








**Intraosseous Insertion &
Fluid Resuscitation**

For on site tutorials as part of the remote simulation program
Paediatrics: P3

This project was possible due to funding made available by Health Workforce Australia
      

General notes on language

Use second person conversation tone but avoid direct use of pronouns such as I, you and we

Use active verbs rather than nouns where possible

Use questions periodically as a prelude to a slide containing information to encourage the facilitator to be interactive

Avoid abbreviated symbols with the following examples: E.g.; I.e.

Avoid abbreviations unless universally understood

Don't omit "the" or "and"

Introductions

Lets introduce ourselves!!



Very quick round the room to assess stage of professional development for each participant.

General Aims

- Learn in a team setting
- Blend clinical skills with team skills
- Reflect critically on practice

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Speakers' notes

- This session, and package as a whole, involves learning together. Learning with the teams that you work with helps that team to function more efficiently and effectively. It allows you to learn from each other, explore different perspectives and to understand the importance of all members of the team.
- We are targeting higher level learning – applied skills and performance in contextualised events. This is through team discussion and also through working through simulated scenarios as a team. It also allows you to put into practice knowledge attained from the eLearning and other solo learning environments.
- To review and reflect upon our own practice and current best practice standards. During our feedback sessions we will facilitate this but we would also encourage you to reflect on your practice and experience after these sessions.

Ground Rules

- Participation
- Privacy
- Confidentiality
- Disclaimer
- Debriefing
- Mobile phones

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Speakers notes

- Challenge of video conferencing tips: don't change your seat, speak up nice & clearly
- Details collected and de-identified for reporting purposes
- Signed form, don't speak outside about how people performed as not necessarily indicative of real life. This is a chance to try new things, don't tell anyone about the scenarios as they are used again on subsequent courses.
- We try to use best evidence practice and strive to include as up-to-date material as possible. Please do refer to your local policies, guidelines and protocols.
- Debriefing is a chance to reflect upon what we did and how that translates to the workplace. Please use this time to explore the complexities of performance and decision making. Please contribute, we will all learn from each other's experiences.
- Like most things in life, the more that you put in the more you will take away with you.
- It is an open forum where everyone's ideas and thoughts are to be valued.
- If you could please switch your phones off or to silent or vibrate for the duration of the course.

Objectives

- Indications & contraindications for insertion of an intraosseous needle
- Selection & preparation of IV fluids for resuscitation
- Rehearsal of skills in a simulated environment

Intraosseous Access

- Indications
 - Administration of emergency drugs and fluids in a critically ill or injured.
 - Temporising measure until more definitive intravenous access can be obtained in time critical management.
 - Where other methods of access to the vascular system have failed or not possible.

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The intraosseous route (IO) is a rapid method of obtaining circulatory access in the critically unwell to deliver drugs and fluids for early management.

The Australian Resuscitation Council's position is that

“valuable time should not be wasted (more than 90 seconds) with repeated unsuccessful attempts at cannulation because alternative access to the circulation is possible via the bone marrow intraosseous route.”

The IO can be used in any age group as first line for difficult access in the unwell child, exception is neonates where the umbilical line can and should be utilised where possible.

Contraindications

- Fracture of the target or proximal bones.
- Site of previous IO insertion attempt.
- Bone disease e.g. osteogenesis imperfecta.
- Infection in the skin at the insertion site
- Vascular injuries that may prevent reliable venous outflow.

How effective is an IO?

- Rapid access to circulation – 10 seconds
- Drugs and fluids administered via an intraosseous needle are distributed as fast with similar plasma concentrations as those administered intravenously.
- Aspirate can be used for laboratory tests, but you **MUST** inform the lab staff it is bone marrow

