Recommendations for management of acute pain after trauma – gunshot wounds, blast Injuries, and amputation – in Ukraine

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PAMELA

Prevention and Management of Phantom Limb Pain

The aim of information presented in these slides is to assist clinicians with recommendations in managing the pain of soldiers and civilians with war-related injuries when patients experience acute pain before or after surgery.

The information is not intended to be, and should not be considered, as substitute for medical or other professional advice. Treatment for the conditions described here is highly dependent on the individual circumstances. While the information here is designed to be accurate with respect to the subject matter covered and to be current as of the time it was written, research and knowledge about medical and health issues is constantly evolving and dose schedules for medications are being revised continually, with new side effects recognized and accounted for.

Readers must therefore always check the product information and clinical procedures with the most up-to-date published product information and data sheets provided by the manufacturers and the most recent codes of conduct and safety regulations.

Learning Objectives

At the end of this reviewing the following slides, participants should be able to:

1. Apply a multimodal approach to acute trauma pain management.
2. Select analgesics according to pain severity.
3. Use opioids safely and appropriately.
4. Recognize and treat neuropathic pain components.
5. Understand the role of ketamine in acute trauma pain.
6. Incorporate regional anesthesia into trauma care.
7. Assess pain in communicating and non-communicating patients.
8. Screen for neuropathic pain using the DN4 score.
9. Monitor patients receiving ketamine infusions.
10. Plan safe tapering of analgesic medications.

Why Management of Acute Pain Matters?

Consequences of Poorly Controlled Trauma Pain

- Delayed rehabilitation
- Impaired respiratory function
- Increased opioid requirements
- Sleep disturbance
- Psychological distress
- Increased risk of chronic postsurgical pain
- Increased risk of phantom limb pain after amputation

The Goal In Care: To restore function while minimizing adverse effects.

Overall Strategy: Multimodal Analgesia

Core Principles

- Assess pain & side effects on a regular basis using standardized scales
- Screen for neuropathic pain starting from the early days after the injury
- Treat according to severity of pain & interference with function
- Combine analgesic classes
- Use scheduled dosing and full daily doses for non-opioid analgesics
- Incorporate regional anesthesia when feasible
- Offer non-pharmacological interventions

Stepwise Management of Trauma Pain

Mild Pain (≤3/10)

- Non-opioid analgesics
- Offer non-pharmacological interventions
- Consider regional analgesia

Moderate Pain (4–6/10)

- Non-opioid + short-acting opioid
- Offer non-pharmacological interventions
- Consider inhalational analgesia
- Consider regional techniques

Severe Pain (≥7/10)

- Opioid + non-opioid + adjuvant
- Offer non-pharmacological interventions
- Consider ketamine
- Regional anesthesia strongly considered

Non-Pharmacological Analgesia

- Physiotherapy
- TENS (Transcutaneous Electrical Nerve Stimulation)
- Psychological support
- Virtual reality therapies

Interventional therapies
- Cryoanalgesia
- Peripheral nerve stimulation
- Hydrodissection
- Radiofrequency procedures

Non-Opioid Analgesics

This group of medications form the foundation of acute pain management

- Paracetamol
- NSAIDs (Non-Steroidal-Anti-Inflammatory Drugs)
- COX-2 selective inhibitors
- Metamizole
- Nefopam

Benefits:

- Opioid sparing
- Improved analgesia
- Reduced opioid adverse effects

- **Administer full daily doses and round–the-clock.**

Which NSAIDs and COX-2 Inhibitors?

Common Options

- Ibuprofen
- Naproxen
- Diclofenac
- Ketorolac
- Ketoprofen
- Celecoxib
- Parecoxib
- Meloxicam

Clinical Considerations

- Gastrointestinal toxicity
- Renal impairment
- Bleeding risk
- Bronchospasm in susceptible patients

Opioids in Acute Trauma Pain

Commonly Used Agents

- Morphine
- Hydromorphone
- Fentanyl
- Oxycodone
- Tramadol
- Methadone

Key Principle

Initially use immediate-release formulations and titrate to effect.
Convert to controlled release formulations for long standing pain.

Opioid Selection: Practical Pearls

Morphine
- Familiar
- Renal metabolites accumulate

Hydromorphone
- ~5× potency of morphine
- Useful alternative

Fentanyl
- Rapid onset
- Hemodynamic stability

Methadone
- NMDA antagonist properties
- Long duration

Preventing Opioid Complications by...

