

INTRODUCTION

Non-traumatic extremity emergencies are a common concern encountered in the pre-hospital environment. Clinicians are responsible for completing a thorough assessment directed at identifying symptoms that may indicate a life or limb threatening etiology. Management is largely supportive, focusing on pain control and transport to an appropriate facility.

Non-traumatic extremity emergencies encompass a wide variety of pathologies. Some of the more common include deep venous thrombosis, cellulitis, and radiculopathy or neuropathy. Less common, but serious causes of limb emergencies include acute arterial occlusion or deep soft-tissue infection. Pain in an extremity may also be a symptom of other etiologies such as an acute coronary syndrome.

SAFETY

As with any patient encounter, clinicians should assess the scene for any potential hazards.

Depending on the cause of the emergency, the patient may be suffering from associated symptoms such as delirium and may not be fully aware of their actions.

Clinicians should be cognizant of infectious etiologies of limb pain or emergencies (e.g. Vancomycin-resistant Enterococci (VRE), necrotizing fasciitis, etc.) and wear the appropriate personal protective equipment.

ASSESSMENT

Extremities are comprised of nerves, bones, muscles, joints, vessels, and skin. Differential diagnoses of extremity emergencies should include consideration of pathology pertaining to any of these.

The first step in assessing the extremity is determining if the cause is traumatic or non-traumatic. Although this is often a straightforward determination based on patient history, delayed presentations are also possible. Musculoskeletal and overuse injuries are the most common cause of extremity pain, and there may not be an isolated acute incident that the patient can point out on

history. If trauma is suspected, more information regarding the assessment and management of extremity trauma can be found in the Extremity Trauma Clinical Practice Guideline.

Once traumatic injury has been excluded, it is important to consider if the source of discomfort is due to referred pain from cardiovascular, pulmonary, or other organ pathology. Clinicians assessing patients with extremity pain in the presence of other symptoms such as chest pain or shortness of breath should consider a wide range of possible etiologies.

Non-traumatic extremity emergencies may present with a wide variety of symptoms; many of these are outlined in Figure 1. Although many causes of extremity emergencies are not acutely time sensitive in nature, there are some etiologies that present threat to either life or limb, and delays to diagnosis and/or treatment can worsen outcomes. Signs and symptoms that should alert the clinician to a potentially time sensitive or significant condition include:

- Sudden pain
- Severe pain (e.g. disproportionate to physical findings)
- Signs of acute limb ischemia (e.g. coolness, pallor, pulse deficits, delayed capillary refill)
- Signs of deep vein thrombosis (DVT) (e.g. warmth, redness, swelling)
- Dyspnea, chest pain, and/or diaphoresis
- Signs of rapidly worsening acute infection (redness, warmth, swelling, and severe pain)
- Signs of septic arthritis (redness, swelling, pain, and significant discomfort with range of motion localized to a joint)
- Signs of sepsis (e.g. fever, chills, tachycardia, and/or tachypnea)
- Neurologic deficits (weakness, paresthesia, and/or sensory deficits)

History of Present Illness

The clinician should obtain a history including duration, intensity of pain, location, quality, and pattern. Note any recent excessive or unusual use and any movements or positions that increase or decrease symptoms.

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Past medical history can identify risk factors that may predispose patients to extremity emergencies. These are summarized in Figure 2.

Past Medical History	Common Risks
Cancer	Pathologic fracture, tumour, DVT, neuropathy, cord compression
Immunocompromised (parenteral drug use, chemotherapy, HIV, diabetes)	Infection
Hypercoagulable states (Pregnancy, immobility, cancer, previous DVT/pulmonary embolus)	DVT
Risk factors for peripheral vascular disease (e.g. smoking, hypertension, dyslipidemia, diabetes)	Intermittent claudication, acute arterial ischemia, infection, acute coronary syndrome
Alcohol abuse	Neuropathy
Hematologic, endocrine or renal disease	Neuropathy
Osteoarthritis, rheumatoid arthritis, chronic neck/back pain	Radiculopathy

Figure 2: Risk factors for extremity emergencies

Physical Examination

Vital sign assessment is useful in assessing an extremity emergency. For example, fever may indicate the presence of an infection, tachycardia and/or tachypnea may indicate possible DVT with pulmonary embolism, acute coronary syndrome, or sepsis.

