

SECTION 4

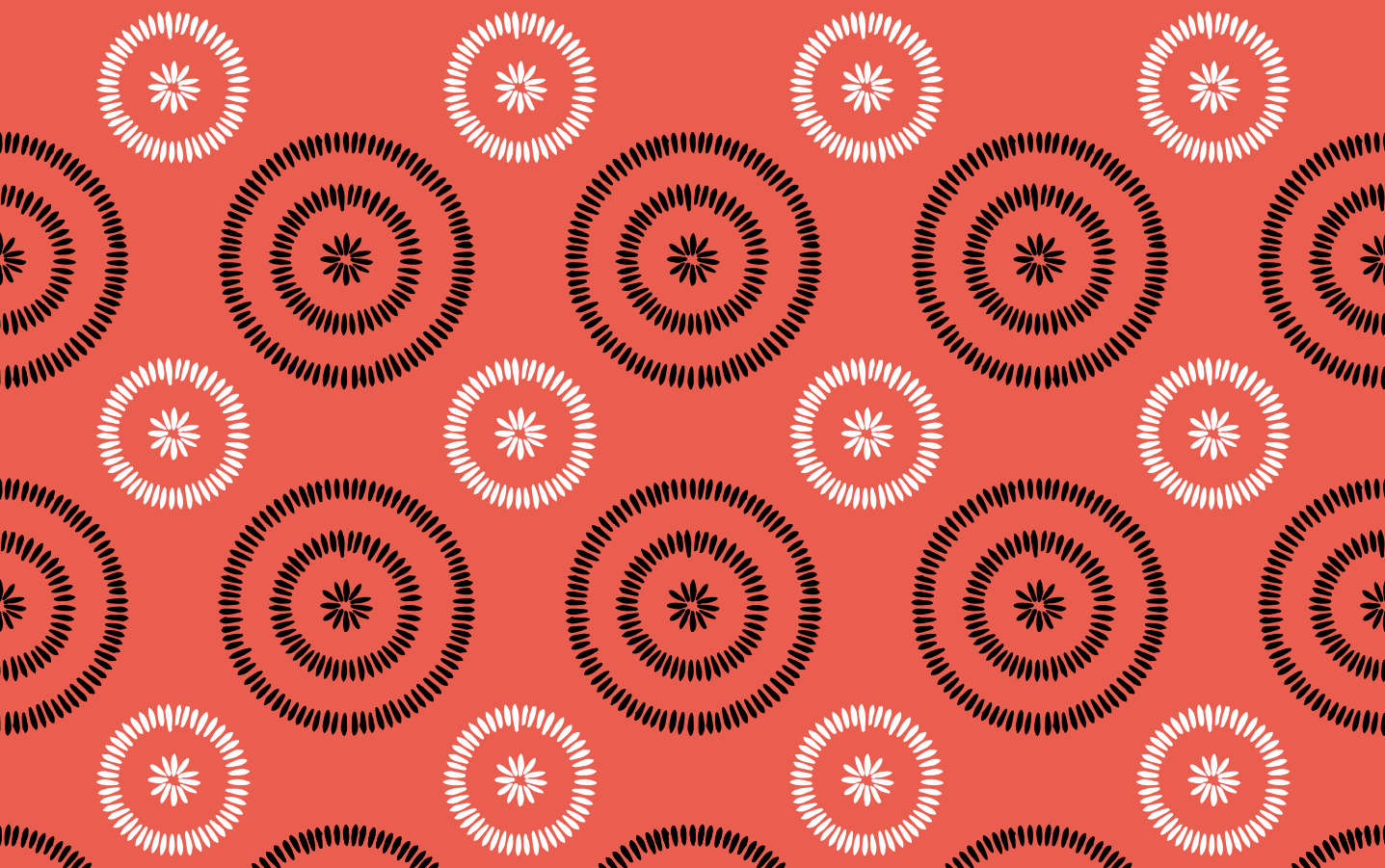
Prehospital and emergency pain

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About the book

This open access textbook is aimed at all healthcare disciplines, including nurses, doctors, rehabilitation and allied healthcare and prehospital care providers.

Throughout the book, essential evidence-based pain knowledge is interwoven with contextual case studies and patient stories, centering the patient experience to enhance understanding of the physiology, assessment, and treatment of pain.



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Introduction

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Pain in emergency settings

Globally, pain is the primary reason for seeking healthcare and the most common presentation at Emergency Centres (EC) (1). Almost 80% of adults, and more than half of paediatric patients presenting for care at ECs have pain as their primary concern. Patients require emergency care for acute pain, chronic pain and acute exacerbations of chronic pain - and emergency care personnel must be educated and prepared to manage persons with pain of all aetiologies (2-4). Traumatic injuries are the foremost aetiology for acute pain in the emergency setting with people suffering trauma regularly experiencing moderate to severe pain (2-4). Despite emergency care and access to pain relief being human rights (5), only a third of people receive pain management in the EC and 86% are discharged still with pain (6, 7). People managed by prehospital providers, with likely the same pain profile as those in ECs, do no better in terms of pain management (8). Less than one fifth of people in moderate or severe pain, or with potentially painful injuries, receive analgesics (6, 7).

In low resource settings, pain management in prehospital settings and ECs would seem to be further neglected and deprioritized. A South African study of people with trauma transferred by ambulance, found that only 18% of patients had a pain score recorded (7). Other South African studies in the prehospital setting found that even when people did receive opiate analgesia, they were substantially underdosed, suggesting widespread educational and perhaps regulatory issues and fears around pain management (9, 10).

The importance of treating pain in emergency care

Pain management is integral to managing people who have suffered trauma as untreated or undertreated pain is associated with many physical and psychological complications (11). Stress, inflammatory responses and sympathetic nervous system responses to trauma result in several physiological effects such as hypercoagulation, tachycardia, tachypnoea, hypertension, increased cardiac workload and increased oxygen demand, amongst others (4, 8, 11, 12). If acute pain remains unalleviated, the stress response is prolonged and the immune system suppressed, causing longer recovery time, increased risk of infection and complications, and increased risk of developing chronic pain (11, 13).

People who have suffered an injury may experience pain due to the traumatic event and the resultant injuries and/or due to the care provided during their stabilisation and transportation (14). Pain management also needs to be prioritised in those who have suffered trauma who have an altered mental status since although unable to self-report pain, the physiological effects and secondary complications of nociception and pain will persist.

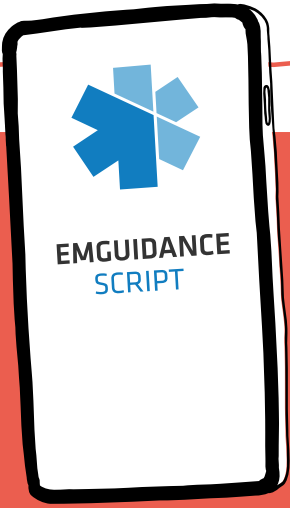




DON'T MISS THIS

Free guidelines on the EMGuidance App

The EMGuidance App is free to download and use! EMCT Guidelines on the app include procedural sedation, preparation of critical care infusions including analgesia and sedation, and a medicines formulary. Most importantly the app has a ‘search’ function so you can easily find what you are looking for. The app is kept up to date by the experts who write the content through a review process. For this reason – we won't be including too much information about drugs and drug dosages in this section, and we encourage you to use a reference such as EMGuidance or the Health Professions Council Professional Body of Emergency Care protocols for Emergency Medical Services (EMS) personnel.



Some easy to follow and practical protocols for sedation and analgesia of particular use are for a ketamine or ketamine/midazolam infusion, midazolam and morphine combined, morphine, common paediatric critical care and analgesia infusions

From a psychological perspective, traumatic events lead to fear and anxiety (15). People who are anxious and fearful suffer more pain (16). As a result, effective trauma care including acute pain management in the critically injured are essential components of quality prehospital care. Prehospital emergency care providers and healthcare professionals working in ECs are ideally positioned to contribute to addressing the early and pre-emptive assessment and management of pain.

Triage and pain management

Pain is classified into mild, moderate, and severe as early as in triage at the Emergency Centre, followed by effective methods of analgesia. The South African Triage Score (SATS) it is widely used across South African prehospital services and healthcare facilities to aid clinical management (17-24), and is used in both private and public health sectors. SATS is also widely accepted and validated and used in various forms across the African continent (19, 25, 26). The SATS is designed to be performed by a nurse, doctor or prehospital provider, using an initial discriminator list of clinical symptoms and signs to calculate a score based on vital signs. This score classifies a patient to a colour category which dictates the urgency for them to be seen by a doctor. There are different triage scores for adult and paediatric patients, with differing discriminators and vital sign parameters.

Figure 4.1: South African Triage Scale categories and time to be seen

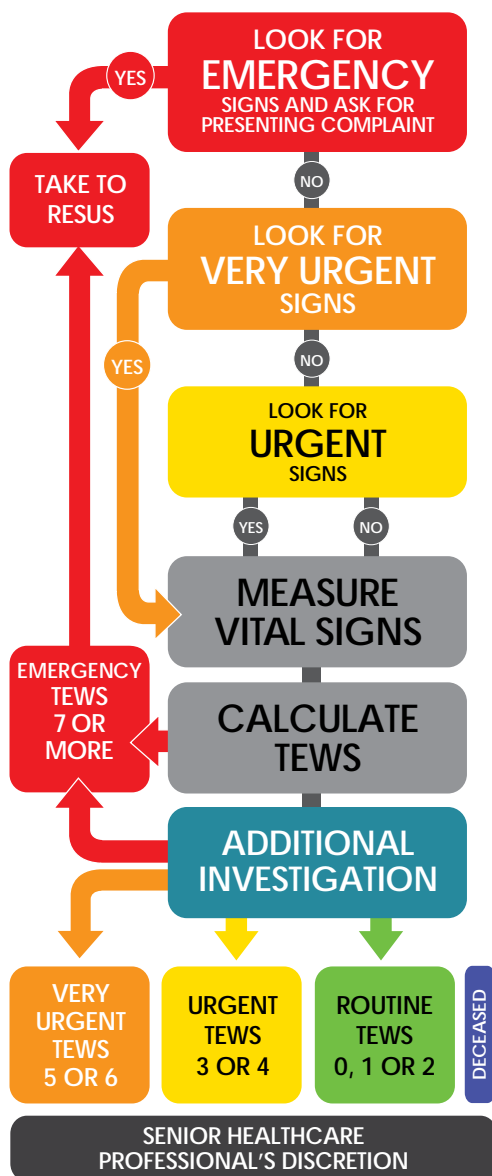


Priority COLOUR	Target time	Management
RED	IMMEDIATE	Take to the resuscitation room for emergency management
ORANGE	< 10 mins	Refer to majors for very urgent management
YELLOW	< 1 hour	Refer to majors for urgent management
GREEN	< 4 hours	Refer to designated area for non-urgent cases
BLUE	< 2 hours	Refer to doctor for certification

Discriminators are an important aspect of the triage process – meaning that there are certain conditions or emergencies which automatically triage a person to a certain category. “Severe pain” is clearly identified as a “Very Urgent” sign which immediately classifies a patient as Orange – meaning they must be seen within 10 minutes even if their vital signs are within normal ranges. An important note is that the pain can be categorised as severe pain by the person in pain or the healthcare practitioner! “Moderate pain” on the other hand is an “Urgent” sign and dependant on vital signs might categorize a patient as Yellow: to be seen within an hour.

Of course, the caveat is that the otherwise clear and quantitative triage assessment tool doesn’t go further into how to grade pain as moderate or severe. Several studies of triage performance have already identified that pain is a commonly missed discriminator, and it has been suggested that triage nurses either lack the confidence to differentiate pain severity or are perhaps “immune” to patients’ complaints of pain (20, 21).

Figure 4.2:
The Adult South African Triage Score
(Source: Emergency Medicine Society of South Africa)



EMERGENCY:

- Not breathing
- Seizure-current
- Burn-facial / inhalation
- Hypoglycaemia-glucose less than 3
- Cardiac arrest
- Obstructed Airway-Not breathing

VERY URGENT:

- Level of consciousness reduced / confused
- High energy transfer (severe mechanism of injury)
- Shortness of breath-acute
- Coughing blood
- Chest pain
- Stabbed neck OR chest
- Haemorrhage-uncontrolled (arterial bleed)
- Seizure-post ictal
- Focal neurology-acute (stroke)
- Aggression
- Threatened limb
- Dislocation of larger joint (not finger or toe)
- Fracture-compound (with a break in skin)
- Burn over 20%
- Burn-electrical
- Burn-circumferential
- Burn-chemical
- Poisoning / Overdose
- Diabetic-glucose over 11 & ketonuria
- Vomiting fresh blood
- Pregnancy and abdominal trauma
- Pregnancy and abdominal pain
- Severe pain

URGENT:

- Haemorrhage controlled
- Dislocation of finger OR toe
- Fracture-closed (no break in skin)
- Burn other
- Abdominal pain
- Diabetic-glucose over 17 (no ketonuria)
- Vomiting persistently
- Pregnancy and trauma
- Pregnancy and PV bleed
- Moderate pain

Overcoming barriers to assessing and managing pain in the emergency setting

Pain management in the emergency setting is challenging. The nature of the environment, the patient demographics and the resources available are all factors that affect the assessment and management of pain. Below we will explore barriers to assessing and managing pain in the emergency setting – whether the emergency is happening in the prehospital setting, a rural clinic, a district hospital or tertiary centre – and suggestions to overcome these barriers. (7,9,10,27-32)

How healthcare system resources may contribute to poor pain assessment and management

Culture within the healthcare setting

All healthcare workers must be advocates for improved pain assessment, management and easement in emergency care to create a culture within the workplace which focuses on assessing and relieving pain.



Limited time to assess and reassess patients

You may work in a setting where the pressure of the patient load limits your time available to assess and reassess pain, and to communicate with team members.



Limited access to analgesic medications

Pain is an emergency! Healthcare systems must ensure healthcare practitioners are able to care for persons with pain. Do what you can with what you have, and advocate for more resources.



Limited access to personnel qualified to prescribe and administer medications

If medication is not in your scope of practice, you can be a strong advocate for non-pharmacological management and, if resources are available, call for assistance for analgesia from another practitioner.



How patient interactions may contribute poor pain assessment and management

Personal, cultural or spiritual beliefs

A person's cultural and personal beliefs affect their experience and communication of pain, such as being stoic or brave, which may limit the person's communication about their pain. Healthcare workers must ensure that they create a rapport with the patient to encourage the patient to communicate about their pain and their concerns.



Assessment

As healthcare workers, we must not assume that the person with pain is familiar with pain scales, is clear about the question we are asking of them or has told us everything about their pain that you need to know for assessment and management. They may be communicating in their second language or be stressed about their condition and distracted. Check in with your patients, ask if you can make anything clearer or if they have any questions – this is an opportunity to show caring and build rapport, which can empower the patient to understand and manage their pain.



Fear of injections & more pain

Needles and healthcare workers are common causes for fear! Healthcare workers must work to reassure and partner with people with pain to manage their anxiety and distress, including open communication, asking for concerns and coaching of mindfulness techniques, including deep breathing techniques.



Understanding of analgesia and pain management options

A person with pain may not be aware of available analgesia options or may be concerned about side-effects or sedation from medication. Creating an open communication style which invites questions and conversation about a person's questions and concerns is empowering – take the time to talk!



Fear of being accused of drug seeking and opioids

Clear communication with the person with pain, and inviting them to ask questions will help to create



Fear of costs

People may be afraid of incurring costs related to their healthcare, and it is always best to be open and invite a person with pain to share their concerns.



How healthcare workers may contribute to poor pain assessment and management

Complexity of managing underlying disease or severity of illness or injury



Critically ill or injured patients may require many simultaneous decisions and emergency actions and pain can easily be overlooked during emergency care. Work as a team to advocate for a culture of better pain management practises by embedding pain assessment and management in routine care.

Fear of masking symptoms or affecting physical examination



Emergencies can be complex, and we may be hesitant to administer analgesia before assessing a patient. The evidence is clear: patients who receive early analgesia have better health outcomes. Don't hesitate to give the analgesia!

Knowledge of regional anaesthesia techniques



Some patients may benefit from regional anaesthesia, especially trauma patients! There are nerve blocks which can be done using anatomical landmarks and do not require ultrasound guidance and motivate for opportunities to learn this exciting skill.

Fear of causing or supporting analgesic addiction



Opioid addiction is a concern globally. Multimodal analgesia may help lessen the need for strong opioids, and opioid sparing strategies such as ketamine infusions can also be considered. Using Pain Science Education empowers a person to understand their pain and be more in control of how their pain is managed, including understanding the role and risk of opioids to make informed decisions where appropriate.

Fear of hospital or regulatory sanctions



Equip yourself with knowledge of the rules and regulations you are concerned about and ask for help from a senior or experienced colleague. Documentation of your treatment and consultations is important for medicolegal concerns.