Monitoring

- Sedation level
- Respiratory rate
- Oxygen saturation
- Nausea/vomiting
- Constipation

Always Consider

- Bowel regimen
- Make sure that Naloxone is available and staff know how to use it.

Administer naloxone when opioid overdose is suspected

Situation	Initial Dose	Repeat	Comments
Suspected opioid overdose	0.04 mg (40 µg) IV	If no response after 2 min → increase stepwise to 0.1 mg, then 0.2 mg, 0.4 mg, 2 mg, and 4 mg every 2–3 min as needed. The effect is dose dependent, lasting ~ 20 to 60 minutes	▪ Use lowest effective dose to restore adequate ventilation while minimizing withdrawal. ▪ Avoid overshooting as can lead to withdrawal hypertension, tachycardia, or pulmonary edema. ▪ Always provide airway support and oxygen while naloxone takes effect
No IV access	0.4–2 mg IM or SC	Repeat every 2–3 min as needed (up to 10 mg total). If no response, reconsider diagnosis.	
Intranasal formulation	4 mg (one spray) into one nostril	Repeat every 2–3 min if inadequate response (alternate nostrils).	

Neuropathic Pain After Trauma

Neuropathic pain matters because it is common after:

- Nerve injury
- Blast trauma
- Limb amputation

...and it is challenging to treat.

Clinical Features

- Burning
- Electric shocks
- Tingling
- Allodynia
- Hyperalgesia

Screen every 7–10 days.

Pharmacologic Management of Neuropathic Pain

Strong recommendations for use:

- Pregabalin
- Gabapentin
- Duloxetine
- Venlafaxine
- Amitriptyline

Soliman, N., et al., *Pharmacotherapy and non-invasive neuromodulation for neuropathic pain: a systematic review and meta-analysis.* Lancet Neurol, 2025. **24**(5): p. 413-428.

Neuropathic Pain: Medications For Which Evidence is Inconclusive

- Carbamazepine–oxcarbazepine
- Lacosamide
- Lamotrigine
- NMDA receptor blockers
- Selective serotonin reuptake inhibitors
- Transcranial direct current stimulation
- Transcutaneous electrical nerve stimulation
- Spinal cord stimulation
- Topiramate
- Cannabinoids
- Valproate
- Levetiracetam
- Mexiletine

Soliman, N., et al., *Pharmacotherapy and non-invasive neuromodulation for neuropathic pain: a systematic review and meta-analysis.* Lancet Neurol, 2025. **24**(5): p. 413-428.

Why Sub-Anesthetic Ketamine in Acute Trauma Pain?

It offers:

- Analgesia
- Anti-hyperalgesia
- Opioid sparing
- Anti-inflammatory properties
- Useful for severe trauma pain

Particularly valuable for opioid-tolerant patients or those with severe pain.

Dosing Ketamine

IV Bolus
• 0.1–0.3 mg/kg

Continuous Infusion
• 0.05–0.3 mg/kg/h

Without ICU Monitoring
• Maximum 0.5 mg/kg/h

Ketamine (sub-anesthetic doses): Adverse Effects

Monitor For:

- Hallucinations
- Dysphoria
- Confusion
- Dizziness
- Dissociation
- Agitation

Clinical Message

Benefits often outweigh risks when patients are carefully monitored.

Regional Analgesia in Trauma

Advantages

- Potential for superior analgesia
- Potential for opioid reduction
- Potential for early rehabilitation
- Potential reduction of phantom limb pain, at least in the early post-operative period.

Regional analgesia should be considered early whenever feasible.

Upper Limb Amputation Blocks

Options

- Interscalene
- Supraclavicular
- Infraclavicular
- Axillary

Clinical Selection Depends On:

- Surgical site
- Respiratory status
- Catheter requirements

Lower Limb Amputation Blocks

Options

- Fascia iliaca
- Femoral nerve block
- Sciatic block
- Popliteal sciatic block
- Adductor canal block

Key Goal

Targeted sensory blockade while preserving function where possible.

Continuous Peripheral Nerve Catheters

Recommended Duration

- Minimum 48–72 hours

Selected Patients

- Up to 5–7 days

Potential benefits:

- Improved pain control
- Reduced opioid use
- Reduced phantom limb pain

Local Anesthetics for Regional Analgesia

Common Choices

- Ropivacaine
- Bupivacaine
- Levobupivacaine

Important Principle

Always calculate total dose across all blocks.

Tapering Analgesic Medications

Consider Tapering When

- Lack of meaningful benefit
- Adverse effects
- Patient preference

General Opioid Approach

- Reduce by 5–20% every 4 weeks or slower
- Individualize all tapering plans.