When assessing the affected limb, the clinician should:

- Inspect for redness/pallor/colour, smell, swelling, rashes, skin breakdown, venous distension, atrophy, and localization of pain
- Palpate for changes in temperature
- Assess for peripheral pulses & any signs of distal limb ischemia (e.g. coolness, pallor, pulse deficits, delayed capillary refill)
- Palpate to localize the pain (e.g. Over a bone? At a joint? In a muscle?)

- Gently assess range of motion for any affected joints, assessing for pain & limitations
- Assess for any associated neurological deficits (e.g. weakness, paresthesia, sensory deficits)

The clinician should always compare the affected limb to the unaffected side, assessing for differences in any of the above findings.

MANAGEMENT

If the initial assessment reveals a potential traumatic cause of the extremity emergency, refer to the Extremity Trauma Clinical Practice Guideline for management information. The clinician should refer to the appropriate CPG (e.g. Chest Pain, Sepsis or Stroke) if indicated by the patient presentation.

Prehospital management of a patient experiencing a non-traumatic extremity emergency should focus on rapid identification of life or limb threatening causes, rapid transport, and symptom control.

Management of pain may include a variety of pharmacologic and non-pharmacologic interventions. In the presence of pain, consider administering pharmacologic pain management early. For severe pain, opioid analgesics may be effective in reducing the patient's discomfort (**PEP 1 supportive**). For less severe pain NSAIDs (**PEP 1 supportive**) and/or acetaminophen (**PEP 1 supportive**) may be administered. Simply elevating or repositioning the limb may also help. For more information refer to the Pain Management Clinical Practice guideline.

TRANSFER OF CARE

Early hospital notification should be prioritized when a life or limb threatening cause of the patient's extremity complaint has been identified.

When transferring care, pertinent history and physical assessments and clinical impression should be clearly communicated as well as time frame, severity, and any treatment provided.

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CHARTING

When documenting assessment and management of a patient experiencing a non-traumatic extremity emergency, ensure the following is documented (in addition to mandatory fields):

- Duration, intensity, location, quality, and pattern of pain
- Neurovascular status
- Any treatment provided, and the patients response to treatment

Key Points to Remember

Signs of life or limb threatening conditions include:

- Sudden or severe pain
- Signs of acute limb ischemia
- Signs of DVT
- Dyspnea, chest pain, or diaphoresis
- Signs of sepsis
- Neurologic deficits

your care. This is especially important as EHS works with the hospital system of care to determine the clinical quality, safety and satisfaction of the patient.

REFERENCES

Anderson, BC. Evaluation of the patient with shoulder complaints. In: UpToDate, Post TW (Ed), UpToDate, Waltham, MA.

Anderson, BC. Evaluation of elbow pain in adults. In: UpToDate, Post TW (Ed), UpToDate, Waltham, MA.

Anderson, BC. Evaluation of the patient with hand pain. In: UpToDate, Post TW (Ed), UpToDate, Waltham, MA.

Anderson, BC. General evaluation of the adult with knee pain. In: UpToDate, Post TW (Ed), UpToDate, Waltham, MA.

KNOWLEDGE GAPS

Prehospital knowledge of extremity complaints has traditionally focused on traumatic etiologies. There are gaps around the prevalence, identification, and management of non-traumatic extremity emergencies in the prehospital setting.

Further research is required regarding the effectiveness of pain management strategies for non-traumatic extremity complaints.

EDUCATION IMPLICATIONS

Training on the assessment and management of non-traumatic extremity emergencies should be incorporated into both primary and continuing education for the prehospital clinician.