Education and experience of pain management and analgesic medications



Healthcare worker experience and understanding of pain management hugely contributes to their confidence and ability to manage pain. All healthcare practitioners must be empowered through comprehensive pain physiology, assessment and management in undergraduate education and ongoing learning, including current evidence about analgesic medications, doses and side effects (including sedation and nausea) to ensure they are comfortable with administration. Don't be afraid to look things up or consult a colleague or senior! Drug doses, treatment guidance and much more are available on reliable information sources like hospital, provincial and national clinical guidelines, and apps like EMGuidance.

Failure to ask patients about pain or underestimating pain severity



Documenting, assessing and reassessing pain can be improved through creating a culture of focusing on pain assessment and managing within healthcare teams, and you can be a part of creating this culture.

Fear of elderly patients



Treating elderly patients can challenge your knowledge, especially if patients have dementia or are particularly frail. When in doubt, consult with a colleague or senior clinician either in person or telephonically.

Fear of treating children



Children can be challenging to assess and treat, and confidence in managing children grows with experience. As we know the assessment and management of pain in children is determined by their age and weight, you can prepare yourself with reference materials such as normal physiological parameters and precalculated doses. Reference tools such as PAWPER (33) and Broselow Tapes (34) are encouraged!

Bias



There is evidence that race, gender, age and language are factors in a patient receiving healthcare and pain management. Reflect on your own biases and the biases you observe in the system around you, and how this may be affecting how people with pain are assessed and treated in your setting.

Assessment drives management

Pain is a personal experience affected by biopsychosocial factors, and not the person's report of pain intensity is the most reliable method of assessing pain (35). Pain may be classified as mild, moderate, or severe in the prehospital setting or in triage at the EC. Assessment should be followed by the administration of effective analgesia with reassessment to evaluate effects. After all, the purpose of assessing and reassessing pain is to ensure we are appropriately treating pain! Using multiple reassessments with the same tool helps us to gather information about how well our pain management strategy is working, and helps us to partner with the person in pain to understand their needs to manage the pain.

The earlier the pain assessment, the earlier effective non-pharmacological and pharmacological pain interventions can be administered and their effect reassessed (35, 36). Assessments must be comprehensive to ensure the potential risks and benefits of pain management strategies for individual patients and their clinical condition are appropriately selected (36). In other words, an assessment is more than simply recording the severity of pain – remember your OPQRSTUVWXYZ from Section 1! A comprehensive assessment is needed because a balance may need to be struck between concerns for the patient's clinical condition and the necessity to manage acute pain in the initial resuscitation phase of care.

Managing pain in emergency care

Multimodal pain management combining pharmacological and non-pharmacological approaches is indicated to manage pain in these challenging settings.

Non-pharmacological pain interventions

Pain is a conscious construct of the brain in response to a perception of threat. Therefore, management of a person's emotions and anxiety can have a wonderful influence on their experience of the pain they are experiencing! Not all pain management includes drugs!



DON'T MISS THIS

Why do so few people in the prehospital setting receive analgesia?

Despite the importance of managing acute traumatic pain, it continues to be under-recognised and under-managed in the prehospital setting (7, 106, 107). In a cohort of 2401 prehospital trauma cases in the Western Cape, South Africa, only 18.1% had a pain score recorded, most of whom experienced moderate (40.2%) or severe pain (38.2%). Only 2.8% of the people who had suffered trauma and 7.6% of those with moderate to severe pain received analgesic medication (7). Other research conducted in South Africa shows that even when people do receive opiate analgesia for moderate and severe pain, they only receive low doses which are inadequate to manage their pain (9, 10). The international literature



suggests that less than a third of people with severe pain cared for in the prehospital setting are treated for their pain (2).

Pre-hospital providers in South Africa report multiple barriers to administering analgesia including scope of practice restrictions, unavailability of higher qualified practitioners to administer medication, concerns about adverse effects of analgesic medications, lack of availability of medications such as nitrous oxide (Entonox®) and factors related to the environment, the injured person and practitioners, to name a few (28).

Effective communication and engagement to provide reassurance and by showing empathy, kindness and professionalism in the pain management approach is a vital initial non-pharmacological treatment for pain. Prehospital non-pharmacological pain interventions include physical interventions such as ice/cooling or heating, dressing/bandaging, positioning, aligning, immobilisation (sling/splinting/traction), elevation, etc. and psychological interventions such as information sharing (e.g., about procedures), distraction techniques, coaching, and breathing techniques (14, 35). Although non-pharmacological interventions such as immobilising unstable injuries decrease the likelihood of further tissue damage and assist in alleviating pain, the process itself may also be associated with pain (14, 16). Prehospital non-pharmacological pain interventions can, in some instances, be used independently in mild pain and in combination with pharmacological interventions in moderate to severe pain (14). Pharmacological pain management interventions can be combined with non-pharmacological interventions to optimise effects.

Table 4.1: The EEECCP of non-pharmacological pain management strategies (39-46)



Category	Strategies
Environmental What can we do to decrease the stress of the environment?	<ul style="list-style-type: none"> Control the environment Create a calm environment, control the visuals and the sounds. Try to reduce noise (especially of others in distress), dim bright lights, reduce monitor alarms.
Emotional What can we do to help the person with pain (and caregivers) feel more comfortable and reassured in our space?	<ul style="list-style-type: none"> Provide reassurance by explaining each step in their care and by showing empathy, kindness and professionalism in all communication. For children, ensure the caregiver is present and actively involved in care where possible. The healthcare team can also use calm voices, positive affirmations and active reassurance to both the child and the caregiver.
Cognitive What can we do to anticipate and manage stress and anxiety?	<ul style="list-style-type: none"> Cognitive reassurance by providing information about each step in care, explaining what procedures and actions are planned – such as blood tests or medication administration, and why these are being conducted is key here. Distraction is a powerful tool! Talk to the person in pain or encourage others to talk to them on any topic to distract them. Allow children to play music or play games, encourage toys and distraction. Virtual reality games and immersive play are very effective in reducing procedural pain. When possible and appropriate explain pain mechanisms using pain science education. Encourage mindfulness techniques such as deep breathing.
Context How can we plan our care to reduce stress and pain?	<ul style="list-style-type: none"> Ensure analgesia is at peak effect before a painful procedure – reassess your patients pain and ask! Group procedures and anticipated painful experiences to reduce handling and encourage rest.
Physical What about the physical experiences can we control to reduce their experience of pain?	<ul style="list-style-type: none"> Heat and cold – e.g. for swelling in acute injuries, apply ice. Dress / bandage, splint, immobilise, position and elevate injuries as indicated Provide comfort – such as lying or sitting in a comfortable position, providing a blanket or pillow etc For children, physical experiences which decrease pain range between age groups but include breast-feeding, a dummy or pacifier, Kangaroo Mother Care or being held by a caregiver, gentle touch and warmth.

Pharmacological pain interventions

Multimodal pain management is an imperative in the EC and prehospital setting. Multimodal pain management combines non-pharmacological analgesia with opioid and non-opioid agents targeting different sites in the nociceptive pathway to treat pain (4, 35). For example, ketamine in combination with opioids may result in more pain reduction at 15 to 30 minutes after administration when compared to opioids alone (47). Combining these agents improves the efficacy of the analgesia through a synergistic effect, reduces the dose of the single agent and reduces the risk of adverse effects and the use of opioids (4, 35).

Several medications such as opioids (morphine and fentanyl) and non-opioids (ketamine, paracetamol, nitrous oxide (Entonox®) and methoxyflurane (or penthroxyflurane)) are available for prehospital and EC pharmacological pain interventions in the South African context (48). Usefully, these medications can be administered through various routes such as inhaled (nitrous oxide, methoxyflurane), intravenous (IV) (opioids, ketamine, paracetamol), intranasal (fentanyl, ketamine) and intramuscular (ketamine) (35). All of these medications are deemed safe and have similar efficacy in reducing traumatic pain in the setting (35, 47, 49-54). This means that we have a variety of medications available for prehospital pain management to allow us to tailor pain management to the person and their condition while minimising possible adverse effects (47).

The use of nerve blocks in the emergency centre is a growing field, and provides early, consistent and effective pain control. This may be especially useful in low resource settings where there are limited resources to administer and re-assess the effect of analgesia, and especially as many nerve blocks can be done safely using anatomical landmarks. You can read more about this in the Deep Dive on regional anaesthesia in Chapter 5 where Elizabeth tells us her story of falling in her garden.



DEEP DIVE

South African emergency care practitioners

Table 4.2: Medications in the scope of practice of South African Prehospital Qualifications

Prehospital care in South Africa is provided by emergency care practitioners with qualifications which range from one-month short courses to one-, two- or four-year university degrees, with the defined scope of practice differing vastly between differing qualifications. In many parts of South Africa, there are limited numbers of practitioners qualified to deliver analgesia such as sufentanil, alfentanil and tramadol and non-steroidal anti-inflammatory drugs (47, 51). Consequently, inhaled nitrous oxide (Entonox®) and inhaled methoxyflurane are regularly the only option. Sadly, in the South African prehospital context these are often not available (27).



Qualification	Medication
BAA, AEA and ECA ^a	Nitrous Oxide (inhaled), Methoxyflurane (inhaled)
Emergency Care Technician (ECT)	Nitrous Oxide (inhaled), Methoxyflurane (inhaled), Morphine (IV) ^c
Advanced Life Support (ANT register) ^b	Nitrous Oxide (inhaled), Methoxyflurane (inhaled), Morphine (IV) ^c , Fentanyl (IV, IN) ^c , Ketamine (IV, IN, IM) ^c , Paracetamol (PO, IV) ^b , NSAID (Ibuprofen) ^d
Emergency Care Practitioner (ECP)	Nitrous Oxide (inhaled), Methoxyflurane (inhaled), Morphine (IV, IM) ^c , Fentanyl (IV, IN) ^c , Ketamine (IV, IN, IM) ^c , Paracetamol (PO, IV) ^c , NSAID (Ibuprofen) ^d

Footnote: a: Basic Ambulance Assistant (BAA), Ambulance Emergency Assistant (AEA), Emergency Care Assistant (ECA), b: Include National Diploma, Diploma and Critical Care Assistant (CCA) paramedics, c: Intravenous (IV), Intranasal (IN), Intramuscular (IM), Per os (PO) d: Non-Steroidal Anti-Inflammatory Drug

In this Section, we will explore pain in the prehospital and emergency centre setting to better understand how we as healthcare workers can assess and treat pain, even when it is challenging.

Brave Leah will tell us her story of being burnt and we will learn more about assessing and managing pain in children, non-pharmacological pain management for emergency care and especially pain management of burn injuries.

Sashka's story shares important lessons about analgesia in acute pain (hint: we don't need to wait until the patient has been assessed!) We will explore management of pain in the prehospital setting in Sashka's story of being in a pedestrian-vehicle accident and sustaining polytrauma.

Elizabeth's neck of femur story will delve more into pain management of patients in the emergency centre, and a deep dive into the role of nerve blocks in emergency pain as well as special considerations for pain management in our older patients. From Romy's drawn-out abdominal pain we learn about visceral pain and the importance of early analgesia even in the stoic patient, and amidst a chaotic EC.



DEEP DIVE

Palliative care breakthrough pain in the emergency setting

People receiving palliative care may require emergency care when they experience breakthrough pain (55, 56), and this is a common emergency presentation. Here we will explore why they experience this pain during their treatment and how we as emergency care personnel can care for them.

Althea January is a 39-year-old lady with advanced metastatic breast cancer, including metastasis to ribs, spine, liver and lung. She has had chemotherapy & radiotherapy in the past, but oncology recently told her she is now "palliative", gave her some morphine, and she has no future appointments. She arrives to the Emergency Centre with an ambulance which her family called due to severe pain. She is crying, appears to be in a lot of pain, whilst she is not confused, she seems to be very distant/disengaged.

Why might Althea, who has been referred for Palliative Care present to an EC with an acute pain crisis?

Often people who should be receiving ongoing palliative care do not have access to a palliative care team for help. This may be because they have not been referred, or the palliative care service has no afterhours coverage, or there simply is no palliative care service where they live. This means that people have no choice but to go to an EC for help.

Their pain may be a symptom of a new complication of the disease such as a new metastasis or pathological fracture. This means that an impeccable history and examination is needed and the OPQRSTUVW is vital here.



Althea may be in pain because she has not been taking medication (perhaps she doesn't like how it makes her feel), or her medication has run out. It may also be that the dosage of the medication she has been provided with is inadequate resulting in breakthrough pain. Althea may be struggling with vomiting, or she may have developed a bowel obstruction, both of which would impair her ability to absorb the medication.

Key concept in palliative care: Total Pain

Pain is a conscious construct of the brain in response to a perception of threat. In palliative care, the term "Total Pain" is used to understand the complexities of pain. Suffering and fear of death can profoundly alter the perception and meaning of pain. The term "Total Pain" was coined by Dame Cicely Saunders, founder of the hospice movement, who proposed that pain in terminally ill patients should be understood as having physical, psychological, social, emotional, and spiritual components and managed as such (57).

Why might Althea not be taking her oral morphine?

Perhaps she has become too frail to manage her own medication and needs someone else to assist with timing of medication & administration. Althea may be struggling with side effects. These can include: nausea, vomiting, constipation and somnolence. The key to minimising side effects and optimising treatment with oral morphine is careful prescribing when initiating treatment.

Key steps when initiating treatment

- Careful education when first prescribing mist morphine, taking time to explain side effects, and providing reassurance that the side effects usually improve within 2 weeks can ensure trust is maintained between all parties. Many myths exist regarding morphine, and it is vital to address these directly with all involved parties at the start.
- Healthcare workers may make the mistake of starting treatment at a higher dose 6 hourly instead of lower dose 4 hourly, thinking this is more convenient. **DO'T DO THIS!** It leads to swings between severe pain and disorientation which can be very distressing.
- Always prescribe stool softeners with mist morphine
- Consider prescribing metoclopramide or haloperidol to manage nausea and/or constipation.
- Before initiating any patient on mist morphine, read the HPCSA Guidelines on commencing and titrating mist morphine (HPCSA Guidelines for oral / mist morphine <https://emguidance.com/content/18579> and Hospice Palliative Care Association of South Africa – Clinical Guidelines 2012 https://apcc.org.za/wp-content/uploads/2020/04/HPCA_Clinical_guidelines_2012-1.pdf)

Why might Althea have run out of morphine?

Perhaps she does not have social support. Althea may have been collecting her own medication from the clinic but now she is too frail/weak, and perhaps feels guilty to ask someone to collect for her. Althea may have been started on a low dose of morphine which has gradually been titrated upwards by her doctor, with advice for breakthrough doses. But this might mean that the months' supply she was provided with finished early, and the pharmacist may refuse to accept a new script "early". These situations need good engagement with the pharmacist or an explanation of the new script.

What adjunctive treatments might help Althea?

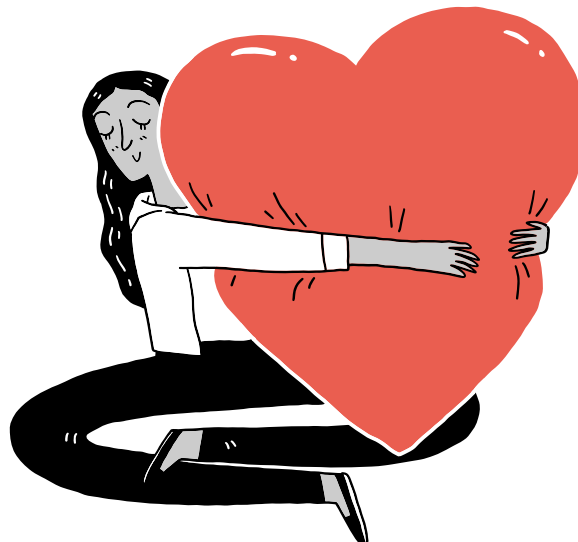
Multimodal analgesia is always important – ensure she is using paracetamol and/or NSAIDs if there are no contraindications. If neuropathic pain mechanisms are present, consider amitriptyline or other central acting drugs. Always ensure that non-pharmacological treatments are planned and implemented.

Consider the A's:

- **A**ntidepressants if Althea has underlying depression (not if life expectancy thought to be less than 2 weeks)
- **S**leep **A**id if Althea is struggling to sleep (remember lack of sleep increases pain)
- **A**nxiety: consider sublingual lorazepam if Althea is struggling with anxiety
- **A**nticipate pain from painful events like bathing/dressing changes/toiling and adjust dosing times or give breakthrough doses before these activities.

Are there other opiates/long-acting options for Althea?

There are, but these other agents can be very costly in comparison to mist morphine. In an acute severe pain crisis like the one Althea is experiencing, rapidly titrating long acting or slow release drugs is often impractical or impossible. It may be necessary to switch to oral / mist morphine which is easily titrated. This can be done by adding up all the different opiates used in 24hours and calculating the Morphine Milligram equivalents per 24hrs using an Opiate conversion calculator. Once her pain is controlled and stable the calculator can be used to switch back to long-acting options if available/desired. However, Althea needs to always have a rapid acting opiate available for breakthrough pain.