Principles of Pain Assessment

Assessment Should Be

- Regular
- Documented
- Repeated after interventions

Evaluate

- Pain at rest
- Pain with movement
- Impact on function
- After administering medication – eg 5 - 30 minutes after IV treatment; 60 minutes after oral treatment

Pain Assessment in Communicating Patients

Recommended Tools

- Numerical Rating Scale (NRS) – 0 to 10 scale
- Category scales – mild / moderate / severe pain
- Defense & Veterans Pain Rating Scale (DVPRS)

Clinically Significant Pain

NRS ≥4/10

Pain Assessment in Non-Communicating Patients

- **Behavioral Pain Scale (BPS)**
- **Critical-Care Pain Observation Tool (CPOT)**

Useful in:

• Intubated patients
• ICU patients
• Patients with impaired consciousness

Clinically Significant Pain:

Neuropathic Pain Screening: DN4

Interpretation of the findings:

If both parts of the assessment are carried out (=DN4) a score of ≥4 indicates that the patient has neuropathic pain or a neuropathic pain component (in mixed nociceptive-neuropathic pain syndromes).

If only the patient interview section is carried out (DN2) a score of ≥3 indicates that the patient has neuropathic pain or a neuropathic pain component (in mixed nociceptive-neuropathic pain syndromes).

Опитувальник DN4

Будь ласка, позначте галочкою одну відповідь для кожного пункту в наведених нижче питаннях.

СПІВБЕСІДА З ПАЦІЄНТОМ

Питання 1: Чи відповідає біль, який Ви відчуваєте, одному чи декільком з наступних визначень?

		Так	Ні
1.	**Відчуття печіння**	☐	☐
2.	**Болюче відчуття холоду**	☐	☐
3.	**Відчуття як від ударів струму**	☐	☐

Питання 2: Чи супроводжується біль одним чи декільком з наступних симптомів в ділянці її локалізації?

		Так	Ні
4.	**Пощипуванням, відчуттям повзанням мурах**	☐	☐
5.	**Поколюванням**	☐	☐
6.	**Онімінням**	☐	☐
7.	**Свербіжем**	☐	☐

ОГЛЯД ПАЦІЄНТА

Питання 3: Чи локалізований біль у тій же ділянці, де огляд виявляє один чи обидва наступних симптоми:

		Так	Ні
8.	**Знижена чутливість до дотику**	☐	☐
9.	**Знижена чутливість до поколювання**	☐	☐

Питання 4: Чи можна викликати або підсилити біль в ділянці його локалізації:

		Так	Ні
10.	**якщо провести в цій ділянці пензликом**	☐	☐

Сума балів (кількість відповідей «Так»): _____

Monitoring Ketamine Infusions

Parameter to Monitor	Key Findings / Recommendation
Pain score	Assess at baseline and regular intervals to evaluate efficacy.
Sedation level	Use a structured scale, e.g, Richmond Agitation-Sedation Scale or Ramsay. Aim: mild sedation (RASS 0 to −1).
Mental status / Psychomimetic effects	Observe for hallucinations, dysphoria, agitation, and dissociation; reduce dose or administer benzodiazepine use if severe.
Hemodynamics (BP, HR)	Ketamine increases sympathetic tone; monitor BP/HR every 15–30 min initially and hourly thereafter. Reduce or stop infusion if >20% above baseline.
Respiratory rate / SpO_2	Though ketamine preserves airway reflexes, concurrent opioid/sedative use increases risk; monitor RR and SpO_2 regularly.
Nausea / Vomiting	Nausea/vomiting is common; routine monitoring advised; treat with antiemetics if necessary.
Urine output (for prolonged use)	For infusions >24 hours, monitor for reduced urine output and symptoms of cystitis
Overall documentation and reassessment	Continuous documentation of vital signs, sedation, and adverse effects is essential for titration and safety.

Key Take-Home Messages

1. Administer multimodal analgesia from the start of treatment.
2. Match therapy to pain severity & interference in function.
3. Screen routinely for neuropathic pain.
4. Use regional anesthesia whenever feasible.
5. Functional recovery—not pain score alone—is the ultimate goal.

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NEW CLINICAL PROTOCOL OF ANESTHESIA OF PATIENTS WITH GUN AND MINE-EXPLOSIVE INJURIES AT THE STAGES OF TREATMENT IN HEALTH CARE INSTITUTIONS IN THE SYSTEM OF THE MINISTRY OF DEFENSE OF UKRAINE, 2022

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For more information: Consult the complete guideline