QUALITY IMPROVEMENT

It is important for the clinician to document all interventions as well as the response to interventions during the time the patient is under

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Figure 1: Causes of non-traumatic extremity emergencies (possible acute presentations)

Cause	Assessment Findings
Musculoskeletal (bones, muscle, joints) and Soft Tissue	
Cellulitis	<ul style="list-style-type: none"> Focal redness, warmth, tenderness, swelling Occasionally accompanied by a fever, or systemic symptoms of sepsis
Deep soft-tissue infection (e.g. myonecrosis, necrotizing subcutaneous infection)	<ul style="list-style-type: none"> Deep, constant pain, typically out of proportion to other findings Redness, warmth, tenderness, tense swelling, and fever Sometimes crepitation, foul discharge, necrotic areas, and signs of systemic toxicity (e.g., delirium, tachycardia, pallor, and shock)
Septic Joint	<ul style="list-style-type: none"> Acute onset of pain localized to a joint Possible swelling and overlying redness or heat Severe pain on motion or inability to move joint due to pain
Osteomyelitis	<ul style="list-style-type: none"> Deep, constant, often nocturnal pain Bone tenderness, fever Often accompanied by risk factors (e.g., immunocompromised, parenteral drug use, known contiguous or remote source of infection)
Compartment Syndrome	<ul style="list-style-type: none"> May occur with trauma, but also following extreme exertion Pain out of proportion to the events leading up to it Increased pain with palpation, active contraction or passive stretching of the area Pulselessness is a late sign and reflects complete occlusion of arterial circulation
Bone tumour	<ul style="list-style-type: none"> Deep, constant, often nocturnal pain Bone tenderness Often a known cancer
Vascular	
Acute ischemia (may be preceded by intermittent claudication)	<ul style="list-style-type: none"> Sudden, severe pain Signs of distal limb ischemia (e.g., coolness, pallor, pulse deficits, delayed capillary refill) Neurologic deficits and muscle tenderness
Peripheral arterial insufficiency	<ul style="list-style-type: none"> Intermittent leg pain triggered predictably by exertion and relieved by rest
Deep venous thrombosis	<ul style="list-style-type: none"> Swelling, often warmth and/or redness, sometimes venous distention Risk factors often present (e.g., hypercoagulable state, recent surgery, or immobility, cancer)
Neurologic	
Plexopathy	<ul style="list-style-type: none"> Pain, usually weakness, decreased reflexes Numbness
Radiculopathy (e.g. sciatica)	<ul style="list-style-type: none"> Pain and sometimes sensory deficits Pain may be radiating in character Neck or back pain Weakness
Cord compression	<ul style="list-style-type: none"> Neurological deficits Pain in the back or limbs History of neck or back pain and/or history of cancer

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PEP 3x3 TABLES for NON-TRAUMATIC EXTREMITY EMERGENCIES

Throughout the EHS Guidelines, you will see notations after clinical interventions (e.g.: **PEP 2 neutral**). PEP stands for: the Canadian Prehospital Evidence-based Protocols Project.

The number indicates the Strength of cumulative evidence for the intervention:

1 = strong evidence exists, usually from randomized controlled trials;

2 = fair evidence exists, usually from non-randomized studies with a comparison group; and

3 = weak evidence exists, usually from studies without a comparison group, or from simulation or animal studies.

The coloured word indicates the direction of the evidence for the intervention:

Green = the evidence is supportive for the use of the intervention;

Yellow = the evidence is neutral;

Red = the evidence opposes use of the intervention;

White = there is no evidence available for the intervention, or located evidence is currently under review.

PEP Recommendations for Non-Traumatic Extremity Emergencies Interventions, as of 2022/09/27. PEP is continuously updated. See:

<https://emspep.cdha.nshealth.ca/> for latest recommendations, and for individual appraised articles.


Analgesia


Recommendation		RECOMMENDATION FOR INTERVENTION			
		SUPPORTIVE (Green)	NEUTRAL (Yellow)	AGAINST (Red)	NOT YET GRADED (White)
STRENGTH OF EVIDENCE FOR INTERVENTION	1 (strong evidence exists)	<ul style="list-style-type: none"> Acetaminophen IV Acetaminophen PO Fentanyl Ketamine Ketorolac (Toradol) Methoxyflurane (Pentrox) Morphine Nitrous Oxide NSAIDs 			
	2 (fair evidence exists)			<ul style="list-style-type: none"> Benzodiazepines 	
	3 (weak evidence exists)				

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