WOUND MANAGEMENT

Facilitators Guide

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Author Orla Kelly Duration 2 hrs Facilitator level Senior trainee/Advanced care Practitioner (ANP) Learner level Junior trainee/Staff nurse and Senior trainee/ANP Equipment required Skin glue, paper stitches (Steristrips), suture set, sutures, artificial skin or animal product for demonstration, sharps bins

OUTLINE (USE THE SECTIONS THAT ARE RELEVANT FOR YOUR LEARNERS)

- Basics (10 mins)
- Main Session: (4 x 15 minute) case discussions covering the key points and evidence
- Practical stations (30-60 mins)
- Take home learning points (5 mins)

We also recommend printing/sharing a copy of your local guideline.

PRE-READING FOR LEARNERS

Learners should read the following links prior to the session:

https://dontforgetthebubbles.com/managing-wounds/

https://geekymedics.com/category/surgery/suturing/

https://litfl.com/own-the-wound/

Some highly recommended optional extras:

www.rchsd.org/documents/2014/03/pem-articles-pediatric-lacerations.pdf/

https://www.rcemlearning.co.uk/reference/soft-tissue-injuries-of-thehand/#1583314712453-97cc4a3b-8294

BASICS

Basic Anatomy, Function and Initial Assessment



Image from Wikimedia

The skin is made of three layers: epidermis, dermis and subcutaneous layer. It has many functions including as a barrier to infection and regulation of homeostasis. Wounds in both paediatric and adult populations require similar assessment – haemorrhage control, assessment for underlying structural damage, infection potential and (lastly) scarring.

Highlight the importance of a full thorough examination. Wounds (particularly ones that are bleeding on presentation) have the tendency to be distracting. A full head to toe examination with a careful history taking is essential.

History

The mechanism of injury is the most important determinant of management. A crush injury to a finger will have decidely different outcomes than an incisional wound from a knife. **Crush injury:** Is an xray required? A missed open fracture is unacceptable. Where did it occur? Is there potential for a foreign body?

Incisional wound: From what? Knife edge or glass? If glass, an xray is warranted. Risk of damage to underlying nerves tendons and vessels is high, consider the need to refer to local speciality surgical team.

Road rash: These must be cleaned out thoroughly to avoid tattooing. They can often cover large surface area so sedation may be required.

Puncture wound: Again, from what instrument? Is there potential for retained foreign body? Location is important, puncture wounds to the palmar surface of hand or finger runs the risk of infection, particularly flexor tenosynovitis.

Bite wounds: These require thorough washout and antibiotic cover and are not suitable for closure in the ED. Consultation with speciality surgical services is advised, often healing by secondary intention is more appropriate to avoid sealing in deep seated infection.

CASE 1 (15 MINS)

A 12 year old girl is brought into ED by her mum. As she was making lunch at home, the ring came off a ring-pull can, so she tried to pull open the lid of the can by grasping and pulling the sharp edges. She arrives with a blood soaked tea towel around her hand and is tearful. On examination she has wounds to her thumb, index and middle fingers of her right hand.

What structures require assessment in a wound? How do you assess neurovascular function in hand injuries? How do you assess the function of the flexor and extensor tendons?

Discussion points:

A strong knowledge of anatomy is essential in the assessment of a wound; its location will indicate the possible structures that may be damaged. For example, on the face, be particularly mindful of the facial nerve, parotid gland and lacrimal ducts. In the fingers, assessment of radial and ulnar digital nerves and arteries,

superficial and deep flexors and extensor tendon is necessary and must be documented. Don't forget that tendons move; looking into a wound and seeing an intact tendon does not exclude a tendon injury. Wounds to hands and forearms must be carefully assessed, and if there is any possibility of damage to these structures, plastic surgery referral is recommended.

Another important factor of location is the likelihood of tension across the wound or articulation with a joint. The possiblity of an open joint means referral to orthopaedics for washout.

This is an opportunity to reference some learning from the <u>RCEM learning soft-tis</u>sue injuries of the hand post

Some tips for assessing finger wounds:

1-Assess radial, median and ulnar nerve motor function...



Rock paper scissors OK from embeds.co.uk

The anterior interosseous nerve is a branch of the median nerve and has purely motor function. It innervates flexor pollicis longus, pronator quadratus and the radial half of the flexor digitorum profundus. The 'OK' sign tests it: if the O shape is pincer-shaped, rather than O shaped, with extension at the thumb IPJ and index DIPJ, it is abnormal.

The median nerve innervates the LOAF muscles (all of the thumb muscles except adductor pollicis). Although children are often asked to make a fist (the 'rock' of rock paper scissors), this also tests the ulnar nerve. To test for the median nerve alone, ask the child to oppose their thumb by touching it to the little finger against resistance.