A key concept in palliative care: Delivery of subcutaneous medication when people are unable to use oral medications

When the oral analgesic route is no longer possible e.g. due to complete malignant bowel obstruction, gastric outlet obstruction, decreased level of consciousness, subcutaneous morphine sulphate is an excellent option both at home and in healthcare facilities. A 23G butterfly, left in situ on the chest wall, taped down with a clear dressing can be applied for administration. This is convenient as there is minimal discomfort to reinsert it should it dislodge. It is also simple to situate, unlike IV access which can prove more challenging.

There are two options for delivery

- A continuous infusion with syringe driver
- Bolus/intermittent dosing

Calculate the oral morphine dose required over previous 24hours and divide by 3 to obtain the equivalent subcutaneous dose. Deliver this amount over 24hours via infusion or divide up into 4hourly bolus doses (if no syringe driver is available)

If using syringe driver Metoclopramide 20mg can be added into the same syringe (or give 10mg boluses 8hourly). If Althea is at the end of her life and develops terminal restlessness, adding sedation/anoxiolysis with midazolam or haloperidol is possible in the same syringe.

What factors were contributing to Althea's "total pain"?

Althea has been struggling to sleep. She has been feeling anxious about her children seeing her sick this way and she is worrying about how this will affect them. Althea is worried about what will happen to her children when she dies, who will have custody of them. Althea is angry and embarrassed that she is losing her independence. As she looks back on her life, Althea also has regret for broken down relationships.

Acknowledging and validating all of these emotions and concerns, and helping Althea communicate these thoughts and feelings will assist her pain. She may benefit from counselling/social work/psychology to help her process these thoughts and feelings.

Althea and her family are counselled on the meaning of palliative care and how to help Althea manage her "total pain" going forward and given some leaflets to take home (link here <https://palprac.org/palliative-care-for-me-patients-loved-ones/patient-and-family-resources/>). Althea and her family feel relieved to have more resources to help them understand how to manage and plan, and Althea is comfortable to try taking mist morphine at a lower dose every four hours (link here PalPrac family leaflet on oral / mist morphine <https://palprac.org/wp-content/uploads/2024/05/Myths-about-morphine.pdf>).



2

Burns

“Please be gentle”: Managing burns & paediatric pain

Jocelyn Park-Ross
Asma Salloo
Samantha Marchant
Nikki Allorto
Romy Parker
Shamiel Salie

An accident means it isn't my fault

My name is Leah and I am 9 years old. I live in Strand, we were visiting my grandmother in her town with my Mommy, my aunt, and my baby cousin who is 9 months old.

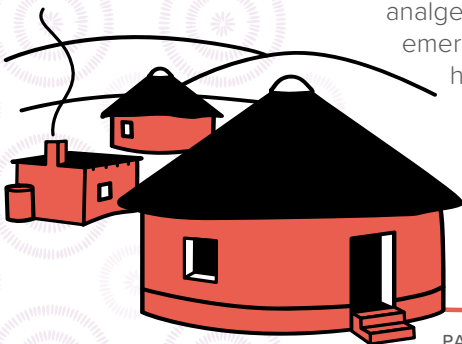
I was standing holding my cousin and I was holding the kettle, and he pulled the kettle and it spilled water and on me and my cousin. I screamed hard! I dropped my cousin! My Mum come and she take my cousin and my Mom take off the clothes of my cousin and my clothes also and she called an ambulance. And when the ambulance come, I said, “it was all my fault!” and she said it wasn't my fault, it was an accident. And I said – “so it wasn't my fault?” and she said “No”. And I was not even a little bit OK, but I was a little bit scared.

Epidemiology

People living in Africa live in environments which increase the risk of sustaining a burn injury resulting in a high incidence of burn injuries on the continent (58). Overcrowding, informal structures, unreliable or unsafe electricity supplies, and use of open flames for warmth and cooking all increase the risks of suffering a burn injury. Burn injuries from very hot liquid or steam (scald injuries) are the commonest cause of burns in children living in sub-Saharan Africa (59%) with injuries from flames being the second most common cause (59).

Children below the age of 10, are particularly vulnerable to suffering a burn injury and they represent over 80% of cases. Vulnerability increases in younger children, with children under the age of 4 at highest risk of suffering a burn injury (59). While one in five people suffering a burn in Sub-Saharan Africa will die of the injury (59), tragically, children in Africa are four times more likely to die from a burn injury than children receiving treatment for the same injury in high income countries (60).

To optimise the management of burn injuries, a network of burn injury services is being developed in South Africa. Injuries classified as ‘non-complex’ should be managed at the primary level of care where basic wound care, antibiotics and analgesia can be administered (60). More severe burns should be managed in emergency departments at day hospitals, primary healthcare facilities or at district hospitals. When people have suffered more complex burns, initial treatment can be offered at these facilities before transfer to a regional hospital equipped to manage more complex cases or directly to a specialised burn unit, as Leah was (60). Major burns which are classified as more than 20% of total body surface area (TBSA) and burns of a special nature should be managed in specialised burn facilities or units (58).



Leah's Mom tells us more

I was busy on my phone, and she asked me if she could hold her cousin. I was busy with timesheets on my phone, they went into the kitchen where my oldest daughter was busy. I heard this scream, and I thought they were fighting again. I saw Cayden was burned and his face was red, I took his clothes off and put cold water on him. Why are they still screaming? Then I saw that she also got burnt. I called the ambulance two or three times. We just took her clothes and go with the ambulance to the hospital. When it happened, I didn't feel sorry for them I just thought how I must help them. She was very brave – she just stood there shaking, telling my mother she was cold.

Mechanisms of pain

Leah is suffering from acute nociceptive pain from a burn injury with associated inflammation. Depending on the depth of the injury there may also be neuropathic mechanisms contributing to her pain.

Peripheral nervous system

A burn injury to the skin results in a cascade of events all of which contribute to nociception and pain. The nociceptor channels particularly involved in generating pain from a burn are the thermosensitive transient receptor potential vanilloid (TRPV) channels which release CGRP from the nociceptor when they are stimulated. The release of CGRP results in an increase in intracellular calcium which sensitises the nociceptor (61).

A burn such as the one Leah has experienced also damages the skin cells. The cell membranes break down and release ATP and other cellular contents including damage-associated molecular pattern molecules (DAMPs). DAMPs bind with toll-like receptors, and other receptors of the immune system which trigger an immune cascade. The immune cascade means that histamine, catecholamines, proinflammatory cytokines like TNF α , bradykinins and other products are released or recruited to the area of tissue damage. This inflammatory soup rapidly sensitises the nociceptors (61). As you will recall from Section 1, this means that the peripheral nociceptors (primarily A δ - and C-fibres) will now have lowered firing thresholds, increased responsiveness to stimulation and silent nociceptors will be activated. Leah will not only have pain, but she will also have primary hyperalgesia – excessive pain from normally painful stimuli.

Children in Africa are four times more likely to die from a burn injury than children receiving treatment for the same injury in high income countries.

Spinal Cord

The barrage of nociception from the periphery would rapidly sensitise the second order neurons in the spinal cord. Within minutes of her injury, Leah would be experiencing allodynia (pain from normally non-painful stimuli) and secondary hyperalgesia as evidence of this sensitisation. The lowered firing threshold, increased receptor field size and increased responsiveness to stimulation means that there would now be increased levels of nociception being transmitted up the spinothalamic tract to the brain.

Brain

Leah experienced severe pain at the time of the injury which was useful! It generated a response in her own movements and called attention to those around her to give help. However, the barrage of stimulation would be ongoing, potentially meaning that Leah suffered ongoing pain. However, Leah's mother has stayed with her and remained calm and brave. Her presence has likely reduced Leah's pain by creating a sense of safety. A sense of safety means that Leah's brain can activate the descending inhibitory mechanisms, including releasing endogenous opioids (62). These endogenous analgesic mechanisms would have reduced the severity of her pain on the way to the hospital. However, if Leah's mother had been afraid, or angry or engaged with Leah in a way which did not create a sense of safety, her pain may well have become worse because of activating of descending facilitatory mechanisms.

Synergistic systems

The synergistic systems would have been immediately activated as a result of the tissue damage and the cascade of events including the release of DAMPs activating the immune system (61). Leah was worried that it was her fault that her cousin was injured and was naturally stressed by the events. The immune, endocrine and autonomic systems would all have been activated with a sympathetic dominance and systemic inflammatory and stress responses further contributing to pain.

Leah meets the paramedics

It was sore. The ambulance people gave me some medicine to help with the sore, they give me medicine in my mouth, and it helped a little bit. The ambulance say where you get burnt – I said I got burnt on my arm and my body and my leg. And then I went for a ride in the ambulance.

First, I go to the hospital they give me an injection just here, and they make me got to sleep. Then I come to Red Cross. I don't know how we got to Red Cross hospital.

Pain assessment

When a person who has suffered an injury comes into contact with both EMS and Emergency Centre staff, they will be assessed and triaged. The physical assessment of the child who has suffered a burn involves exposing the wound to examine and calculate burn size and depth, asking questions about the cause of the injury, doing a full physical examination, initiating intravenous access and much more! The examination can be

painful and cause anxiety. We can manage the pain and anxiety of assessment by communicating clearly with the child and their caregiver and providing early analgesia. It is not necessary to wait for assessment prior to giving analgesia - in fact a better assessment can be conducted if analgesia has been administered first (63).

The size and depth of the burn wound are not good predictors of pain, but all burn wounds are painful!

Assessing children who are experiencing an emergency or are experiencing pain can be challenging. Leah, at the age of 9, is old enough for healthcare workers to be able to talk to her and assess her pain. Younger children, especially those under the age of 5, may not be old enough to communicate how they are feeling or answer many of the questions they may be asked during physical assessments and assessment of their pain. In these situations, it is important to use all your verbal and non-verbal communication skills with the child and their caregiver to assess their pain. Anticipating pain and distress and communicating and previewing the next actions to be taken in assessment and treatment will help to decrease anxiety for the child and their caregiver and create a good rapport.

On triage, we would note Leah's vital signs to document her triage, and because she has a burn of more than 10% total body surface area and severe pain, she would be triaged Orange on the South African Triage Score. The discriminators and vital signs parameters are different in children!

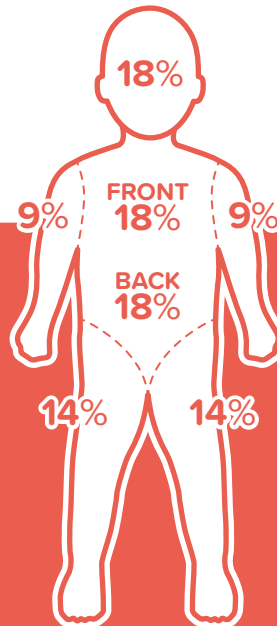
We will use the OPQRSTUWV to understand Leah's pain from her burn injury. As she is old enough to talk and express her experience of her pain, we can ask her the questions below, and use a vertical numeric pain rating scale or a faces of pain scale such as the Baker-Wong or Faces Pain Scale (64).



DON'T MISS THIS

All burns are painful!

The size and depth of the burn wound are not good predictors of pain. Full thickness burns, while lacking sensation in the full thickness area, will have areas of lesser burn in the surrounding tissue, and will be very painful! It is challenging to correctly assess the size and depth of a burn in the acute setting, and the focus should be on assessing and treating the pain symptomatically, and anticipating painful experiences.



Paediatric South African Triage Score Chart

Child's body Part	% of total BSA
Arm	9%
Head and Neck	18%
Leg	14%
Anterior trunk	18%
Posterior trunk	18%



DON'T MISS THIS

Understand and anticipate pain

Emergency teams have an important role to play by anticipating and assessing pain provoking factors and events to create a better experience for the child who may undergo several surgeries and prolonged rehabilitation after a burn injury. It is important to assess and understand what provokes pain in children! Anxiety and stress hugely affect a person's experience of pain, and emergency care personnel can positively influence their experience by being aware of this. Burn injuries are exceptionally painful and may require a long recovery time with many dressing changes and treatments which can exacerbate pain and cause great anxiety for the child. It is important to anticipate the events which will be painful early in the treatment journey, and to use all the tools in your pharmacological and non-pharmacological toolbelt to reduce their pain.



The earlier we partner with injured children and empower them to understand and communicate their pain, as well as communicate about how we are anticipating their pain to manage it, the better the relationship with the healthcare team and the smoother the healing process.

↓ **Table 4.3:** Leah's OPQRSTUVW for pain

Gather information on the...	What questions to ask	Leah's pain	What did this information tell us?
O nsset	<p>When and how did this start?</p> <p>How long does the pain last?</p> <p>How often do you get the pain?</p>	Leah didn't feel the pain immediately after the incident, but when the pain started it was very severe!	For most, the pain is instant and severe, requiring first aid such as running water over the burn to cool a thermal burn or Burnshield™.
P rovoking and palliating activities	<p>What causes the pain?</p> <p>What makes it better?</p> <p>What makes it worse?</p>	Leah's pain is made worse by stimulus – moving, medical procedures such as weighing on triage, siting an intravenous line and changing of bandages.	<p>Anticipate painful activities and communicate with Leah. Provide analgesia ahead of time to ensure her pain is managed as best as we can!</p> <p>Keep in mind that initial assessment, removal of clothes and dressings, moving around for triage and between areas in the hospital will cause pain. We can advocate for Leah to receive her analgesia as early as possible, such as oral paracetamol at triage, and top up analgesia as soon as needed or possible.</p>
Q uality of the pain	Can you describe your pain?	Leah describes her pain as very severe, but isn't sure what it feels like.	Younger children may struggle to describe their pain, and may not always be able to help us understand the quality of their pain. Leah is 9 years old and happy to describe her pain.
R egion or radiation	<p>Where is the pain?</p> <p>Does the pain spread?</p> <p>Where does it spread to?</p>	The pain is localised to the area of the burn at the moment.	Younger children under 5 may struggle to describe their pain – you may need to ask a caregiver to help you understand where the pain is worst and where it radiates to.
S everity	<p>How severe is your pain?</p> <p>How severe is it right now; at its best; at its worst and on average?</p> <p>How severe is your pain when you try to be active?</p>	Leah is old enough to use a numeric rating scale and has communicated with us that her pain is severe but is well managed with analgesia. She says it is sorer when she is moved and would maybe like more medicine before she is moved.	We can expect that even minor burn wounds are painful, and that any movement or stimulus may make the pain more severe.

Continued...

Gather information on the...	What questions to ask	Leah's pain	What did this information tell us?
T reatment	<ul style="list-style-type: none"> • What treatment have you tried for your pain? • How well has it worked? • Have you had any side-effects from these treatments? 	Leah tells us that she had some analgesia from the paramedics, and strong analgesia at the hospital before her ambulance transfer to the second hospital.	At every step of the emergency care journey, assess and reassess the pain management plan and comfort of the person. <i>Regularly ask if they need more analgesia, different analgesia or if they are comfortable!</i>
U nderstanding beliefs and impact	<p>What do you think is causing your pain?</p> <p>What do you think is wrong?</p> <p>What can you not do because of your pain?</p>	Leah is clear that her burn from the kettle is causing her pain, and she is reassured by her mom that it was just an accident.	Understanding what Leah is worried about helps healthcare workers and her caregivers to comfort her to ease her anxiety as best we can.
V alues	<p>What do you like doing and want to do that pain is stopping you from doing?</p> <p>Ask about playing, being with friends or family, reading or going to school.</p>	Leah is worried that she won't be allowed to play with her cousin or see her family for a long time.	<p>Allowing Leah to ask questions and understand her worries gives us an opportunity to partner with her caregiver to provide reassurance, and to guide how we help Leah cope.</p> <p>Values may be difficult to assess in the acute period but are important to revisit later.</p>
W hat else?	<p>What else is going on in your life?</p> <p>How are you generally?</p>	Leah says she is okay and she wants to go home and be with her family.	<p>Knowing what is important to Leah helps us know what to talk to about when she needs some comfort and distraction.</p> <p>"What else" may be difficult to assess in the acute period but is important to revisit later.</p>



DEEP DIVE

Assessing pain in children

Why is assessing pain difficult or different?

Age, education level, language and culture are all important factors which influence our assessment of pain in children (39). We gather information from the information children tell us, but also from our visual observation of the child (crying, their position and behaviour) and physiological signs of pain, such as tachycardia.

In assessing pain in children, the caregiver is an important source of information. Leah is a little older, and we can ask her questions – she will tell us where she is hurting, and she can describe her pain on a visual-analogue scale and tell us how severe her pain is. For many children under 5 who are too small to communicate, we ask the caregiver if their child is in pain – they will tell us their child is restless, not sleeping or eating, and if they think they are in pain. For pre-verbal children, physiological assessment and observation of a child’s behaviour and posture gives us a wealth of information about how much pain they are experiencing (39, 65, 66). Anxiety about painful procedures and being in a foreign environment contributes hugely to the distress experienced by the child and makes the assessment of pain more difficult. Remember the EECPP of non-pharmacological management to aid your assessment! What tools and scales can be used?