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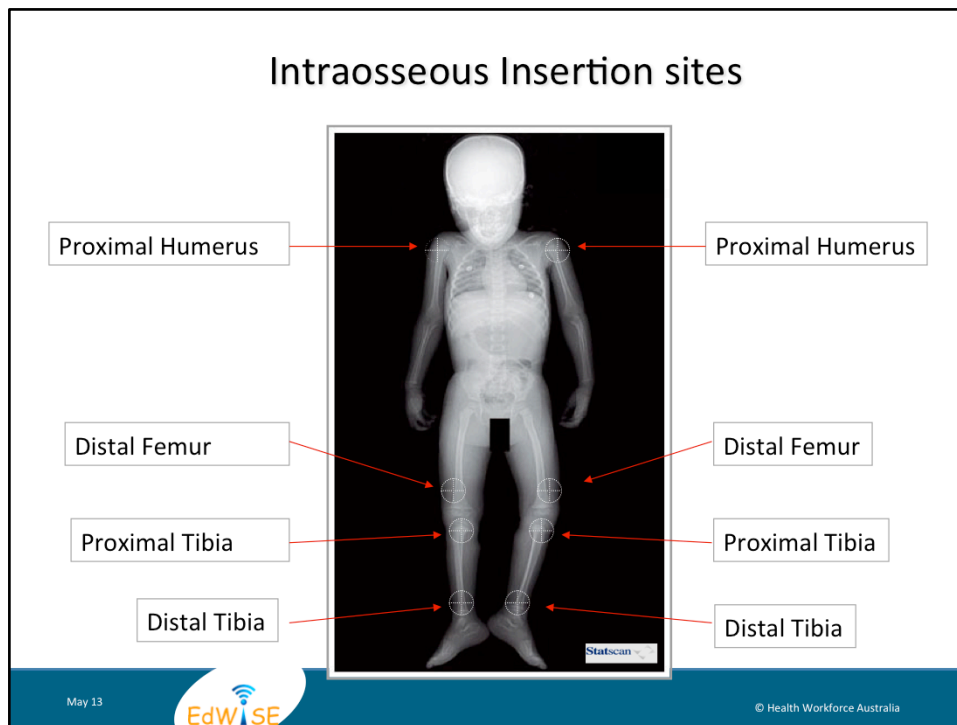


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Insertion of an IO is rapid and effective, providing circulatory access that distributes fluid and medication in similar plasma concentrations as that administered IV. The EZ-IO can be inserted in 10seconds and has a first pass success rate of 92%. The medullary cavity functions as a rigid vein that does not collapse in the presence of hypovolaemia and profound peripheral circulatory shock.

Any medication that can be given IV can be given IO, this is now in preference to endotracheal administration of drugs during the cardiac arrest situation.

Once inserted the bone marrow aspirate can be used by the laboratory for most tests, but it is essential to inform the laboratory staff as it may need to be treated differently to avoid damaging the machines.



The IO can be used at multiple sites including the proximal humerus, distal femur, proximal tibia and distal tibia.