The ulnar nerve innervates adductor pollicis, the lumbricals, palmar and dorsal interossei. The 'scissors' test (finger abduction) tests the dorsal interossei – test by abducting fingers against resistance.

and sensory function

Vascular assessment

Pulses: palpate the brachial, radial and ulnar artery and compare to contralateral side Pallor: compare to contralateral side Capillary refill: measure it and compare to other side Temperature: Is the limb cold compared to the other side?

Neurological assessment

Test the sensory function of the median, radial and ulnar nerve distally.



Median nerve: test active flexion of the thumb Radial nerve: Thumb extension "thumbs up", or "paper" when assessing using "rock, paper, scissor, OK" technique (below) Ulnar nerve: test adduction and abduction strength of fingers

2-Assess flexor digitorum profundus (FDP) and flexor digitorum superficialis (FDS)

function, if there is a wound on the volar (palmar) surface of the hand or finger. Remember 'P' for point –FDP is assessed at the distal IPJ



• To check FDS function, hold all adjacent fingers in extension and then release the finger you want to assess. Ask the child to flex the free digit at the PIP joint, against resistance. A normal intact FDS can be flexed at the PIP joint on the unrestricted finger.

• To examine the FDP, hold the middle phalanx in extension and ask the child to flex the DIP joint. A normal intact FDP is indicated by flexion at the DIP joint.

3-Assess the extensor tendon if there is a wound to the dorsal surface of the forearm, hand or finger

The extensor tendons are assessed by asking the child to extend their finger against resistance. The following images are from **RCEM learning.**



To test the Extensor Pollicis Longus (EPL), ask the patient to place their hand flat on a table and lift up their thumb against resistance.



In young or uncooperative children, looking for normal wrist tenodesis can give clues about whether the flexor and extensor tendons are intact or not. Check out the DFTB finger injuries post for examination pearls.

CASE 2

A 4 year old boy is brought to the ED by his parents. He was playing with his brother in the garden when he tripped and hit his head off the curb. He did not lose consciousness and has not vomited. On examination there is a 6cm horizontal wound with jagged edges and visible contamination on his left forehead.

What techniques can you employ to ensure the child cooperates with assessment of his wound? Discuss non-pharmacological as well as pharmacological.

Discussion points:

In order to fully clean, explore and close a wound, the patient must be comfortable.

Distraction techniques such as smart phones, books, bubbles should all be employed. If you are lucky enough to have a <u>play specialist</u> in your department then they should be used as soon as possible!

Topical anaesthetic such as <u>LAT gel</u> is wonderful for anaesthetising wounds, and the adrenaline in it blanches surrounding skin helpfully letting you know when it's ready. If further anaesthesia is required, local anaesthetic (for example 1% lidocaine) can be used. A few tips to avoid the pain associated with injection: to inject it through the wound edges and not through surrounding intact skin, use a small needle (insulin syringe if only a small amount is needed), buffer it with bicarbonate to raise the pH, and to make sure it's at room temperature.

If after all the armoury has been depleted, then the patient may need to be sedated, in which case a senior doctor should be involved, local guidelines followed, and consider referral for GA if appropriate.

Have a look at the DFTB **procedural sedation** post or watch **Deb Shellshear's procedural sedation talk** from DFTB17.

CASE 3

An 8 year old girl is brought to the department by her Dad. She was cycling in front of the house when she fell off her bike. She has a large area of road rash to her left forearm and left knee. It is visibly contaminated with gravel, dirt and plant material.

How will you ensure this wound is cleaned adequately? How would your management change if the wound was deemed to be very dirty? What closure options are available to you?

Discussion points:

Washout

The mainstay of treatment of wounds is cleaning. Thorough washout with normal saline is recommended for all wounds. Scrubbing with a sponge or soft brush is essential for road rash to avoid tattooing and infection. For other wounds a cannula (without needle) can be fitted to the top of a 20 ml syringe and used to create a type of pressure wash. A polystyrene cup can be placed around the syringe to create a type of splash guard. All debris and underlying haematoma must be removed, if that's not possible then formal washout in theatre is necessary.

Closure

Wounds can be closed via secondary intention (ie, with no adjuncts), glue, steristrips or sutures. Superficial dermal wounds (more scratches) and puncture or bite wounds are usually more suited to secondary intention healing.

Glue

is useful for small wounds (<3cm) with clean easily opposable edges and no tension. As with all wounds, washout is necessary. When the wound is clean and not bleeding, the two edges must be gently pinched together, everting the edges, and glued in place. Be careful when pinching the wound sides together to avoid creating a valley that the glue sticks in – this will widen the scar. Aslo be careful not to glue your gloves to the patient, which is quite easy to do!