For children, healthcare workers must choose a pain scale appropriate to the child’s neurodevelopment (39). The Neonatal Infant Behaviour Scale (NIPS) for neonates and infants uses the observations of facial expressions, crying, breathing pattern, arm and leg movement and the child’s state of arousal (sleeping, awake or fussy) to provide a numeric scale (66). For older children, consider the FLACC or a faces of pain scale, such as the Wong-Baker or Faces Pain Scale,

which are described in Section 1. The FLACC tool is used in children who are pre-verbal, and includes physiological measurements to noxious stimuli, while the Wong-Baker or Faces Pain Scale is used in children who are able to speak (39, 65, 67). Clinicians often use the FLACC and Wong-Baker or Faces Pain Scale in combination.

Assessment guides treatment

Remember that a once-off assessment is not helpful for managing pain – we must reassess regularly, especially after giving interventions or medication to manage pain to ensure it has been effective or if we need to escalate our treatment (39, 66, 68). Remember it is vital to partner with the caregiver to understand whether your pain management interventions are working!



Leah’s Mom struggled too

At the hospital they gave her an injection so she can sleep while they clean the wounds. While I was standing next to the bed, I felt a bit dizzy as I saw how badly she got burnt. We waited for the ambulance to take us to Red Cross Hospital.

When we got here, I didn’t realise we would stay so long. It’s hard. It’s hard to see her in pain. There isn’t anything I can do to help her, only to be here so she can see that Mommy is here.

Pain management

Pain from a burn can be excruciating – and we can anticipate that Leah will need prolonged care and rehabilitation. Multimodal analgesia and combining non-pharmacological and pharmacological strategies need to be used from the start to reduce Leah's pain as quickly and effectively as possible.

Simple first aid is important for burn care and pain management. Leah's mum did the correct first steps by removing the children's clothes and potential source of ongoing burn. An additional useful action is to run tap water over the burnt areas while awaiting the ambulance. Running tap water over the area helps cool down the area and prevents the burn injury from extending while also providing some pain relief. If it is available, Burnshield™ can also be applied to provide some comfort. If no Burnshield™ is available, burn wounds can be gently covered with plastic wrap or cling wrap which is often available in most households (while taking care not to wrap the clingwrap too tightly). The wrap helps to prevent fluid loss, which is a major factor in resuscitating burnt children, and provides some pain relief. Covering the exposed area minimises stimulus from friction and contact with air or clothing.

Prehospital providers can anticipate the pain of a burn wound, and administer analgesia based on their respective protocols, or request assistance from practitioners who can administer analgesia. This is an important time for prehospital providers to advocate for early pain management!

Before we dive into the pharmacological management of Leah's pain, we will reflect on all the other things we as healthcare providers can do, or advocate for, to manage her pain. What can we do for Leah? Let's look at the EECCP of pain management in Table 2.2!

Being separated from their caregiver causes distress and anxiety in children, especially during an emergency or when they are experiencing pain. One of the most important things we can do for Leah is to keep her Mom with her to comfort her and decrease her anxiety.

Distraction and physical comfort are important tools for pain management, especially in younger children and infants (39).

Once Leah reached the first hospital, the priority was to assess her burn for size and depth, and to assess and manage her pain. In larger surface burns like Leah's, it is important to establish intravenous access and give intravenous fluid based on the Parklands formula to replace fluid lost from the burn area (69). People who have suffered burns with large surface areas may experience haemodynamic instability or shock because of the pathophysiology of a burn. This does not mean that analgesia cannot be given, in fact, analgesia administration is vital, and can be titrated to their hemodynamic status.

Combining multimodal analgesia and non-pharmacological need to be used from the start to reduce Leah's pain as quickly and effectively as possible.

Analgesia strategies are chosen based on the mechanism of the pain, but also on the severity of the pain experienced. Leah's burn area is large, and she is reporting severe pain, and we are anticipating that she will be moved, assessed and have repeated dressing changes. Multimodal analgesia is always best practice, and the severity of Leah's pain guides her choice of analgesia towards stronger medications such as a combination of intravenous morphine or ketamine with paracetamol, gabapentin and clonidine. Intravenous paracetamol provides good analgesia in children who are nil per mouth or have feeding difficulties. Clonidine is used routinely in children with burns as an anxiolytic agent and all children with deep burns should receive gabapentin for neuropathic pain (61, 70).

↓ **Table 4.4:** The EECCP of pain management for Leah

Category	Prehospital strategies	Emergency Centre strategies
<p>Environmental What can we do to decrease the stress of the environment?</p>	<p>Where possible, try and minimise stressful exposures! We can move Leah to a chair where she is comfortable to assess her, or she can sit on Mom's lap. Try and create a calm space in which to assess and treat Leah, which may be in a quiet place in the house where she feels comfortable, or in the ambulance with her Mom present if needed.</p>	<p>Create a child-friendly and calm environment, control the visuals and the sounds a child experiences. Try to reduce noise (especially of other distressed children), dim bright lights, reduce monitor alarms.</p>
<p>Emotional What can we do to help Leah and her Mom feel more comfortable and reassured in our space?</p>	<p>Ensure Leah's Mom is with her and actively involved in care where possible – include the caregiver in the treatment plan and encourage them to talk to the child in a calm voice and provide reassurance. Encourage Leah to do things she finds comforting – maybe to bring a teddy or blanket that makes her feel comforted.</p> <p>The EMS team can also use calm voices, positive affirmations and active reassurance when talking to Leah and her Mom.</p>	<p>Keep Leah's Mom with her as much as possible to keep her calm and ask Leah's Mom to help reassure and comfort Leah.</p> <p>Encourage things that make Leah feel more comfortable, such as a teddy or toy.</p>
<p>Cognitive What can we do to anticipate and manage stress and anxiety?</p>	<p>Managing anticipation and needs decreases stress and anxiety! The paramedics caring for Leah must anticipate that she and her Mom are feeling anxious, and that Leah needs our help to manage her pain, which will help Leah feel comforted and cared for. By explaining to Leah and her Mom what we are doing and why, we can help them both to manage their anxiety and stress.</p> <p>For example – we can explain that we are using Burnshield™ and clingwrap to help Leah feel more comfortable. If you aren't able to offer any analgesia, we can explain to Leah and her Mom that while the EMS team can't offer medication for the pain, they would like to get them to a hospital where the EMS team will make sure they ask the Emergency Centre team to prioritise analgesia.</p> <p>Distraction is a powerful tool! We can encourage Leah to play music or games on a cell phone, encourage toys and distraction.</p> <p>Where appropriate, we can use pain science education to help the injured person in the emergency setting to understand their pain, and it is very important that we always explain what we are doing to help manage their pain.</p> <p>Leah is awake and talking, and we can encourage mindfulness techniques such as deep breathing for her and her Mom.</p>	<p>Engage with the child and caregiver and explain what procedures and actions are planned – such as blood tests or medication administration, and why these are being conducted.</p> <p>Distraction is a powerful tool! Allowing Leah to play music or games on a cell phone, encourage toys and distraction. Hint: Virtual reality games and immersive play are very effective in reducing procedural pain (46).</p> <p>We can talk to Leah and her Mom about pain mechanisms and help them understand why the burn is so sore and what is being done to manage the pain.</p> <p>We can encourage Leah and her Mom to practise mindfulness techniques such as deep breathing.</p>

Continued...

Category	Prehospital strategies	Emergency Centre strategies
Context How can we plan our care to reduce stress and pain?	Where possible, explain what procedures or other actions are going to be done (intravenous access and dressing of her wound in Leah's case) and why they are being done – and try and group these painful procedures to allow Leah time to rest.	There is a lot that needs to happen for Leah's care – intravenous access, burn scrubs and dressings, drawing of blood samples etc. Where possible, explain what Leah can expect to happen next and why it needs to be done – and try and group these painful procedures to allow Leah time to rest.
Physical What physical strategies can we use to reduce their pain?	For Leah's burn, running tap water over her burn site for first aid and then applying Burnshield™ or clingwrap to minimise stimulus.	

Where possible, consider administering analgesia orally as it is equally as effective, cost-effective and is considered best practice (71). Depending on the clinical condition of the person and the severity of their pain, the percentage total body surface area burnt and degree of shock secondary to the burn, enteral (by mouth) medication may not be tolerated. In these situations, intravenous opioids would be the first step in analgesia for the pain of an acute burn. Leah has an intravenous line established administering fluid maintenance, and so the administration of an intravenous morphine and/or ketamine infusion helps us to manage Leah's pain. When administering these infusions, we will ensure that Leah's vital signs are regularly monitored and communicate with Leah and her Mom about the effects of the medication, such as drowsiness.

Sometimes in an emergency, it may be difficult to establish intravenous access, and intramuscular ketamine may be considered until intraosseous access is established. It is always a good idea to minimize invasive or painful procedures for children, including intramuscular injections, but intramuscular ketamine is a safe administration method in the emergency setting.



DON'T MISS THIS

Procedural pain management

The best practice evidence for all burns (superficial to deep) is surgical scrubbing as soon as possible after the burn to decrease sepsis. This is a very painful procedure and should only be done under procedural sedation! Ketamine sedation is a safe and effective modality, and can be given intravenously or intramuscularly (70, 74). However, all people undergoing procedural sedation must be monitored

for oxygen saturation, heart rate and respiratory rate, with emergency equipment available. Where procedural sedation is not possible, a strong opioid is advised.



Lessons learnt

Our core messages for caring with children with pain in the emergency setting:

1: Partner and communicate

Communication with a child's caregiver and with the child about what to expect and how you are partnering with them to manage their pain will help the child and the healthcare team to manage the child's pain. The child's caregiver is often your most powerful ally in understanding a child's pain. The caregiver can focus on comforting the child to decrease their anxiety, allowing you to conduct a full assessment. The caregiver is also able to provide feedback on whether your treatment plan is working.

2: Anticipate!

Leah says: "It gets very sore when I get burnt. Please be gentle."

Anticipate which procedures or moments may cause anxiety or pain, and ensure you communicate and have a plan to manage these moments. Your plan may include analgesia, distraction and partnering with the child's caregiver to reassure the child and decrease anxiety. If possible, try and reduce handling of the child and allow the child to rest by clustering procedures or events that may cause pain.

3: Advocate!

Pain assessment and management are poorly done in emergency care – both in the prehospital and in-hospital setting. Be an advocate for pain management and ensure that your assessment and pain management plan is emphasised when handing over care. An example of this is to ask for paracetamol from the triage nurse during hand-over!

4: Assess and reassess

Document the assessment and reassessment of pain! This guides us as healthcare practitioners on how well we are managing pain. Assessing pain in children may include children too young to talk, but this doesn't mean they aren't communicating. Use different tools such as the FLACC, NIPPS or faces of pain scales for children who aren't able to talk, or a numeric rating scale for children who can talk and describe their pain. Caregivers will also have valuable information to help guide your assessment.

5: Don't forget the non-pharmacological pain management

You can reduce pain by controlling the experiences of the child and the caregivers of their environment, as well as their cognitive and emotional stress and physical factors.

6: Multimodal analgesia is best practice

Don't forget that this means targeting as many pain mechanisms as possible using both pharmacological and non-pharmacological treatments.

7: Have a plan for calculate dosing

Weight-based dosing may be difficult to calculate, especially in moments of stress. It may be useful to work out these doses ahead of time if possible, or to use an established guideline which guides your dosing.

8: Prioritise oral analgesia where possible!

Remember that there are many administration routes and formularies for analgesia, such as nasal administration, and syrups and suppositories.

→
Table 4.5: General analgesia for children in pain (Adapted from the Red Cross War Memorial Children's Hospital Clinical Guideline for Paediatric Pain Management) (70, 72, 73)

Predicted pain severity	Analgesia
Mild	Paracetamol (oral), clonidine AND consider NSAID* (Ibuprofen)
Moderate	Paracetamol (oral), clonidine AND consider NSAID* (Ibuprofen) AND Weak opioid: either tramadol drops SL or oral (older children) OR morphine PO / IV
Severe	Paracetamol (oral), clonidine AND consider NSAID* (Ibuprofen) AND Strong opioid (choose one): ketamine infusion AND/OR morphine infusion OR fentanyl infusion
Neuropathic pain	Gabapentin OR pregabalin
Synergistic agents**	Clonidine
	Ketamine
Interventional modalities (not applicable to burns!)	Regional anaesthesia infusions Regional nerve block

*The concern with NSAIDs is masking of thrombocytopenia from sepsis and risk of kidney injury - ensure normal renal function, platelets normal

** Can be used with any pain severity and are strongly suggested with moderate/severe pain or if neuropathic mechanisms are suspected.



DON'T MISS THIS

Leah gets better in Section 5

Now that we have covered the emergency treatment of Leah's burn, you can follow Leah's story of her skin grafts and how she is recovering from her injury.

In this chapter we have focused on assessment of pain in children - and in Leah's chapter in Section 5 we will explore more about managing pain in children, and how to partner with caregivers to help us care better for a child's pain.

3

Acute abdominal pain

Romy Parker
Gill Bedwell

Andrit Lourens

Mashiko Setshedi

Peter Hodgkinson

Sa'ad Lahri

“I’m trying not to be a wimp...but it really is 10 out of 10!”

Adapted from the
previously published
paper (63)

Introduction

My name is Romy, I am a physiotherapist, a professor, a clinician and academic who specialises in pain management. When this happened to me, I was 51 years old and regarded myself as a relatively strong, perhaps even a powerful woman. And yet, when I was a patient in severe pain, I was no different to anyone else, I was vulnerable and felt completely disempowered.

I was diagnosed with diverticulitis at the age of 45 when I developed severe left sided abdominal pain and was diagnosed with a diverticular cyst. That episode required an admission and treatment with intravenous antibiotics. After that, I managed things myself. I keep fit and healthy, and exercise at high intensity 5 or 6 days a week, training with a canoeing and surfski squad that includes several world medallists (including my own silver medal at the World Masters Canoe Marathon Championships in 2018). I pay attention to my diet and living a balanced lifestyle.

In July 2020 things changed. On Friday night of 3 July 2020, I woke with left sided abdominal pain. This didn't surprise me, it's not unusual and I'd been uncomfortable all week which I blamed on diet, eating soups when it was cold and not salad! As usual, the sharp stabbing sensation would start in my left upper quadrant, ripple down to the left lower quadrant and into my pelvis. On Saturday morning I was lecturing on a course. As the day progressed the pain intensified, I took more Buscopan®, drank lots of water, breathed, and lay down during lunch.... nothing helped and the pain got worse until at 3pm when I had to admit defeat and stop teaching for fear of saying something unacceptable to the class!!

Buscopan® contains
hyoscine butylbromide
which is indicated
for its antispasmodic
properties.



Epidemiology

Diverticulitis is a common condition where pouch-like protrusions of the colonic wall (diverticulae) become inflamed. Acute diverticulitis typically presents with abdominal pain, fever and leucocytosis. The clinical presentation, diagnostic procedures and treatment depend on the severity of inflammation.

Acute abdominal pain is the primary reason for presentation in the Emergency Centre (EC) in 7-10% of cases (75). Poorly managed acute pain has multiple negative consequences including patient dissatisfaction, poor outcomes of the acute incident including delayed healing, and increased risk of developing chronic pain (11).



DEEP DIVE

Diverticular disease is common

In the USA it is the 8th most common reason for outpatient gastrointestinal diagnosis. The presentation and course of the condition in this case is not unusual. The term is an all-encompassing one, describing manifestations of diseases including diverticulosis, diverticulitis and segmental colitis associated with diverticulosis. Diverticulosis refers to a pouchlike protrusion where the colonic mucosa and submucosa herniate through the muscle layer at points of weakness where blood vessels traverse the colon wall (76). Typically this condition is asymptomatic, but when a diverticulum becomes obstructed, inflammation results in diverticulitis, commonly presenting with acute left-sided abdominal pain. In 75% of cases the condition presents as uncomplicated, with the complicated form presenting with severe inflammation which may penetrate through all the layers of the colon resulting in the formation of abscesses, fistulae, strictures, or perforation with/without peritonitis.

The pathophysiology of diverticular disease is multifactorial and remains unclear. It was previously thought that slow transit and increased colonic pressures were associated with diverticular disease, but the data are inconsistent (77, 78). Notwithstanding, a commonly accepted theory is that stool particles



(faecoliths) accumulate in diverticula, become inspissated and hardened, and erode through the diverticular wall (79). If a diverticulum perforates freely into the abdominal cavity, diffuse peritonitis results, whereas diverticula covered by mesentery are contained, creating a phlegmon or abscess, with localized peritoneal signs (80). In this case, the patient has been appropriately managing risk factors for diverticular disease, by eating a high fibre diet, avoiding refined carbohydrates and red meat, not smoking, and keeping her weight under control (81). While the role of physical inactivity as a risk factor is controversial, this patient's engagement with physical activity is in line with the guidelines on diverticulitis which strongly suggest vigorous physical activity in patients with a history of acute diverticulitis 18 to reduce the rate of recurrence (81).

