centre of the bone and 90 degrees to the surface of the bone. **Distal Tibia Neonates, Infants and Children** Insertion site is located approximately 1-2 cm proximal to the most prominent aspect of the medial malleolus. Palpate the anterior and posterior borders of the tibia to assure that your insertion site is in the flat centre of the bone and 90 degrees to the surface of the bone.	 

C EZIO Analgesia Guidance

EZIO Intraosseous Analgesia Guidance

Conscious patients may require fluid, blood or drug resuscitation through the intraosseous route. Infusion has to be achieved under pressure. Higher pressure generates higher infusion rates. This may be very painful.
There is evidence that prior injection of preservative- free lidocaine has been shown to be effective in limiting or alleviating IO infusion pain.
This is the responsibility of the administering clinician who has to weigh up benefit v risk.

Infusion dosage for Adults

Weight	Lidocaine %	Dosage
>40 kg	2 mls 2%	40 mg
<40 Kg	0.05mls 1% Lidocaine/kg	0.5mg/kg

(1% Lidocaine allows for smaller volumes to be accurately measured)

Infusion dosage for Paediatrics

Lidocaine %	Dosage
0.05mls 1% Lidocaine/kg	0.5mg/kg (**Do not exceed the adult dose of 40mg total)**

(1% Lidocaine allows for smaller volumes to be accurately measured)

Prior to administration exclude contraindications to Lidocaine :
Sino atrial disorders, AV block, severe myocardial depression, acute porphyria.
Consider cautions to Lidocaine :
Epilepsy, bradycardia, myasthenia gravis, impaired respiratory and cardiac impairment

Infusion Procedure
Administer IO Lidocaine slowly over 2 minutes
Leave to dwell in IO space for 1 minute
Administer rapid flush using 0.9% saline
Commence pressurised infusion
If not effective and still painful then repeat process but give half the initial dose
Monitor the patient closely for any side effects.

D EZIO Care Plan

The EZIO Care Plan can be located on StaffNet within the Document Library, Health Records Document Management, Vascular Access folder.