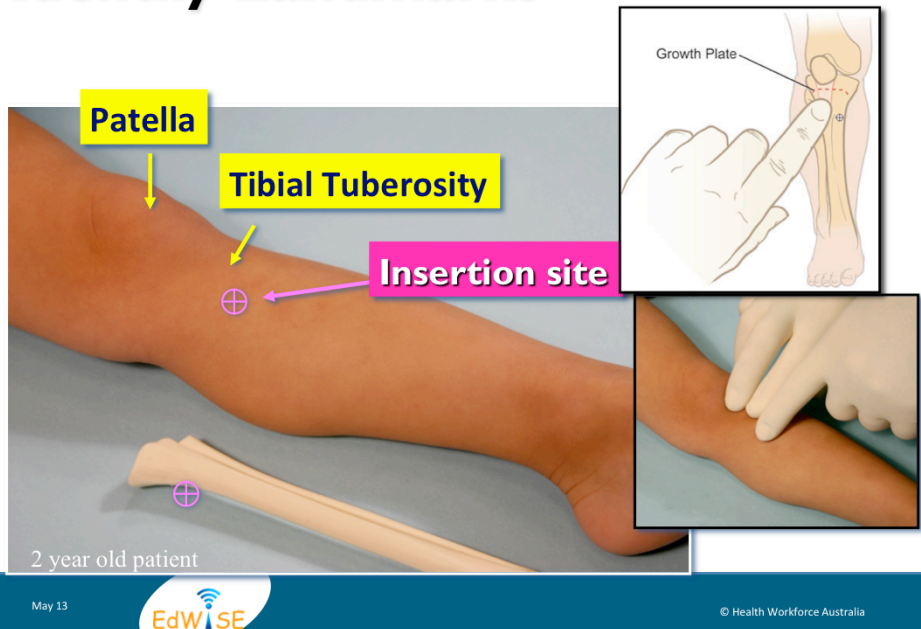
Proximal Tibia preferred

This is the preferred site in children as it has a broad flat surface with a thin layer of skin covering the bone.

The cortex is easy to penetrate and marrow content abundant.

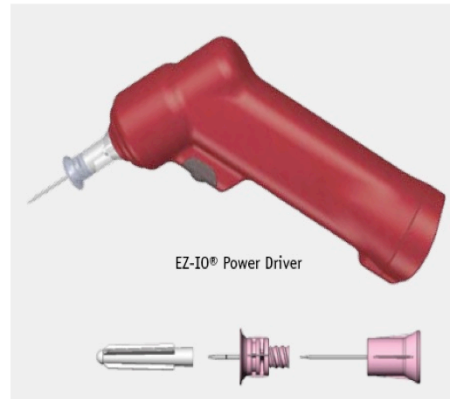
Insertion site is the anteromedial surface of the tibia, approximately 1-3

Identify Landmarks



This is an opportunity to discuss the landmarks on the tibia for insertion of the IO into the anterior tibial surface.

IO devices

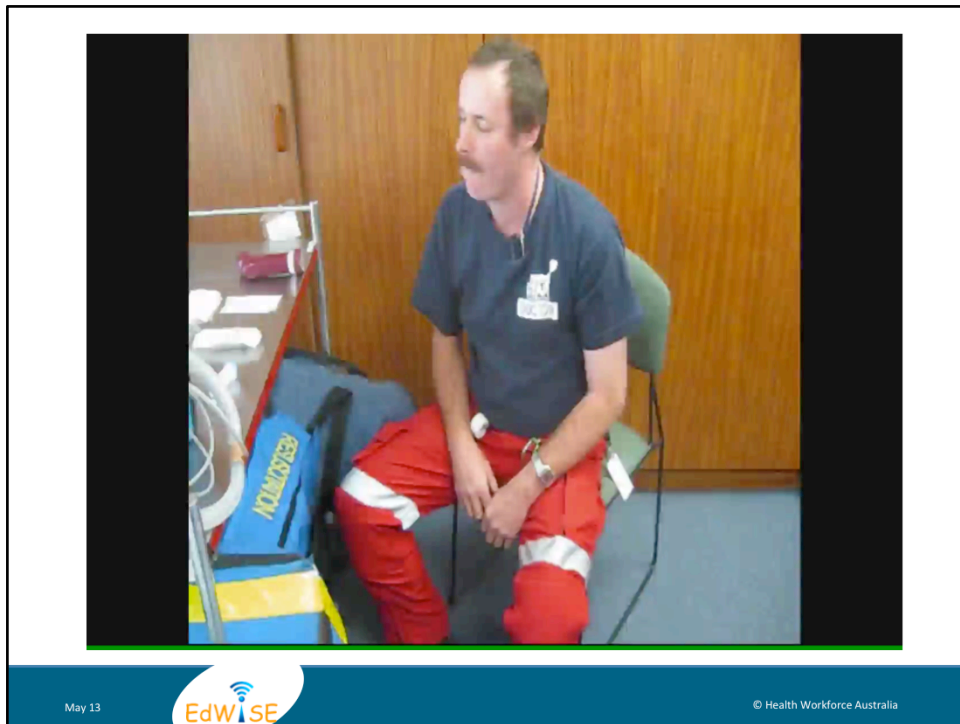


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These are the two most common devices available in NSW, staff should become familiar with the use of both of these devices.
The EZ-IO will be demonstrated on the next slide in a video.