What should I do?

It is now after 3pm on a Saturday afternoon during the COVID-19 pandemic, what do I do? I tried phoning my GP and the gastroenterologist I haven't seen for 6 years. No luck! I argued with my husband that I didn't need to go to hospital – we're in the middle of COVID lockdown, that's the worst place to be. I phoned my pain colleague and friend hoping she'd be on my side, but no, she agreed with my husband, and so off to hospital we went. We arrived at the emergency centre of a large private hospital group at 4:30pm. Step 1 – get in the door without my husband, register, try to stand up straight and not make strange noises. Step 2 – get seen by a triage nurse: "how bad is your pain?" she asks. "Well right now an 8/10 but when one of those spasms comes its 10!" I reply. No flicker of acknowledgement from her about my answer, she just writes it down. Takes my vitals, nothing unusual there I notice, which is reassuring but also makes me feel like a wimp. If my temperature and blood pressure are normal, then I clearly don't have an infection so why am I causing all the fuss? I think to myself. But then the pain hits again, so I'll stay. Surely someone will see me soon and give me some decent analgesics and we can go home.



DON'T MISS THIS

The challenge of finding a number for your pain



The triage nurse used the standard approach, asking how severe her pain was on a scale of 0=no pain and 10=worst pain imaginable. Notice Romy's internal thought processes as she tried to choose the number. She was concerned about how the nurse would perceive her, she was concerned about being a burden on the healthcare system at a time she knew was already challenging for the healthcare team, and she was concerned about causing an unnecessary fuss. All of these thoughts were going through her mind while the nurse looked on expectantly. It is important to consider that when we ask people with pain questions about their pain, the questions are not so simple after all, pain is about context, there is a lot of conscious and unconscious processing going on when we ask questions.

Triage procedure in the EC for the person with acute abdominal pain

Romy appropriately presented to her nearest emergency centre for assessment. The first step is triage, one of the central tenants of most Emergency Centres around South Africa, including those in the private sector, where it is widely used to aid clinical management and as a tool for billing purposes (although not the original intent). This score classifies a patient to a colour category which dictates the urgency for them to be seen by a doctor. The reasons for this are clearly demonstrated by Romy's case – vital signs alone (heart rate, respiratory rate, blood pressure and temperature) are not sufficient for triage purposes. In fact, "severe pain" is clearly identified as a "Very Urgent" sign which immediately classifies a patient as Orange: to be seen within 10 minutes even without abnormal vital signs.

Of course, the caveat is that the otherwise clear and quantitative triage assessment tool doesn't go further into how to grade pain as

moderate or severe. In this situation, where Romy presented with severe pain (pain greater than 7 on a pain scale of 0-10), she should have been classified as Orange to be seen within 10 minutes by a doctor.

Romy is in agony

It's now 6pm and I'm sitting on a plastic chair in the waiting area with two other people scattered around the room. No one is allowed to sit with me, it's COVID-times, and my husband is in the car. The pain is now cranking up regularly in speed and intensity, what I thought was a 10 was nothing on this! I'm trying to breathe, I'm trying to cope but I find myself bent over with my head on my knees gasping for air, swearing like a trooper and banging my fist against the chair with each spasm. I can hear the comments ("Daddy what's wrong with that lady") but I can't do anything else. The receptionist is starting to sweat and calls the nurses – surely, they can give me some analgesics? No, I hear them say, we can't until she's been assessed and there are no beds right now. I hear all this, and I know I should argue but it's taking all my energy just to stay in the chair. You know it's getting bad when the receptionist sneaks over and offers you the paracetamol in her handbag, and then she apologises because she can't even give you a hug! The background pain doesn't drop to an 8 anymore, and it's not localised anymore, my abdomen is in agony and then there is agony on top of agony.

Pain assessment

The EC waiting room can be a high stress and chaotic environment for staff and patient alike, yet patient safety is heavily dependent on, not only initial triage, but also regular reassessment of patients in the waiting room (82). In this case, as Romy

presented with severe pain, assessment and regular reassessment of her pain was indicated to evaluate and prompt evaluation of the mechanisms which may have been contributing to her pain. As she could not be seen by a doctor within 10 minutes as indicated by her SATS score, scheduled reassessment (sometimes referred to as ‘watchful waiting’) could have been initiated.

Mechanisms of pain

Visceral pain can be diffuse, referring, and may be associated with autonomic responses such as nausea and vomiting (84).

Peripheral nervous system

Although not all viscera can evoke nociception (e.g. liver), other organs, including the colon, can elicit nociception both with and without tissue injury, e.g. in response to stretching of the tissues (85). Organs, including the gastrointestinal tract, are innervated by two classes of receptors: (i) high threshold receptors, which encode noxious stimuli and (ii) low threshold receptors, which encode innocuous and noxious stimuli, and there are also a large proportion of ‘silent’ nociceptors. Similar to silent nociceptors in the skin, these receptors are generally dormant but become activated in response to inflammation and/or ischemia (86). The activation of silent nociceptors contributes to peripheral sensitisation by increasing the number of receptors responding to (potentially) noxious stimuli. This process of peripheral sensitisation is observed clinically with worsening pain and primary hyperalgesia as described here by Romy.

Spinal Cord

The barrage of nociceptive signals from the periphery enhances synaptic activity at the dorsal horn of the spinal cord. This enhanced synaptic activity – spinal cord sensitisation which you learnt about in Section 1 – contributes to the amplification of nociception from the spinal cord to the brain (87). When pain is unmanaged, ongoing nociception from the periphery leads to spinal cord sensitisation and experiencing worse pain, pain referral, allodynia, and secondary hyperalgesia. If there is a concomitant infective process, neuroimmune mechanisms may further contribute to spinal cord sensitisation mediated by glial cell activity at the synapse. The pain that Romy has described might not have been going on for more than 24 hours but here we can see that spinal cord sensitisation happens rapidly.



DON'T MISS THIS

Pain is not a measure of tissue damage

Romy's case is a good reminder that pain and vital signs are not directly correlated. Even in the emergency situation, vital signs cannot be used as a proxy for pain. This means that vital signs alone (heart rate, respiratory rate, blood pressure and temperature) are not sufficient for triage or assessment purposes.



DON'T MISS THIS

Worsening pain severity is a concern

Unmanaged pain with worsening severity is a concern, not only as a potential indicator of worsening pathology, but also as a contributor to poor outcomes due to the barrage of nociceptive stimuli sensitising the nervous system with impact on the immune, autonomic and endocrine systems further worsening pain and having a negative impact on healing processes. Unmanaged acute pain can rapidly worsen as a consequence of sensitisation processes in both the peripheral and central nervous systems driven by neurogenic inflammation in the periphery, neuroimmune mediated inflammation in the spinal cord and patient anxiety leading to cortical upregulation (83). All these processes would have occurred with Romy. Pain can lead to more pain, and the synergistic responses place the sufferer at risk of delayed recovery and complications.



Brain

By now you are familiar with the idea of pain as a high order somatosensory construct of a conscious brain produced in response to a perception of threat (88). In Romy's brain, multiple areas will have been activated producing the affective, sensory, and motivational dimensions of pain. Romy reports feeling anxious, worried about being a burden, worried about being perceived as "a wimp". Within the cortex, the anterior cingulate, which is involved in the affective dimension of pain (like anxiety), indirectly influences descending modulation of nociception through projections to the amygdala (the fear centre) and the periaqueductal grey, which influences endogenous opioid release (89). Her pain may have worsened because of the lack of social support from her husband who had to wait outside in the car; no nurse or doctor had reassured her and contained her anxiety by explaining their management protocol to her; and her pain was not being acknowledged or addressed. This anxiety may have contributed to increasing her pain with sub-cortical and cortical sensitisation (90-93) through multiple mechanisms including activation of cholecystokinergic systems which upregulate the nervous system and facilitate nociception. Unfortunately, the sensitisation processes occurring in the periphery, spinal cord and in the brain would have been ongoing with resultant worsening severity of the sensory and emotional experience of pain.

CRP is C-reactive protein present in the blood which is used as an indicator of inflammation. A CRP of >10mg/L is regarded as high and indicative of inflammation.



Synergistic systems

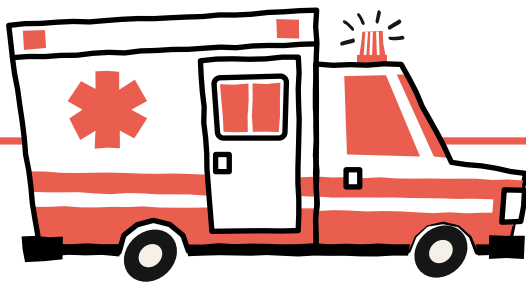
With specific reference to Romy's situation, her anxiety and lack of support impacted her nervous system and her autonomic nervous system; specifically, her sympathetic system was upregulated. In addition, she had an active infection with a CRP of over 150mg/L and this heightened immune response contributed to further sensitisation of her nociceptive system through neuroimmune interactions, worsening her pain.



DEEP DIVE

Calling an ambulance!

Romy's reflection that calling an ambulance would have resulted in faster and better treatment is a common one which negatively impacts on ambulance service efficiency and capacity (94). Several papers have documented the practice by the public of inappropriate calling of an ambulance based on the perception that the patient will jump the EC waiting room queue (95). One of the reasons why people call ambulance services is a sense of urgency (96). Clearly Romy presented to the EC because she, her husband and her friend who is a doctor perceived her pain as severe and the situation as needing urgent attention. A lack of a sense of urgency on the part of the staff



led her to believe that an ambulance would have been a better option (96). If an ambulance had been requested, an appropriately qualified crew should have triaged her according to the SATS. And, ideally, given the caveats referred to earlier that pain is often ignored by emergency healthcare professionals, administered analgesia according to their scope (Entonox® or intravenous (IV) morphine or ketamine (IV and intranasal (IN))). Romy's perception that an ambulance would have been a better option highlights some of the systemic problems in prioritizing patients, with ambulance delivered patients often jumping the queue.

Romy finally gets a bed- but no analgesia

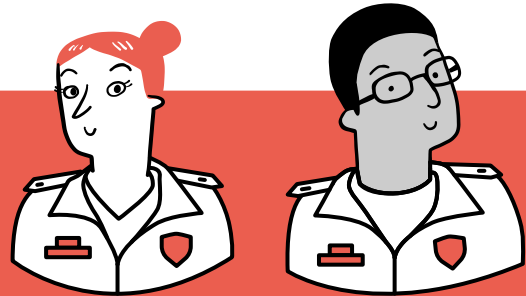
It's now been two and a half hours and suddenly a nurse appears at my side and grabs my arm saying "come, come". I shuffle after her, I can't stand up straight, she points me to the hand sanitiser and then leads me to a bed. "Lie down", she says. Weirdly I worry about my shoes dirtying the sheets! She brings a drip set. At last, I think! I try to relax, I have to keep my knees bent to get some pain relief, I pull up my sleeve, oh dear I have terrible veins. She finds a vein in my hand and finally the drip is up. I look up and see, saline. Where is the analgesia I ask? No, she says, we can't give you anything until you've been assessed but I wanted to get a line in so that as soon as they decide we can give it to you quickly. Thanks, I think, but really?! I watch patients coming in by ambulance going straight through for treatment and think to myself that we should have called the ambulance out rather than coming in ourselves!



DON'T MISS THIS

New clinical practice guidelines for emergency medical services

Encouragingly, new clinical practice guidelines for emergency medical services in South Africa may add additional analgesic agents to prehospital professionals' scope of practice (48). However, recent work suggests a lack of availability (or administration) of Entonox® for prehospital practitioners to manage



pain. This coupled with prehospital advanced life support practitioners' reluctance to manage undiagnosed abdominal pain with morphine (7, 27, 28) suggests that Romy would likely not have received analgesia in the prehospital setting if she had indeed requested an ambulance to get her to the EC.

Managing acute abdominal pain

Decades of research and evidence give a clear voice to the fact that analgesia is an urgent requisite for the emergency management of moderate or severe abdominal pain and in fact facilitates clinical examination (97, 98). It is difficult to perform an adequate physical examination when someone is in severe pain as described by Romy. She describes being unable to stand up or lie flat, needing to keep her legs bent, this would have made performing an examination difficult. Pain also interferes with cognition which can make obtaining a full history challenging too.

The European Pain Federation algorithm for acute abdominal pain of ≥ 8 out of 10, suggest intravenous paracetamol AND parenteral opioids for initial management, as soon as possible (97). This term "as soon as possible" is not clearly interpreted by staff as treatment was not initiated in this case.

Romy gets some relief

Finally, a doctor! "I can see you are in pain" – really?! I want to respond sarcastically. He asks for my history; he palpates my abdomen – which is still soft! "Right" he says, "we're going to sort your pain, take some bloods, do a COVID swab because I'm going to admit you, and then I want to send you for a scan because I think you might have perforated your bowel". And this is the

weird bit, I argued with him! How can I have perforated if my abdomen is so soft? Something in my brain was still processing, and the fear of a perforation was enough for me to push back. But the promise of pain relief was wonderful and within minutes the Perfalgan® was linked to my drip with a promise of opioids if that didn't make a difference. Phew, its 7:30pm and finally the pain is back where I can manage without curling up and gasping out swearwords. Peace!

Acute treatment

At this point in Romy's story, the appropriate analgesic regimen was initiated – intravenous (IV) paracetamol with an opioid (97). However, the non-pharmacological treatment of pain was still poor. The communication skills used by the clinician do not appear to have validated her suffering. In addition, the clinician did not seem to appreciate that delivering a message of “you might have perforated your bowel” would be interpreted as bad news. Emergency medicine specialists are trained in effective communication skills, particularly with a focus on breaking bad news, however, these skills do not appear to have been utilised in this case. A pity, as you will recall from Section 1 that communication which builds a therapeutic alliance with the patient is an effective pain management strategy which activates endogenous analgesic pathways through a meaning response (99). The use of reassuring communication, including ensuring that Romy's ideas, concerns and expectations were addressed may have reduced the threat of the situation. This would have resulted in a positive meaning response with Romy's brain activating the descending inhibitory mechanisms with endogenous opioid, dopamine and cannabinoids to reduce the nociception at the level of the spinal cord.

Once the pain was managed, an examination would have included establishing the site of pain, fever, presence of other symptoms (diarrhoea, constipation, cystitis and the feeling of pelvic pressure) and blood tests to establish leukocytosis. As contrast CT scans are the imaging modality of choice, with excellent sensitivity (98%) and specificity (99%) (100, 101) this was an appropriate part of the assessment.

Romy gets some answers

Now to get some answers, 9pm and off to the CT scan. Off the bed onto the scanner, for the first time someone notices that I can't straighten my legs and puts a cushion under my knees so I can lie down and relax. The scan is done and back we go to the EC and we wait, and wait, and wait. Midnight and we have an answer at last – yes, it seems I perforated my bowel and there is free air in my abdomen. But, it looks like the perforation has self-sealed. So, the plan for now, admission, IV antibiotics and continue with the relief of analgesics which have now been upped to IV tramadol. Its 12h30am when I get to the ward, send my husband a message and finally collapse asleep, the pain manageable as long as that drip keeps running!

The treatment plan

Once the diagnosis was confirmed Romy was managed according to her clinical presentation in line with guidelines (75). Admission was indicated due to her leukocytosis, complicated disease on CT, and need for pain control (102). Inpatient management includes bowel rest (nil by mouth), pain control and antibiotics, usually administered intravenously. Symptoms usually improve within 2 to 3 days after the initiation of treatment, at which time the diet is commonly advanced to clear liquids followed by a low-residue diet.

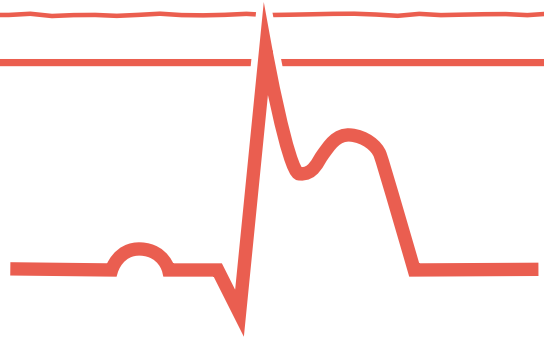


DEEP DIVE

Chest Pain

Chest pain is another common cause of pain requiring emergency care, and it is important to recognise that its presentation can vary, especially in women (103). While chest pain is the most frequent symptom for both men and women ultimately diagnosed with acute coronary syndrome, women may be more likely to present with accompanying symptoms such as nausea, shortness of breath, fatigue, and vague abdominal symptoms (103). It is crucial to consider a broad range of symptoms as potential anginal equivalents, including pain, pressure, tightness, or discomfort in the chest, shoulders, arms, neck, back, upper abdomen, or jaw, as well as shortness of breath and fatigue (103).