Steristrips

are useful for similar wounds as glue, but can be longer. Prep the wound edges with tincture of benzoin prior to application of the steris to increase adherence. Place the strip on one side of the wound, and with a 'pinch and pull' motion, bring the wound edges together. Leave some space between the strips to allow fluid to escape to avoid infection. If there is a chance that little fingers or drool can get at the wound, some duoderm over the wound will leave the strips impervious

Finally, if the wound is under tension or likely to reopen due to movement, then **suturing** is recommended – see case 4.

CASE 4

A 12 year old boy is brought in by ambulance after falling off his bike while swerving to avoid a car. He was wearing a helmet and thinks he did not hit his head. He has a painful right ankle and is unable to weight bear. He has a wound to his mid anterolateral shin. It is horizontal, 4cm wide and approximately 1 cm deep. He is unable to weight bear and has pinpoint tenderness at his lateral malleolus X-ray confirms a non displaced isolated distal fibular fracture.

What size suture would you like to use? What type: absorbable or non-absorbable? What do you need to ensure before the child leaves the ED?

Discussion points:

Suturing is useful for wounds that will be subject to movement and tension. Suture material can be divided into **absorbable** and **non absorbable**. The benefits to absorbable sutures is the lack of removal, however they can take time to dissolve, adding to scarring. Therefore they are useful for wounds that are not cosmetically sensitive such as the scalp and wounds under casts. In this case, there is an isolated wound that needs to be closed, and a separate distal fracture (NB not an open fracture). In this case an absorbable suture, e.g. vicryl rapide, would be most suitable as this patient is likely to be in a cast or boot for a number of weeks.

The two types of sutures that should be demonstrated in the practice stations are deep dermal and simple interrupted. Deep sutures must be absorbable such as vicryl or monocryl, dermal sutures can be absorbable such as vicryl rapide, or non absorbable like prolene or seralon.

Post Closure

1

ALWAYS ascertain the **tetanus** status of the patient and consult local guidelines.

2

Most simple wounds don't require **antibiotic** cover, but particularly contaminated ones and bites certainly do. It's likely in those situations specialist referral is necessary.

3

Open fractures require prompt referral to orthopaedics and **IV antibiotics**.

4

Patients and parents must be advised about the warning signs for infection.

5

With regards to **scarring** – parents must be informed that everyone and every wound scars differently. The main thing is the wound stays clean, infection will certainly worsen cosmetic outcomes. Post initial healing, longitudinal steristripping for a number of weeks followed by pinpoint massage has been thought to improve scarring. The wound should be covered from ultraviolet rays for up to 18 months.

STATION 1 (15 MINS)

Description and demonstration of steristrips, glue, different suture materials and equipment.

Equipment needed:

1-Skin glue

- 2-Prolene, monocryl, vicryl rapide sutures
- 3-Suture kit
- 4-Sharps bin

https://geekymedics.com/simple-interrupted-suture-osce-guide/

https://dontforgetthebubbles.com/tissue-adhesive/

SUTURE CLASSIFICATION



From Geekymedics.com

body area	size	remove in
face/lip	6-0	3 to 5 days
scalp	3-0/4-0	7 to 10 days
chest/abdo/back	3-0/4-0	10 to 14 days
limbs	3-0 to 5-0	10 to 14 days
hands	4-0/5-0	10 to 14 days
nailbed	6-0	absorbable 👸
		Contracting Contra

STATION 2 (20 MINS)

Demonstration and practice of local anaesthetic injection and simple interrupted sutures using either fake skin or animal skin (if using animal products, ensure hygiene standards are adhered to – yellow bin for disposal of gloves and soft waste).

Equipment needed:

1-Gloves	6-Plastic apron if using animal products
2-Table cover (eg incontinence sheet)	7-5ml syringes
3-Fake skin or animal skin	8-Dermal needles
4-Sharps bin	9-Saline
5-Hazardous waste bin if using	10-Suture kits
animal products	11-Prolene sutures – sizes 3-0 and 4-0

https://geekymedics.com/simple-interrupted-suture-osce-guide/

https://youtu.be/z8oWv-nVO6g

ADVANCED STATION (20 MINS)

This is an opportunity to cover more challenging sutures such as deep dermal sutures and 3 point sutures. It uses the same equipment as Station 2.

See Corner and deep suture videos:

https://litfl.com/own-the-wound/

Take home tips

- Mechanism is everything, a careful history is essential!
- 2 Examine carefully for damaged structures, deep and distal!
- 3 Wash, wash, wash, and then some more
- 4 Prepare! Position the patient and your equipment appropriately to maximise outcome and comfort
- 5 Safety net and scar advice for all patients and parents

REFERENCES

DFTB blog posts (wound management, hand exam etc)

https://litfl.com/own-the-wound/

http://www.rchsd.org/documents/2014/03/pem-articles-pediatric-lacerations.pdf/

https://www.rch.org.au/clinicalguide/guideline_index/Lacerations/

https://geekymedics.com/category/surgery/suturing/