This video demonstrates insertion of the intraosseous access by one of the doctor's from South Australia's MedStar retrieval service. We would not recommend trying this at home or work yourself.

The Conscious Patient

- Insertion has pain score 1-3
- Infusion is painful.
- Little evidence but option to use lignocaine bolus in conscious patient
 - 0.5mg / kg

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The IO can be used in a conscious patient and has been found to be less painful than recurrent unsuccessful attempts at IV cannulation. The previous video demonstrates that this insertion is not too painful.

The infusion of fluids can be painful and an infusion of lignocaine into the limb prior to rapid infusion may reduce the pain of infusion. 0.5mg/kg of lignocaine can be bolused, followed by waiting 2 minutes before use to diffuse the marrow and anaesthetise the bone prior to use. However this delay should not take precedence over resuscitation in the critically unwell child.

Preparation for fluid bolus

Age < 1 year

- 0.9% normal saline
- Burette
- Blood giving hand pump set
- 3 way tap
- 60ml syringe
- T piece extension

Age 1- 8 yrs

- 0.9% normal saline
- Burette
- Blood giving hand pump set
- 3 way tap
- large bore extension

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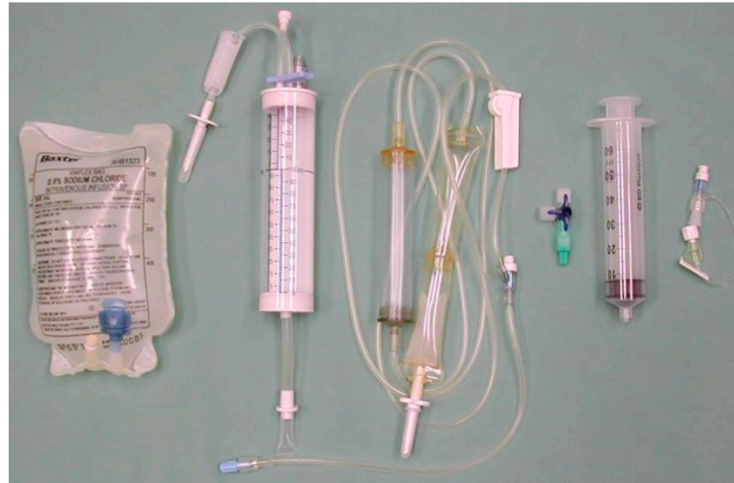
Preparing fluids for a resuscitation situation in paediatrics is important as the doses to be given are proportional to weight, size and age. The doses are significantly smaller than in adults and the risk of over resuscitating a child should be remembered.

Normal saline is the initial resuscitation fluid of choice in both paediatrics and adults.

It is essential to remember to check the blood sugar level and regularly review the electrolyte status.

All fluid resuscitation should be titrated to specific end points clearly stated by the team.

Components for administration of a Paediatric Fluid Bolus in Patients aged < 1 year of age



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Age < 1 year

0.9% normal saline

Burette

Blood giving hand pump set

3 way tap

60ml syringe

T piece extension

Components for administration of a Paediatric Fluid Bolus in Patients aged 1 – 8 years of age



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Age 1- 8 yrs

0.9% normal saline

Burette

Blood giving hand pump set

3 way tap

large bore extension

Components for administration of a Paediatric Fluid Bolus in Patients aged > 8 years



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Age >8 yrs

0.9% normal saline

Blood giving hand pump set

large bore extension

Scenario

Triage Category 1 to resuscitation area

- Please listen to the triage nurse for handover

Questions?



Photo courtesy of Edward Truemper, MD - Children's Hospital of Nebraska

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This photograph demonstrates an IO set up in a small child used for resuscitation.

Summary

- Consider IO insertion when immediate access required & IV unsuccessful after 90 secs
- All fluids & drugs can be given via IO
- Laboratory tests can be sent, but tell the lab it's marrow
- Insertion site is the antero-medial surface of the tibia, approximately 1-3 cms below the tibial tuberosity
- Bolus fluids N/S with an age appropriate set up

References

- Vidacare. EZ-IO by Vidacare Training Program, 2009

Acknowledgments

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