When assessing patients with chest pain, structured risk assessment should be used to estimate the risk for coronary artery disease and adverse events (104). A comprehensive history that captures all the characteristics of chest pain, along with a detailed assessment of cardiovascular risk factors, review of systems, past medical history, and family and social history, is essential for identifying potential cardiac causes(104).



It is important to note that women, particularly those aged 65 and older, make up the majority of patients presenting to the emergency department with chest pain(103). However, women are less likely to receive timely and appropriate care, possibly due to their higher likelihood of experiencing prodromal symptoms and presenting with accompanying symptoms more often than men(103, 104).

Regarding epigastric pain, it is worth mentioning that this type of pain can be a symptom of an inferior myocardial infarction (MI). Inferior MIs occur when there is a blockage in the right coronary artery or the left circumflex artery, which supply blood to the inferior wall of the heart. Patients with an inferior MI may present with epigastric pain, nausea, and vomiting, in addition to or instead of typical chest pain.

Lessons learnt

Acute abdominal pain is a common presentation in the EC. Its effective management should be facilitated by an effective triage system like the SATS. However, the SATS needs to be implemented with a systematic approach to assessing and responding to pain. Health care professionals need to be trained to obtain and interpret pain scores i.e., a pain score of 8 out of 10 is interpreted as severe and requires action. It is not sufficient to assess and document pain, and not take action!

Notwithstanding the pressures in the EC, effective pain management in the EC requires timeous implementation of both pharmacological and non-pharmacological (acknowledgement of pain, containment, explanation of procedure, etc) strategies and regular reassessment to stop the spiral of sensitisation leading to worse pain. Finally, a full assessment of the patient is not needed before initiating treatment for pain – delaying treatment often makes pain worse and assessment harder. In the modern era of healthcare, clinicians working in the prehospital setting need to prioritise pain assessment and management after the ABCs of resuscitation.

4

Prehospital polytrauma

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Sashka's accident: Managing pain in the critically ill with polytrauma

Sashka's accident

My name is Sashka, I'm 24 years old and I am the mother of a wonderful 5-year-old girl. The night before it happened, I was out, I spent the night at my Pa's house. In the morning my Pa dropped me at my Grandma's place in Heideveld. It was a peaceful morning; I remember it was very cold! I was resting in my pyjamas and gown it was so cold! But by the afternoon I was getting bored, and my brother came in and said he was going to a friend in Manenberg. I was bored so I decided I was going to walk with him. I remember putting on my jeans, my takkies. My brother's mother-in-law also came with. It was the three of us walking along, talking. To be honest, I don't really remember much. It all happened so fast!

The next thing I know...I know where it happened, it was close to the police station. Then the next thing I knew I was laying there, it was terrifying, I couldn't process what happened. It happened so very fast! My brother was panicking, he was running to me. I think I hit the pavement and then bounced onto the grass. It was a taxi that hit me. It almost hit my brother, but he managed to step back. The taxi hit me, I hit the pavement and rolled onto the grass.

Introduction

In this chapter, we will specifically focus on the pre-hospital assessment and management of Sashka's pain when she suffered multiple injuries. When Sashka was hit by the taxi, she sustained a severe chest injury, facial fractures and lacerations, and multiple lower leg fractures resulting in a visible deformation of her left lower leg. Her fractured, displaced anterior and posterior rib fractures on the left side of her chest resulted in a flail chest, pneumomediastinum and haemopneumothorax. She sustained facial fractures and a large laceration on her head and face but had no intracranial bleeding. She sustained a comminuted, displaced fracture of her left tibia and fibula. Due to the mechanisms of her injury, it was suspected that she had abdominal trauma and had possibly fractured her pelvis.



We will focus on her treatment on scene after the accident and her transfer to the nearest district hospital. After being initially seen at a district hospital close to the accident for emergency management of her chest and facial injuries including endotracheal intubation and an intercostal chest drain, she was transferred to a tertiary hospital. She is telling us her story at the end of her time in hospital, as she is just about to be discharged after several weeks of surgeries and rehabilitation! She did not sustain any injuries of her abdomen but was treated conservatively (without surgical management) for an injury to her oesophagus.

Epidemiology

Traumatic injuries are the most common cause of acute pain in the emergency setting with people who have suffered trauma typically experiencing moderate to severe pain (4, 105, 106). Despite the importance of managing acute traumatic pain, pain continues to be under-recognised and under-managed in the prehospital setting (7, 106, 107).

Inadequately managed acute pain has several negative effects. It is not surprising that traumatic injuries result in stress and inflammatory responses. The sympathetic nervous system will be activated by noxious stimuli resulting in several physiological effects such as hypercoagulation, tachycardia, tachypnoea, hypertension, increased cardiac workload and oxygen demand, amongst others (4, 8, 11, 12). If pain is not managed in these situations, the stress response will be prolonged and the immune system suppressed, resulting in longer recovery times, increased risk of infection and poor wound healing (4, 8). All of these increase the risk of developing chronic nociplastic pain (12, 108).

People who have suffered trauma like Sashka may experience pain not only from the traumatic event and the resultant injuries, but also as a result of the care provided during their stabilisation and transportation to a clinic or hospital (14). Anyone would feel anxious and fearful following a traumatic injury such as Sashka's. If pain is not well managed in these acute situations, pain-related anxiety adds to the distress of the situation (15). People who are anxious and fearful report higher levels of traumatic pain (16). Clearly then, it is important to pay attention to pain in trauma victims. Emergency care providers must provide timely management of pain in the acute resuscitation phase of trauma care (8).

Honestly, I thought I was dying

It so hard to explain, I was in a LOT of pain! I was crying! People came running over. I don't how fast they got there but the firefighters were there so fast. They were busy with my leg, and with my head – it was bleeding. No one knew what was happening on the inside. I was crying, I was saying I was in pain, and they were trying to figure it out. It felt like everything was in pain. But then I couldn't breathe – I told my brother I can't breathe! I really couldn't breathe.

Honestly, I thought I was dying. I told my brother to tell my daughter that I loved her.

Sashka's Pain Mechanisms

Sashka's pain is acute nociceptive pain with both somatic (from her fractures) and visceral components (from her internal injuries).

Pain which is not well treated results in stress and immune responses, resulting in longer healing times, increased infection risk and poor wound healing.

Peripheral nervous system

The massive forces from being struck by the vehicle and thrown a distance to the ground have resulted in several injuries. Sashka has sustained fractures to her skull, several ribs (with a flail chest) and her tibia. All of these bone fractures will have activated the nociceptors in the bones. These nociceptors, mostly in the bone's periosteum, are primarily mechanosensitive A δ - and C-fibres. Any movement or loading of the bone after the fracture results in stimulation of these fibres resulting in a barrage of nociception and pain (109). The tissue damage immediately stimulates an inflammatory cascade starting peripheral sensitisation – lowering the firing thresholds, increasing the responsiveness to stimulation and activating silent nociceptors (110).

However, Sashka also suffered visceral injuries with a haemopneumothorax. This would activate visceral nociceptors. The lung pleura is richly innervated, and the injury would have activated the nociceptors in this tissue too. As the viscera have more silent nociceptors than somatic tissues, the process of peripheral sensitisation rapidly escalates nociception and pain (111). No wonder Sashka had pain everywhere, she was sensitised in multiple ways in multiple places!

Spinal Cord

Not only would Sashka have had rapid peripheral sensitisation, but there would also be rapid spinal cord sensitisation because of the combined visceral and somatic mechanisms. Visceral spinal cord mechanisms involve both the sympathetic and parasympathetic nerves which converge with somatic afferent nerves in the dorsal horn – Sashka will have convergence of nociception from her fractured ribs with nociception from her pleura. Visceral nerves also extend further in the spinal cord, they may terminate up to 10 spinal segments above or below their entry point (111). Sashka's description of pain everywhere, and her struggle to identify where it was, is typical of pain from visceral origin.

Sashka will have spinal cord sensitisation at multiple levels with allodynia everywhere (in her story you will hear her describe the experience of cutting off her clothes as being agony). She will also have primary and secondary hyperalgesia increasing the pain she feels from normally painful stimuli such as inserting a drip or a drain – treatments needed to save her life, but more painful than expected.

Brain

Sashka's brain is clearly involved, she is in pain! She is also afraid, and at some point, she felt that she might die. And then, when she reaches help at the hospital, her brother is kept away from her, so that instead of feeling safe, she is lonely and more afraid. Not only will multiple areas of her brain be activated to localise the site of her pain (somatosensory, premotor and motor cortices), her hippocampus (memory), amygdala (fear), prefrontal cortex (executive control), anterior cingulate cortex (suffering) and limbic system (emotions) will all be contributing to her pain.

The addition of visceral nociception means that she would also have activation in the cerebellum and enhanced activation of the prefrontal and anterior cingulate cortices (111). This is evident in Sashka's recollection of how hard it was for her to understand what was happening to her, and her fear of dying. The increased activation in the prefrontal and anterior cingulate cortices seen with visceral pain impacts cognition and increases suffering.

Sashka's pain is acute nociceptive pain with both somatic (from her fractures) and visceral components (from her internal injuries).

Synergistic Systems

Polytrauma involving somatic (musculoskeletal) and visceral injuries will activate the autonomic nervous system because of the involvement of the phrenic and vagus nerves (111). Sashka immediately struggled to breathe due to her injuries, this would have impacted on vagus activity with sympathetic upregulation and consequent increase in nociceptive processing.

In addition, Sashka is frightened which will lead to a stress response with activity in the hypothalamic-pituitary-adrenal (HPA) axis increasing. This is a normal, healthy response in the acute setting, but if it is ongoing through her hospital admission, it may lead to increased pain later in her recovery from these injuries (112).

And then the ambulance came

Then the ambulance came and the paramedics. My brother told the paramedics that I can't breathe. They put me into the ambulance and gave me oxygen. I can't really remember that. It was very uncomfortable to have the mask on my face to help me breathe. It's funny it was meant to help me breathe but I felt like it made it harder too.

I don't remember the whole drive in the ambulance. My brother was saying 'stay awake, stay awake' – that's all I remember. He was trying to calm me down.

Pain assessment

Sashka was a pedestrian hit by a taxi at high speed. Assessment at the side of the road would be complex and assessing pain would be only one part of the process.

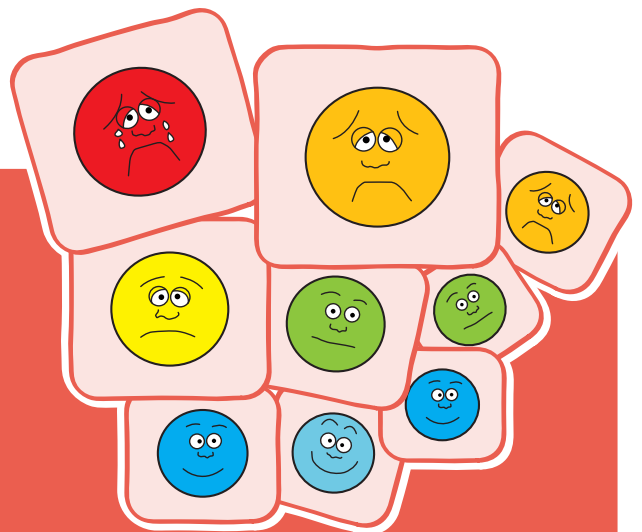
Prehospital triage is important to guide practitioners on the urgency of a patient's condition, and to determine the correct facility to transfer a patient to for the best care of their emergency condition (24). Sashka's vital signs and TEWS score triaged her as a Red category – but she is in severe pain as well, and so if on assessment her vital signs were normal, she would have triaged in the Orange category.



DON'T MISS THIS

Assessment of pain in the pre-hospital setting

It is clear from the available literature that globally, prehospital pain assessment and management is poorly conducted (8-10, 16, 28, 105-107, 113-117). While there are limited data from the South African setting, only one in five trauma people who had suffered trauma had a pain assessment recorded by treating paramedics in the Western Cape, and for those who did have pain recorded the median numeric pain score was 6/10, indicating that they need analgesia and other pain management (7). Another study in the



South African Western Cape EMS services showed that while 21% had a documented pain score, only 6% had a documented reassessment of pain (9).

↓ **Table 4.6:** The OPQRSTUVW of Sashka's pain assessment

Gather information on the...	What questions to ask	Sashka's pain	What did this information tell us?
O nset	When and how did this start? How long does the pain last? How often do you get the pain?	Sashka tells us very clearly that she was in severe pain from the moment of the accident.	Sashka has severe injuries, and that her pain began at the time of the injuries.
P rovoking and palliating activities	What causes the pain? What makes it better? What makes it worse?	Any movement is agony! It's all already agony!	We need to prioritise analgesia administration, and to reassess to ensure the analgesia is working.
Q uality of the pain	Can you describe your pain?	It's bad and its everywhere!	Quality of pain is a vital question in the emergency care of many medical conditions such as chest or abdominal pain. In trauma, we may choose to focus on managing the severity of the pain.
R egion or radiation	Where is the pain? Does the pain spread? Where does it spread to?	The pain is in her head, chest and leg!	Severe pain in Sashka's head, chest and leg need to be managed! The severity of the pain also means that we can't rule out that she has injured her cervical spine in the accident, and we must immobilise her.
S everity	How severe is your pain? How severe is it right now/at its best/at its worst and on average? How severe is your pain when you try to be active?	IT IS BAD! Please don't move me! Please!	This helps us to plan our analgesia – we will need to splint Sashka's leg and move Sashka and so that we can check her vital signs and do a physical assessment. We can plan early to administer analgesia while we do a secondary survey. This will give the analgesia time to take effect so that when we are splinting, and logrolling to apply a pelvic binder and spinal immobilisation equipment and transporting Sashka we can keep her as comfortable as we can. Early administration of analgesia also means that we can titrate it for effect if needed before transfer.

Continued...

Gather information on the...	What questions to ask	Sashka's pain	What did this information tell us?
Treatment	<p>What treatment have you tried or previously been given for pain?</p> <p>How well has it worked?</p> <p>Have you had any side-effects from any analgesia before?</p> <p>Are you allergic to anything, have any medical conditions or take any medication?</p>	<p>Sashka is healthy and well with no chronic medication or known allergies. She has had morphine before, and it wasn't a problem for her.</p>	<p>Knowing if Sashka has had any side effects from analgesia before or if she has any medical problems, allergies or medication we should know about helps us to ensure we choose the right analgesia agent. We would want to ensure we communicate any analgesia doses and administration times with fellow EMS on scene, and on handover at the Emergency Centre.</p>
Understanding beliefs and impact	<p>Where is the pain coming from, and can you move (consider the injury type first!)</p> <p>Is there anything that is worrying you right now other than your injuries that I can help with?</p>	<p>The pain is everywhere! Sashka is clear she doesn't want to be alone without her family.</p>	<p>In the emergency setting, we are not always able to explore someone's beliefs and understandings, of their pain, but we can help them manage their anxiety around the emergency. By asking Sashka if there is anything we can help with, we learn she is worried about having contact with her family, and we can help ease her anxiety over this worry which can change her experience of the pain, and make sure she doesn't feel alone.</p>
Values	<p>What is your goal in getting your pain treated?</p> <p>What do you want me as a healthcare professional to do for your pain?</p> <p>What are you not doing because of your pain that you want to be able to do?</p>	<p>Sashka is worried about her family and her injuries and feeling anxious and confused.</p>	<p>Although we may not be able to ask all these questions in the emergency setting with someone so unwell, we must ensure that we have asked them about their concerns and values as best we can and when possible. This helps a person to feel cared for!</p>
What else?	<p>What else is going on in your life?</p> <p>How are you generally?</p>	<p>Sashka is worried that she will die and not see her daughter!</p>	<p>We can ensure that Sashka's brother is with her for as long as we can in the emergency setting, and that he is communicating with the family and caregivers to help alleviate Sashka's anxiety about the care of her daughter. We can reassure Sashka that we are doing everything we can to care for her.</p>

Continued...

I couldn't understand why I was alone

When I got to the first hospital I didn't see my brother. They just pushed me into a room like a ward. I remember they asked me if they could cut my clothes to take them off. They started cutting and taking off the clothes, I was crying and screaming it was so painful. It was very painful the cutting of the clothes!

Then they put me into the ambulance to bring me to this hospital, I think they made me sleep to take me to the hospital. When I woke up, I was at the hospital in the emergency department. I was so confused about where I was and what was happening. There were a lot of patients – the pain started again! I was very thirsty; I was crying for water, but the nurses didn't want to give me water. I didn't understand at the time but that was probably because there was a pipe in my mouth to help me breath. I was really terrified!

I remember a woman made a cut under my arm. It was very painful! I think she put in a pipe. It was very painful! I was so scared; I couldn't see my brother or my family. I was terrified. I was in so much pain. I couldn't understand why I was alone.

Then they took me to theatre. The whole week is a blur.

