Meperidine - Adult/Pediatric/Neonatal - Inpatient
Clinical Practice Guideline

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Executive Summary

Guideline Overview
This clinical practice guideline guides clinicians in the appropriate use of meperidine in adult and pediatric patients. Graded recommendations for indications, dosing, administration, and precautions for use are included.

Key Practice Recommendations

1. Alternative such as morphine, hydromorphone, fentanyl, oxycodone, hydrocodone, codeine (for adult patients) and tramadol should be used in preference to meperidine for analgesia. (Class I, Level C)

2. Meperidine should be avoided in elderly patients and patients with renal dysfunction. (Class I, Level C)

3. Appropriate indications for use of meperidine
   3.1. Prevention or treatment of drug-induced or blood product-induced rigors (e.g., amphotericin B, platelets) and treatment of post-anesthesia shivering. (Class IIa, Level B).
   3.2. Reduction of the shivering threshold during therapeutic hypothermia (Class IIa, Level B)
   3.2. Procedural sedation used as a single injection prior to adult procedures requiring pre-procedure analgesia, where rapid onset and short duration may improve patient care and fentanyl is not indicated. (Class I, Level C)
   3.3. Management of acute episodes of moderate to severe pain only if the patient has a history one or more of the following concerns (Class I, Level C):
      3.3.1 Unmanageable adverse reactions to other available opioids
      3.3.2 Treatment failure with first-line other available opioids given in adequate doses
   3.4. Research protocols specifying the use of meperidine. (Class I, Level C)

4. Meperidine is inappropriate therapy for migraine headache, although it has been commonly used. Meperidine is not recommended for this use because of its very short duration, its toxic metabolite, and because it is painful to inject. While IM meperidine has a slightly faster onset than morphine, its disadvantages outweigh this very small advantage. (Class III, Level B)

5. Adult Dose, Route, and Duration of Therapy
   5.1. Do not use meperidine for more than 48 hours or at doses greater than 600 mg IV per 24 hours. (Avoid use in renal dysfunction.) (Class III, Level A)
   5.2. The oral dosage form SHOULD NOT BE USED due to high first-pass metabolism and increased concentration of normeperidine. Oral tablets are non-formulary at UWHC (Class III, Level C)
   5.3. Adult parenteral doses may range from 50 to 150 mg subcutaneously every 3 hours as needed. (Class I, Level A)
   5.4. Intravenous (IV) push route may also be used, at a starting dose of 25 mg, increasing in 25 mg increments to a maximum of 100 mg, every 2 to 3 hours as needed, within the limitations noted. (Class I, Level A)
   5.5. Intramuscular (IM) absorption is erratic and IM injections are painful; therefore, this route should not routinely be used. (Class III, Level C)
   5.6. For the prevention of rigors and reduction of the shivering threshold, 12.5 to 50 mg should be administered via slow IV push over 4 minutes. (Class IIa, Level C)
   5.7. For treatment of rigors or post-anesthesia shivering, 12.5 to 50 mg should be given once by slow IV push over 4 minutes. (Class IIa, Level B)
5.8. For procedural sedation in patients unable to tolerate other opioids, single incremental doses of 12.5 to 50 mg IV may be given, 5 to 10 minutes prior to procedures. Note: Intravenous administration or administration of IV doses greater than 50 mg require heightened sedation monitoring (Class I, Level A)

6. Pediatric Dose, Route, and Duration of Therapy
6.1. Meperidine is not indicated for analgesia in children unless they are unable to tolerate all other opioids. (Class I, Level C)
6.2. The analgesic dose is 1 to 1.5 mg/kg subcutaneously or slow IV push over 4 minutes every 3 hours as needed (Class I, Level A).
6.3. For the prevention or treatment of rigors, a single dose of 0.5 mg/kg may be administered via slow IV push over 4 minutes (Class IIa, Level C).

7. Neonate Population – Avoid the use of meperidine in neonatal patients to avoid harmful side effects. 1-3 (Class III, Level C)

Companion Documents
1. UWHC Guidelines for Renal Function-Based Dose Adjustments in Adult Inpatients
2. Intravenous Administration of Formulary Medications – Adult – Inpatient/Ambulatory Clinical Practice Guideline
3. Intravenous Administration of Formulary Medications – Pediatric – Inpatient/Ambulatory Clinical Practice Guideline

Pertinent UW Health Policies & Procedures

Patient Resources - NA

Scope
Disease/Condition(s): Appropriate use in meperidine for adult and pediatric patients

Intended Users: Prescribers, nurses and pharmacists

Objective(s): Guidance for appropriate use of meperidine for treatment of rigors and avoidance of adverse drug reactions associated with meperidine.

Target Population: Inpatients requiring analgesia for severe pain or treatment of rigors.

Guideline Metrics: Adverse events submitted through the Patient Safety Network (PSN) will be monitored.
Methodology

A modified Grading of Recommendations Assessment, Development and Evaluation (GRADE) developed by the American Heart Association and American College of Cardiology (Figure 1) was used to assess the Quality and Strength of the Evidence in this Clinical Practice Guideline. PubMed, CINHAL plus, and Cochrane databases and were searched using the terms “meperidine”, “pain”, “rigors”.