I had broken my ribs, a big wound on my skull, and I broke my leg. People said it was so bad they couldn't even recognise me. My face was so swollen!

Pain management

Efficacious and timely acute traumatic pain management in the emergency care setting is dependent on early pain assessment, implementation of a combination of non-pharmacological and pharmacological pain interventions and subsequent pain reassessment to guide treatment. Non-pharmacological pain interventions complement pharmacological pain interventions and are a vital part of treating pain in the emergency setting (36, 45).



DON'T MISS THIS

Managing pain in someone who is unresponsive or intubated

Sashka sustained injuries in the accident which meant she required endotracheal intubation and assistance with ventilation. Many people who are endotracheally intubated with mechanical ventilation may be aware, but many are not (37, 38). Everyone with an endotracheal tube require analgesia, even if they are not responsive to any stimulus! While they may not be feeling pain, nociception is certainly ongoing and observational assessment using behavioural scales must be used to assess pain and guide analgesia administration (37). Analgesia should preferably by infusion which is a more consistent dose, rather than push-dose administration (37).



Pain management in the prehospital and emergency care setting is often challenging for practitioners as they balance concerns for the clinical condition, the timing of administration of analgesia for best effect and the necessity to manage acute pain in the initial resuscitation phase of trauma care. EMS personnel must plan timing of analgesia administration with anticipated events that will be painful – such as the splinting of a leg or extricating a person from a vehicle and plan their analgesia administration so that the medication has taken effect before the painful stimulus is introduced. Furthermore, the potential risks and benefits of pain management strategies must be carefully weighed against the individual's clinical condition during pain management decision-making (45).

Non-pharmacological pain management

Prehospital non-pharmacological pain interventions include physical interventions such as cooling or heating, dressing/bandaging, positioning, aligning, immobilisation (sling/splinting/traction), elevation, etc. and psychological interventions such as providing verbal reassurance using clear communication and information sharing (e.g., about procedures), distraction techniques, coaching and breathing techniques (14, 45). Equally as important as the physical interventions, interpersonal interaction and engagement by showing empathy, kindness and professionalism in the pain management approach is vital.

Prehospital non-pharmacological pain interventions can, in some instances, be used independently in mild pain and in combination with pharmacological interventions in moderate to severe pain (14). The efficacy of prehospital non-pharmacological pain management interventions is, however, not well-explored and the utilisation thereof, poorly reported (8, 118). However, the potential benefit should not be overlooked as non-pharmacological treatments are believed to aid considerably in the reduction of pain (14, 45, 119). Non-pharmacological interventions such as immobilising unstable injuries decrease the likelihood of further tissue damage and assist in alleviating pain, however, the process itself may also be associated with pain (14, 16). Consideration, therefore, should also be given to pharmacological pain management interventions to facilitate non-pharmacological interventions.



See Table 4.7 on the following page

Non-pharmacological pain interventions complement pharmacological pain interventions and are a vital part of treating pain the emergency setting.

Pharmacological pain management

Multimodal pain management must be prioritised in the prehospital setting. Multimodal pain management for severe pain is the combination of opioid and non-opioid analgesic agents targeting different sites in the nociceptive pathway to treat pain (4, 120). Analgesia must be administered as soon as possible by EMS – no matter how short the time for transport to the nearest healthcare facility (116).

Several medications such as opioids (morphine and fentanyl) and non-opioids (ketamine, paracetamol, nitrous oxide (Entonox®) and methoxyflurane (or penthroxyflurane)) are available for prehospital pharmacological pain interventions in the South African context (48). These medications can be administered through various routes such as inhaled (nitrous oxide, methoxyflurane), intravenous (IV) (opioids, ketamine, paracetamol), intranasal (fentanyl, ketamine) and intramuscular (ketamine) which carries benefits for example when IV access is not immediately available (45). Intramuscular administration of analgesia in the emergency setting should not be first line if it is possible to establish intravenous access (12, 118).

↓ **Table 4.7:** The EECPC of non-pharmacological pain management strategies for Sashka's pain (14, 16, 45, 105, 108)

Category	Strategies
Environmental What can we do to decrease the stress of the environment?	<p>We can control the people around Sashka as we care for her and try to control the crowd close to her. We can minimise any elements that may cause her additional stress, such as bright lights and sirens.</p>
Emotional What can we do to help the person (and caregivers) feel more comfortable and reassured in our space?	<p>After introducing our whole team to Sashka, we can ensure we continue to communicate with her in a calm and respectful manner and show empathy and kindness to make her feel cared for. We can be aware of what communication Sashka can hear between those around her. We can ask her brother to stay close to her when appropriate, and to help us to reassure Sashka appropriately.</p>
Cognitive What can we do to anticipate and manage stress and anxiety?	<p>We can keep Sashka informed about what is going on around her and help her feel less helpless and distressed. Where appropriate we need to ask for consent, such as to touch Sashka for physical examination or lift her clothing for a visual examination.</p> <p>We can anticipate that any painful procedures or movement will increase Sashka's anxiety, and we can empower and partner with her by previewing our planned actions (such as siting an intravenous line or splinting a leg) and how we are managing her pain (such as giving analgesia early and reassessing that it is working before moving and splinting her leg!). Actively communicating with Sashka and asking her questions will help us to understand how to manage her pain best.</p> <p>When we are able, we can talk to Sashka about things that may distract her (but not distress her more), and we can ask her brother to help us talk to and distract Sashka.</p> <p>Emergency care is a challenging time to talk to Sashka about pain science education – but we can talk to her and confirm the sources of her pain, and what actions we have taken to help the pain and ask if they are working.</p>
Context How can we plan our care to reduce stress and pain?	<p>We can plan her care by giving analgesia and reassessing that the analgesia is sufficiently managing Sashka's pain, and only then perform painful procedures such as splinting, log rolling and spinal immobilisation.</p>
Physical What about the person's physical experiences can we control to reduce their experience of pain?	<p>Splinting Sashka's leg fractures to reduce pain in her leg and giving Sashka oxygen via a facemask to assist with her feeling of breathlessness are both helpful for decreasing her experience of anxiety and pain.</p> <p>Positioning is a vital element of physical comfort, and we must ask if we can help her feel more comfortable or if the equipment we are using is hurting her! We can ensure that Sashka is as comfortable as we can make her while being immobilised on a spine board, scoop stretcher or vacuum mattress, and provide a blanket for comfort and warmth. Check that no buckles or straps are hurting her – we can always add a little extra padding between Sashka and equipment if needed. Due to the nature of her injury and our suspicion of injury to her spine or pelvis, we would be hesitant to allow her to elevate her leg too much or move into a more comfortable position like to lie on her side.</p>

Multimodal analgesia must be administered as soon as possible by EMS – no matter how short the time for transport to the nearest healthcare facility.

To manage Sashka's severe pain, EMS crews could consider an inhaled agent, or intravenous paracetamol in combination with ketamine, morphine or fentanyl. An inhaled agent has the added benefit of a rapid onset of action, and can be controlled by the injured person (48). Morphine administration must be titrated to effect, with dosing adjusted relative to the person's haemodynamic status as it may cause hypotension in larger doses (10). Ketamine in combination with opioids may result in better pain reduction at 15 to 30 minutes compared to opioids alone, however, evidence of adverse effects secondary to the combination of medications is less clear (47). Combining these agents improves the efficacy of the analgesia by a synergistic effect, reduces the dose of the single agent and the risk of adverse effects and reduces the use of opioids (45). Ketamine at higher dose ranges causes dissociative amnesia and is a great tool for procedural sedation for people undergoing painful procedures after trauma (48, 121, 122).

After arriving at the emergency centre, Sashka is endotracheally intubated for mechanical ventilation because of her chest injuries. It is vital to remember that people who are intubated require sedation and analgesia! Sashka was experiencing severe pain from her injuries and will experience discomfort from the endotracheal tube – both of which are best managed by an infusion of analgesic-sedation medications. Infusions of morphine and midazolam combined, or ketamine and midazolam combined can be used with the doses titrated to pain control and haemodynamic stability (37, 38).

A long road to recovery

I've been healthy and strong all my life and now I've had so many operations – it has been 7 weeks now and I'm ready to go home. I've had operations to fix my ribs and my leg. I've had staples in my head. It's been so hard but I'm so excited to go home today to see my daughter.

Lessons learnt

Prehospital providers have a powerful role to play in managing pain, and there is much room for improvement in the assessment and management of people experiencing pain in the prehospital setting. By considering the environment, emotional, cognitive, context and physical experience of the emergency that the person is experiencing, EMS can work together with the person to decrease their anxiety and stress. A person's experience of their pain in the emergency setting has huge effects on their physical and psychological healing from traumatic events.

Early analgesia administration and reassessment of the efficacy of the analgesia provided are vital elements of prehospital pain management. There is much room for all healthcare workers to advocate for better pain control.

5

Neck of femur fracture in the elderly

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Elizabeth slips and falls: Caring for elderly patients with acute pain

Introduction

Elizabeth is 72 years old and is the primary caregiver to her two grandchildren (12 and 14 years old) who were both orphaned in early childhood. Elizabeth was widowed at the age of 46 and has outlived her two children and all of her six siblings. Since then, she has been the sole provider in her home and made ends meet through manual labour on local farms and more recently, through her social grant. She attended school up to Standard 4 (Grade 6) and left school to care for her younger siblings after her father passed away and her mother had to become the breadwinner.

Elizabeth and her grandchildren live in a one-bedroom mud house in a rural village. The three of them sleep on a double mattress with no base. They have no electricity supply and make use of a communal stand pump for water and a pit toilet for ablution purposes. In addition to maintaining the house and handwashing the clothes, Elizabeth prepares food and hot water on an open flame fire daily.

Medically, Elizabeth was previously well and had no chronic conditions. After fracturing her ankle three months ago, she became dependant on analgesia to manage her pain. She is on a chronic script of Paracetamol 1g TDS PO and Tramadol 50mg BD PO with no reported side effects. Following the ankle fracture, Elizabeth uses a single below elbow crutch to mobilise due to malunion of the joint.

Here is Elizabeth's story as told to one of the doctors who was treating her after she was admitted to hospital for a right neck of femur fracture after an accidental fall two days prior.



After a three-day torrential storm had settled, Elizabeth had left her house to salvage the remains of her vegetable garden. She was already unstable and had to use the crutch since her ankle fracture three months ago. The waterlogged ground had given way just as she exited her home and she fell. There was excruciating pain coming from her left hip and she failed to get herself up from muddied ground. She cried for help and got the attention of her two grandchildren. The grandchildren hurried outside to assist her and managed to get her back into their home. She recalls how embarrassed she felt having the children change her into clean clothes before being taken to the clinic. “It is not right for the young ones to see their elders like that” says Elizabeth. They hoisted her with a sheet onto the neighbour’s open-top bakkie and drove to the nearest community health centre which was a 45-minute drive away, under normal conditions. The now semi-solid dirt road exiting the village lengthened the trip by a further hour! This did not bode well for Elizabeth’s pain.



Epidemiology

Traumatic injuries are the foremost aetiology for acute pain in the emergency setting with these injuries regularly causing moderate to severe pain (11, 109, 123). Although South Africa has a high incidence of traumatic femur fractures from motor vehicle accidents and gunshot injuries compared to high income countries, the incidence of fragility hip fractures such as Elizabeth’s fractured neck of femur (NOF) is similar to global rates (124). With an aging population and growing urbanisation, the incidence of NOF fractures in South Africa is expected to double in the next 30 years from 11000 people per year suffering this injury in 2020, to over 26000 in 2050 (125).

Neck of femur fractures are most common in people over the age of 65 with women in this age group more vulnerable than men. The primary vulnerability factor for this age group is osteoporosis (126). However, South African men under the age of 60 are presenting more often with fractured NOF. Associated medical conditions such as diabetes, hypertension, HIV, and excessive alcohol use increases vulnerability to the injury in this population (124).

The majority of NOF fractures should be managed surgically to facilitate rapid mobilisation and return to function. However, in resource limited settings like South Africa, people wait an average of 19 days to receive their surgery – way in excess of the 48-72hr internationally accepted guideline(127). A NOF fracture is a painful fracture with high risks of poor outcomes with 33% of people dying within one year of the injury (128). To optimise the chances of positive long-term outcomes and reduce the risk of death, a NOF fracture requires appropriate emergency care including appropriate analgesia to reduce the negative systemic effects of pain.

With an aging population and growing urbanisation, the incidence of NOF fractures in South Africa is expected to double in the next 30 years.

Back to Elizabeth

By the time she had arrived at the busy clinic, Elizabeth was crying in pain. She recalls having to wait for about two hours before being seen by the only doctor who was available. The doctor examined her and told her that “ithambo liphukile” (“the bone is broken”) and that it would require surgery with “metal and nails” to be fixed. She was given an injection and some pills to drink and was told that she needed to be transferred to hospital that same evening. This information that was thrown at her was scary and she really did not want to be

admitted to hospital because that would mean that her grandchildren would be left alone. However, she had to concede – she could not walk, and the pain was unbearable. Whilst she waited for the ambulance (which would arrive 6 hours or so later), the doctor had “bandaged her leg and pulled it straight with some rope”. Although the procedure made her scream in agony, it made the pain a little more tolerable.

Mechanisms of pain

The mechanisms contributing to Elizabeth’s pain are primarily acute nociceptive with the main activity being in the peripheral nervous system. There will be an ongoing barrage of nociceptive stimulus coming in from the periphery until Elizabeth’s injury is appropriately immobilized and analgesia given.

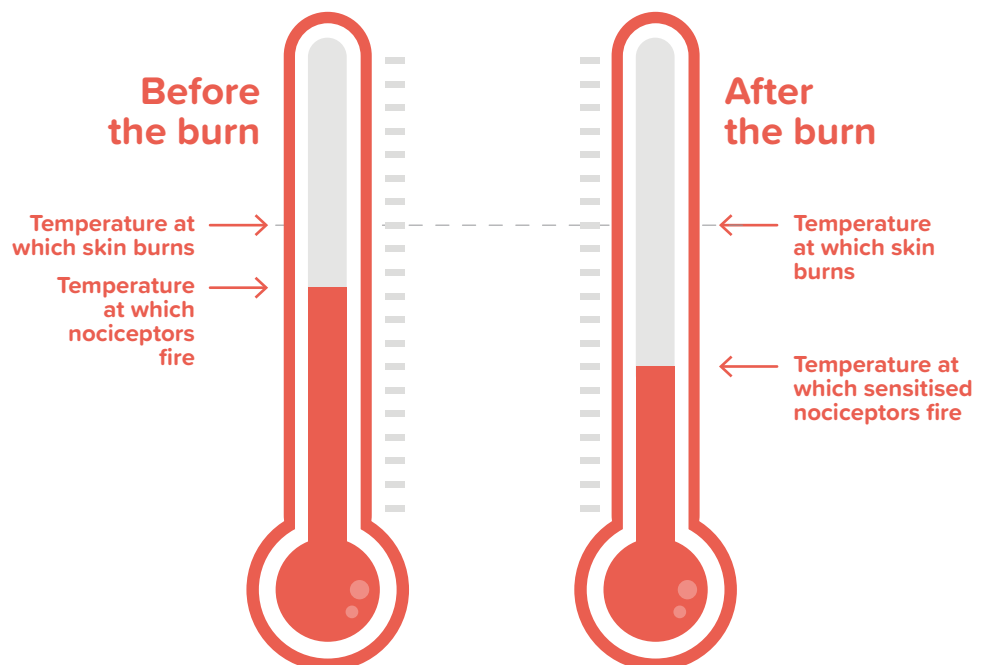
Peripheral Nervous System

As soon as the fracture occurred, the nociceptors in the bone will be stimulated – there is actual tissue damage here! These nociceptors are primarily mechanosensitive A δ - and C-fibres situated in the periosteum of the bone. Any movement or loading of the bone post fracture results in stimulation of these fibres resulting in a barrage of nociception and pain (109).

The tissue damage causes inflammation which means that pro-inflammatory cytokines (TNF α and others), prostaglandins, bradykinin, endothelins and nerve growth factor will be released or attracted to the area. These mediators directly sensitize the peripheral nociceptors – lowering their firing thresholds, increasing their responsiveness to stimulation and activating silent nociceptors (129).

The sensitisation of the peripheral nociceptors will mean that normal stimulation, any movement, or weightbearing will cause them to fire, resulting in pain. The long journey which Elizabeth had to endure to get to the clinic is likely to have caused repeated ongoing firing of the nociceptors which would have driven further sensitisation in the spinal cord.

Figure 4.3:
Elizabeth is
experiencing
peripheral
sensitisation



Spinal Cord

The barrage of stimulus from the periphery to the spinal cord will have caused spinal cord sensitisation. Elizabeth will clearly have allodynia, referred pain, and secondary hyperalgesia. She may experience pain all the way down her leg. And of course, vibration along a dirt road will likely hurt too. Skeletal injuries particularly upregulate spinal cord mechanisms with rapid spreading of pain and significant movement-related allodynia (87, 109). It may be suggested that the rapid inflammatory response upregulates immune mechanisms with consequent glial cell activation in the spinal cord leading to lateral signalling and rapidly sensitizing adjacent synapses in the spinal cord resulting in pain referral (130).

Brain

The nociception would travel up the spinothalamic and spino-mesencephalic tracts to Elizabeth's brain. Her somatosensory, premotor and motor cortices would be activated to localise the site of her pain and drive movement behaviours to protect the injury. Her prefrontal and frontal cortices would be activated evaluating how to call for help, perhaps without upsetting the children (131). These are just some of the areas which would be activated in the brain contributing to her pain.

As the injury occurred, Elizabeth's hippocampus would have accessed all of its memory banks, and asked what has happened before and how should she manage it? Her brain would check all the available information about threat and safety at that moment and generate a response. From her story, Elizabeth experienced pain but was also concerned about her grandchildren, and how this was affecting all of them. Elizabeth has experienced other injuries in her life, including fracturing her ankle not long ago. All of her life experiences would have contributed to descending inhibition or facilitation, downregulating, or upregulating activity in the spinal cord.

The activity in the descending inhibitory and descending facilitatory systems is dynamic. As Elizabeth encounters each challenge along the way, one system might dominate. As the children wash and change her, she may feel worried about them, wanting to protect them and so she may need to be brave. She may also feel safe and loved as they look after her. These feelings might result in more activation of the descending inhibitory mechanisms and decrease her pain. But, once it comes to her neighbours picking her up and getting her into the back of the vehicle, she might be afraid. Afraid they will drop her. Afraid of the journey to come. Afraid that now there is no one to look after the children. All of these different fears might result in more activation of the descending facilitatory mechanisms and increase her pain.

Synergistic Systems

Elizabeth is elderly and it is likely that she has other medical conditions which will affect her pain via endocrine and immune mechanisms. She also sleeps on a mattress on the floor with her grandchildren which might lead to poor sleep – autonomic nervous system activation. And what about her worries for the children and who will care for them – certainly a stress response further activating through both endocrine and autonomic systems.

The mechanisms contributing to Elizabeth's pain are primarily acute nociceptive with the main activity being in the peripheral nervous system.

Elizabeth is worried for herself and her grandchildren

Along the journey to hospital, Elizabeth kept thinking about the idea of surgery and how painful it would be – she had never been to theatre before. She wondered whether she would have to be awake in theatre. She also thought about asking the doctors to use “cement” instead of surgery as they had done for her ankle four months prior. She was fearful of having “metal and nails” inside of her. She worried about the grandchildren who were left to fend for themselves. When she eventually arrived at the hospital, there were many things making Elizabeth feel “stressed” and the pain was now “kakhulu” (“a lot”). The paramedics had not given her anything for pain along the way so she prayed that the doctors at the hospital would. It had now been almost 14 hours since her fall.

In the emergency department, she remembers receiving “umjovo emthanjeni” (“injection in the vein”) which made her feel “ndingindigi” (“dizzy”) but helped a lot with the pain. It was now 3am and she would eventually doze off.

When the sun had come up, “udokotela wamathambo” (the bone doctor) had come to see her. She was told that surgery was the only option to fix her broken hip and that it would have to be done soon. Before she could ask any questions or express her concerns, he hurried off. She lay in her bed crying.

Pain assessment

The EMS crew which transferred Elizabeth from the clinic to the hospital assessed her as “injury to right groin region, pain severe, unable to walk”, with a heart rate of 109 beats/minute, a respiratory rate of 18 and no further description of any management plan. From their documented assessment, it is clear that they didn’t perform a pain assessment and perhaps didn’t recognise that Elizabeth had a fractured femur.

On arrival at hospital after her ambulance transfer, Elizabeth was triaged Orange because of her severe pain. She was seen by a medical officer and assessed as a likely femur fracture as she was unable to weight-bear on her leg. Her vital signs were stable, and sent for X-rays, work up for syncope and written up for analgesia and she was handed over to the orthopaedic team for skin traction and further management.

Elizabeth waits

Elizabeth was interviewed more than 48 hours after her admission to hospital. By this point she remained immobilized without traction and was waiting patiently for theatre. Although she was booked for the emergency slate, the never-ending backlog meant that she would have to wait indefinitely for fixation. Her pain was not optimized, and she was miserable. She appeared sombre and remained teary-eyed throughout the interview. There had been no contact with her grandchildren as yet – neither party had a cell phone. She would have to wait in agonizing anticipation for her neighbour to visit her in order to get an update.

So far, there was no documented assessment of Elizabeth’s pain. Her pain had been treated with: paracetamol 1g TDS PO; tramadol 50mg TDS PO and morphine 5mg PRN IMI.

→
See Table 4.8 on the following page.

↓ **Table 4.8:** The OPQRSTUVW of Elizabeth's pain assessment

Gather information on the...	What questions to ask	Elizabeth's pain	What did this information tell us?
O nset	When and how did this start? How long does the pain last? How often do you get the pain?	The pain started immediately after Elizabeth slipped and fell, and it is far too painful to try and bear weight on.	We can clearly link the accident the onset of Elizabeth pain and the physiology causing the mechanisms of pain.
P rovoking and palliating activities	What causes the pain? What makes it better? What makes it worse?	The pain is there all the time! It is much worse if Elizabeth moves or tries to bear weight.	Elizabeth's baseline pain is severe, and it is made even worse by movement! We can anticipate painful procedures like movement, and ensure we have given enough analgesia for Elizabeth to tell us she feels her pain is managed well.
Q uality of the pain	Can you describe your pain?	Bad! Very bad! It is sore deep in Elizabeths leg.	The quality of pain helps guide diagnosis in some medical conditions, such as chest pain.
R egion or radiation	Where is the pain? Does the pain spread? Where does it spread to?	The pain is localised to the area of the break. Her recently healed fractured ankle hurts as well.	It helps to always ask a trauma patient if they have elsewhere, so we don't miss an injury that might not be obvious to us.
S everity	How severe is your pain? How severe is it right now/at its best/ at its worst and on average? How severe is your pain when you try to be active?	Elizabeths pain is severe! Even when she lies still, it is very sore.	We can partner with Elizabeth to titrate our analgesia administration to decrease the severity of her pain.
T reatment	What treatment have you tried for your pain? How well has it worked? Have you had any side-effects from these treatments?	The clinic and EMS staff did not administer any medication.	It is important for us to know Elizabeth's previous experiences of analgesia in case she has had adverse reactions, and to know what has worked well for her in the past. We also would like to know if she takes any chronic medication.

Continued...

Gather information on the...	What questions to ask	Elizabeth's pain	What did this information tell us?
Understanding beliefs and impact	<p>What do you think is causing your pain?</p> <p>What do you think is wrong?</p> <p>What can you not do because of your pain?</p>	Elizabeth knows that the pain is coming from her hip because of a broken bone, and she is very worried about having an operation and about getting home as soon as she can to her grandchildren.	We can ensure we consider Elizabeth's emotional and cognitive elements of her experience of pain and share information that may help such as the plan to involve a social worker and about the recovery time from the surgical procedure. We can reassure her that we have heard and are taking note of her concerns.
Values	<p>What is your goal in getting your pain treated?</p> <p>What do you want me as a healthcare professional to do for your pain?</p> <p>What are you not doing because of your pain that you want to be able to do?</p>	Elizabeth just wants to get home to her grandchildren!	
What else?	<p>What else is going on in your life?</p> <p>How are you generally?</p>	Elizabeth is worried about getting her social grant, and about whether her grandchildren are safe and if they have food.	

Pain management

Pain is a personal experience affected by biopsychosocial factors, and Elizabeth's report of her experience of her pain is the most reliable method of assessing and guiding the management of her pain (35). The multimodal analgesia approach remains the cornerstone of pain management, as well as pharmacological and non-pharmacological methods in combination. The most appropriate method to achieve adequate analgesia is through accurate initial and repetitive assessment of pain using validated methods (35). Emergency healthcare providers must be trained to address all the biopsychosocial aspects contributing to pain.

Non-pharmacological analgesia methods in a person with a NOF fracture would involve an acknowledgement of pain by a triage nurse and reassurance that their pain will be addressed as soon as possible. Good communication with Elizabeth, informing her about the diagnosis and expected course of management, including explaining the procedure of the expected operation while allowing room for more questions is vital pain management (132). Good communication with Elizabeth would mostly unearth and address the psychosocial concerns she might have, including a clear big concern over the current well-being of her grandchildren and the future since she is unlikely to mobilize for a period recovering from her injuries (133).

It may not happen in the emergency centre, but making notes and communicating to Elizabeth that social workers will be involved to address the welfare of the grandchildren and her own well-being after discharge is critical in the management of her pain. The social workers can assist with children's grants, grants in aid, and assisting with housing. Early involvement of social workers can aid in communication with her grandchildren which could reduce Elizabeth's worries and her pain. Good communication skills are significant in managing these unfortunate situations, so clinicians must be trained to improve this vital skill.

The physical position of the injured person has to be considered by ensuring that they are on a stretcher/ bed. Despite recent literature having failed to show significant pain reduction by application of skin traction and continuous maintenance of traction, current local practice does include its use with the belief that it limits the movements of bone fragments and reduces the fracture, which overall reduces pain, soft tissue swelling and relieves muscle spasm (134). Many institutions have nurse-led analgesia protocols considering the pain severity per verbal reporting, age, co-morbidities, and hemodynamic. These protocols have been shown to improve safe, prompt time to analgesia (68).

Pharmacological options depend on pain intensity through accurate assessment, co-morbidities, availability of analgesics, and expertise to administer certain medications (137). Elizabeth had a fractured NOF.

Elizabeth's anxiety about her injury, her surgery and healing, and her grandchildren are adding to her experience of pain.



Pain Management in the elderly or frail

There is always a challenge in pain management in the elderly due to age-related physiological changes and co-morbidities affecting the drug's pharmacokinetics (135). The elderly have reduced lean body mass and water, increased fat composition, and decreased age-related renal and liver functions, which co-morbid conditions can further exacerbate. They are prone to drug-to-drug interaction due to polypharmacy. These changes affect drug absorption, metabolism, distribution, and elimination. There is also a challenge of enhanced adverse effects such as hypotension compared to their younger counterparts (135, 136).

Emergency medical services practitioners did not or were not able to offer her analgesia, her skin traction was not maintained during transfer, and she was mobilized as she was transferred from clinic to hospital. She also had psychosocial distress from worrying about her grandchildren. She was worried about the bad news that her bone was broken and she would need surgery, which would involve inserting metal plates and nails. Although pain assessment is not documented, there is a high probability that she was in severe pain as she arrived at an emergency centre as she was triaged orange. A multimodal analgesia approach will be essential in her pain management.

Assessment, multimodal analgesia and reassessment of efficacy are needed to help manage Elizabeth's pain.

While she awaits her surgery, Elizabeth is prescribed paracetamol 1g tds po, tramadol 50mg tds po and morphine 5mg IMI every 8 hours. The injection that made Elizabeth feel dizzy was the morphine, but there was no re-assessment that the analgesia was working or if Elizabeth was experiencing side-effects like dizziness and nausea, or if she was in need of more analgesia.

Paracetamol and Non-Steroidal Anti-Inflammatory drugs (NSAIDs), like ibuprofen, must be offered to people with severe acute trauma pain. As part of pain assessment, clinicians should assess if they have already taken these medications to avoid overdose, as they are available over the counter and have a ceiling effect with dose-dependent side effects. NSAIDs are associated with side effects such as gastritis and nephrotoxicity, especially in elderly persons (137). These side effects are not pronounced with short-term use; the recommendation is to use them for 3-5 days (138). NSAIDs are contraindicated in people with kidney disease, significant cardiovascular disorders, peptic ulcer diseases, and hypovolemia. NSAIDs are associated with the reduction of pain and opioid requirements (139).

Parental opioids and ketamine are the mainstay of treatment of severe pain. The available and commonly used parental opioids in our setting are morphine and fentanyl. There is often a reluctance to use opioids, especially in elderly patients, due to fear of their side effects. Opioids are safe for elderly patients, but precautions should be taken to avoid enhanced side effects typically seen in adults. This includes an initial reduction of dose to 25-50% of the dose generally used in the young, reassessing pain regularly, followed by up titration of 50% if the pain has not reduced meaningfully (136). Opioids have no ceiling effect but have dose-dependent side effects. Rapid and effective treatment is best achieved with intravenous administration. While many clinicians are concerned about delirium in the elderly with the use of morphine, inadequate pain treatment is associated with an increased risk of delirium (32)! Analgesic doses of ketamine are beneficial - ketamine is a hemodynamically safe and effective analgesic(121, 122).

Inhaled analgesia, like methoxyflurane, is a promising analgesic adjuvant or bridge to long-term analgesia (120, 122). The drug also means that the person with pain is empowered to be in charge of their pain control (122). Regional anaesthesia has been shown to be superior to parental opioids in reducing pain and the need for rescue analgesia (142). Regional anaesthesia is notably more useful in adults and are opioid sparing. The caveat is that administration of local anaesthesia requires more skill, but with training emergency doctors should be well equipped with this skill, especially with ultrasound guidance.



DEEP DIVE

Nerve blocks for managing pain in the acute setting

Managing pain in the acute setting can be a daunting task, especially in people who are unstable with polytrauma, the elderly, and in the paediatric population (140). Adding to the personal challenges, we also face multiple system barriers that impede optimal pain management. These barriers include high numbers of people presenting for care, the need to reassess responses, and the availability of nurses and doctors to administer medication (141). There is great variety among providers regarding their pain management strategies, but one of the biggest concerns is inadequate analgesia administration resulting in people experiencing pain for prolonged periods.

Using nerve blocks as part of our analgesia strategy in the emergency department is a game-changer, especially for people who have traumatic injuries. Nerve blocks reduce the need for scheduled analgesia, are safe in the elderly, paediatric and haemodynamically unstable. This is particularly valuable considering the opioid crisis experienced worldwide, leading to better pain control, satisfaction, and potentially better outcomes (140).

Some of the more commonly performed nerve blocks in the emergency department include, but are not limited to (29, 30, 141):

- Fascia-iliaca block and femoral nerve block for proximal femur fractures
- Serratus anterior plane block for rib fractures
- Supra-orbital, infra-orbital and submental blocks for facial injuries
- Ring and wrist blocks for hand injuries
- Penile block for paraphimosis and penile trauma

It is important to distinguish between blocks that can be done using only anatomical landmarks such as the greater auricular block, penile block and digital (finger) blocks, from others that require more training and experience and should be done with ultrasound guidance. The length of time for which a block is effective depends on the drug used. Most commonly used drugs include Bupivacaine (8-12 hours) and Lignocaine (1-2 hours) (140).

Some key barriers to implementing ultrasound-guided regional anaesthesia in emergency departments include a lack of trained personnel, the complexity of proximal nerve blocks, time constraints in fast-paced environments, the need for advanced technical skills and experience, potential complications (e.g., vascular puncture, pneumothorax, local anaesthetic toxicity), and resistance to change. Traditional pain management methods such as prescribing opioids are often quicker and met with less resistance.

Despite these challenges, regional anaesthesia in the emergency department is a growing field. Providers will need to adapt and ensure they are proficient and safe in delivering this service. Achieving good, effective pain control early is the aim and what we all should strive for.

Lessons learnt

Pain management in the emergency setting is challenging, and all healthcare workers have a role in advocating for management of pain. Pain affects a person's ability to heal psychologically and physically from traumatic experiences, and must be considered a vital part of the emergency care of all patients. There are many options for analgesia in the emergency setting, and these must be considered against resources in the healthcare environment to administer and monitor the effect of medications, and the person's condition.

Communicating with Elizabeth's about her worries about her family are a crucial part of her care, and taking action to support her, such as including a social worker, will assist her in managing her distress and anxiety.

6

Conclusion

While pain is the most common reason people require emergency care, the global healthcare community has much room for improvement in the assessment and management of pain in the prehospital and hospital settings. The evidence is clear that we need to improve pain science education for all healthcare professionals, and for patients to empower both parties to partner to improve pain care.

Some take home messages about pain in the emergency setting:

1: Be prepared

Understanding pain mechanisms, and the range of pharmacological and non-pharmacological options for pain management empowers healthcare professionals to care better for people with pain.

2: Be an advocate

Create a culture of advocating for better pain assessment and management within the spaces where you work, and always include a pain assessment in your assessment of persons in the emergency centre.

3: Use reference materials

Whether it is your hospital, provincial or national guidelines, the EMGuidance app or the South African Medicines Formulary, there are many reference guides to aid your decision-making regarding medication dosing and decision making.

4: Prepare to care for the wonderful variety of patients

Have appropriate references and guides for dosing in children to decrease your stress in the moment.

Don't be afraid to ask for help

Consult with a senior or a colleague if you need assistance – experience of pain management will help empower you to be more comfortable in managing pain.

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