Introduction

Meperidine is a synthetic opioid, an analog of fentanyl, sufentanil and alfentanil with analgesic properties similar to morphine. It is not as potent an analgesic as morphine and has a short duration of action, so that frequent large doses are needed to control moderate to severe pain. In addition, meperidine is transformed into a neurotoxic metabolite, normeperidine, which can accumulate after repeated administration even in mild renal insufficiency. Adverse effects of normeperidine include tremor, myoclonus and seizures. Problems associated with meperidine use have historically resulted in inadequate pain control and adverse effects for many patients.
Recommendations

1. Alternative opioids such as morphine, hydromorphone, fentanyl, oxycodone, hydrocodone, codeine (in adults) and tramadol should be used in preference to meperidine for analgesia.7-10 (Class I, Level C)

2. Meperidine should be avoided in elderly patients and patients with renal dysfunction.9,11,12 (Class I, Level C)
   2.1. An increased risk of delirium is associated with meperidine in elderly post-surgical patients, whereas the same correlation has not been identified with alternative opioids.12

3. Appropriate indications for use of meperidine
   3.1. Prevention or treatment of drug-induced or blood product-induced rigors (e.g., amphotericin B, platelets) and treatment of post-anesthesia shivering.13-18 (Class IIa, Level B)
      3.1.1. For the prevention and treatment of rigors and reduction of the shivering threshold, 12.5 to 50 mg should be administered via slow IV push over 4 minutes
      3.1.2. Shivering related to neuraxial analgesia may respond to fentanyl, nalbuphine, dexmedetomidine, ketamine, propofol or ondansetron.13 (Class IIb, Level B)
      3.1.3. Dexmedetomidine, nalbuphine may be an alternative agent for post-operative shivering.16,19 (Class IIb, Level B)
   3.2. Reduction of the shivering threshold during therapeutic hypothermia20 (Class IIa, Level B)
      3.2.1. Dexmedetomidine, fentanyl, midazolam, neuromuscular blocking agents and magnesium sulfate infusion may be reasonable as alternative agents.21-23 (Class IIb, Level C)
   3.3. Procedural analgesia used as a single injection prior to adult procedures requiring pre-procedure analgesia, where rapid onset and short duration may improve patient care and fentanyl is not indicated.5 (Class I, Level A)
   3.4. Management of acute episodes of moderate to severe pain only if the patient has a history one or more of the following problems7-9 (Class I, Level C):
      3.4.1. Unmanageable adverse reactions to other available opioids.
      3.4.2. Treatment failure with other available opioids given in adequate doses
   3.5. Research protocols specifying the use of meperidine. (Class I, Level C).

4. Meperidine is inappropriate therapy for migraine headache, although it has been commonly used. Meperidine is not recommended for this use because of its very short duration, its toxic metabolite, and because it is painful to inject. While IM meperidine has a slightly faster onset than morphine, its disadvantages outweigh this very small advantage.24 (Class III, Level B)

5. Adult Dose, Route, and Duration of Therapy
   5.1. Meperidine should not be used for longer than 48 hours or parenteral doses greater than 600 mg per 24 hours in patients with normal renal function.8 (Class III, Level A)
   5.2. The oral dosage form SHOULD NOT BE USED due to high first-pass metabolism and increased concentration of normeperidine.25 (Class III, Level C)
   5.3. Adult parenteral doses may range from 50 to 150 mg subcutaneously every 3 hours as needed.5 (Class I, Level A)
   5.4. Intravenous (IV) push route may also be used, at a starting dose of 25 mg, increasing in 25 mg increments to a maximum of 100 mg, every 2 to 3 hours as needed, within the limitations noted.5 (Class I, Level A)
   5.5. Intramuscular (IM) absorption is erratic and IM injections are painful; therefore, this route should be avoided whenever possible.5,7 (Class III, Level C).
5.6. For the prevention of rigors and reduction of the shivering threshold, 12.5 to 50 mg should be administered via slow IV push over 4 minutes (Class IIa, Level C).

5.7. For treatment of rigors or post-anesthesia shivering, 12.5 to 50 mg should be given once by slow IV push over 4 minutes. (Class IIa, Level B).

5.8. For procedural analgesia in patients unable to tolerate other opioids, single doses of 12.5 to 50 mg IV may be given, preferably incrementally, 5 to 10 minutes prior to procedures. Note: Intravenous administration or administration of IV doses greater than 50 mg require heightened sedation monitoring (Class I, Level A).

6. Pediatric Dose, Route, and Duration of Therapy
   6.1. Meperidine is not indicated for analgesia in children unless they are unable to tolerate all other opioids.26,27 (Class I, Level C)
   6.1.1. The analgesic dose is 1 to 1.5 mg/kg subcutaneously or slow IV push over 4 minutes every 3 hours as needed (Class I, Level A).
   6.2. For the prevention or treatment of rigors, a single dose of 0.5 mg/kg may be administered via slow IV push over 4 minutes (Class IIa, Level C).

7. Neonate Population – Avoid the use of meperidine in neonatal patients to avoid harmful side effects.1-3 (Class III, Level C)

UW Health Implementation

Potential Benefits and Harms:
Use of this guideline should encourage use of low doses meperidine only for the treatment of rigors and thereby minimize adverse events. No harm is anticipated as the result of using this guideline.

Implementation Plan/Tools
1. Guideline will be housed on U-Connect in a dedicated folder for CPGs.
2. Links to this guideline will be updated and/or added in appropriate Health Link or equivalent tools, including the meperidine ERX.

Disclaimer
CPGs are described to assist clinicians by providing a framework for the evaluation and treatment of patients. This Clinical Practice Guideline outlines the preferred approach for most patients. It is not intended to replace a clinician's judgment or to establish a protocol for all patients. It is understood that some patients will not fit the clinical condition contemplated by a guideline and that a guideline will rarely establish the only appropriate approach to a problem.
References