Analgesia for Hip Fracture in the Emergency Department

Dr. Bronwen Evans
MBBS, FANZCA
Disclaimer & Caveats

- I have received small gifts, toys and meals from pharmaceutical companies whose products will be named in this presentation

- all drug doses are guidelines only & should be tailored to individual patient requirements
• What is the evidence?
• Fascia Iliaca Compartment Nerve Block
• Pain Assessment
• Pharmacological
• Summary
Comparative Effectiveness of Pain Management Interventions for Hip Fracture: A Systematic Review

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Background: Pain management is integral to the management of hip fracture.

Purpose: To review the benefits and harms of pharmacologic and nonpharmacologic interventions for managing pain after hip fracture.

Data Sources: 25 electronic databases (January 1990 to December 2010), gray literature, trial registries, and reference lists, with no language restrictions.

Study Selection: Multiple reviewers independently and in duplicate screened 9357 citations to identify randomized, controlled trials (RCTs); nonrandomized, controlled trials (non-RCTs); and cohort studies of pain management techniques in older adults after acute hip fracture.

Data Extraction: Independent, duplicate data extraction and quality assessment were conducted, with discrepancies resolved by consensus or a third reviewer. Data extracted included study characteristics, inclusion and exclusion criteria, participant characteristics, interventions, and outcomes.

Data Synthesis: 83 unique studies (64 RCTs, 5 non-RCTs, and 14 cohort studies) were included that addressed nerve blockade (n = 32), spinal anesthesia (n = 30), systemic analgesia (n = 3), traction (n = 11), multimodal pain management (n = 2), neurostimulation (n = 2), rehabilitation (n = 1), and complementary and alternative medicine (n = 2). Overall, moderate evidence suggests that nerve blockades are effective for relieving acute pain and reducing delirium. Low-level evidence suggests that preoperative traction does not reduce acute pain. Evidence was insufficient on the benefits and harms of most interventions, including spinal anesthesia, systemic analgesia, multimodal pain management, acupressure, relaxation therapy, transcutaneous electrical neurostimulation, and physical therapy regimens, in managing acute pain.

Limitations: No studies evaluated outcomes of chronic pain or exclusively examined participants from nursing homes or with cognitive impairment. Systemic analgesics (narcotics, nonsteroidal anti-inflammatory drugs) were understudied during the search period.

Conclusion: Nerve blockade seems to be effective in reducing acute pain after hip fracture. Sparse data preclude firm conclusions about the relative benefits or harms of many other pain management interventions for patients with hip fracture.

Primary Funding Source: Agency for Healthcare Research and Quality.

For author affiliations, use end of text.
This article was published at www.annals.org on 17 May 2011.
• 9357 citations; 25 electronic DB; 1990-2010
• 65 RCT + 5 non-RCT + 14 cohort studies

• **Evidence insufficient on the benefits & harms of most interventions** including spinal anaesth, systemic analgesia, multimodal analgesia, acupressure, TENS & physical therapies
• None >30 days
• Pre-op & post op for most therapies were represented
• 9357 citations; 25 electronic DB; 1990-2010
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Conclusion: Nerve blockade seems to be effective in reducing acute pain after hip fracture. Sparse data preclude firm conclusions about the relative benefits or harms of many other pain management interventions for patients with hip fracture.

- Femoral Nerve Block
- 3 in 1 Nerve Block
- Fascia Iliaca Nerve Block
- Psoas compartment NB
- Epidural analgesia

- Less supplemental analgesia
  - Less delirium
  - Shorter acute hospitalisation

- No change in mortality, CVS, DVT, PE, N&V, Resp infection, CVA, wound infection, UTI, retention

- Study Heterogeneity
- Low to intermediate levels of evidence
- 50% excluded pt w cog impairment
### Innervation of Hip Joint

<table>
<thead>
<tr>
<th>Nerve</th>
<th>Innervation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Femoral Nerve</td>
<td>Nerve to pectineus</td>
</tr>
<tr>
<td></td>
<td>Nerve to Rectus Femoris</td>
</tr>
<tr>
<td></td>
<td>Nerve to Vastas Lateralis</td>
</tr>
<tr>
<td></td>
<td>Directly from nerve to joint</td>
</tr>
<tr>
<td>Obturator Nerve</td>
<td>Twigs from within obturator canal</td>
</tr>
<tr>
<td>Sciatic Nerve</td>
<td>Nerve to Quadratus Femoris</td>
</tr>
<tr>
<td></td>
<td>Twigs from Superior Gluteal nerve</td>
</tr>
</tbody>
</table>

- **Femoral nerve**
- **Obturator nerve**
- **Sciatic nerve**

LCNT - sensory only
Which Femoral Nerve Block?

http://www.nysora.com/
http://www.neuraxiom.com/
http://www.sonoguide.com/aboutus.html

Femoral Nerve Blocks

“3 in 1”
Fascia Iliaca Block
Femoral Nerve Block

Technique

Landmarks
Nerve Stimulator
Ultrasound Guide
FIB+_ catheter.

- http://www.youtube.com/watch?v=eCWnd3fYYV8s
USD_Fem neve Block 2

- [http://www.youtube.com/watch?NR=1&feature=endscreen&v=PFpfnKXLGuo](http://www.youtube.com/watch?NR=1&feature=endscreen&v=PFpfnKXLGuo)

- [www.regional.anaesthesia.org.au](http://www.regional.anaesthesia.org.au)

- Dr Michael Barrington commenced an audit of peripheral nerve blocks in 2006 & one can visit this site to register & participate in the audit. It is probably the only way to find out both the numerator & denominator of nerve injury & complications
Fascia Iliaca vs. US guided FNB

Landmarks Fascia Iliaca Block
• Simple & less equipment
• A “compartment” Block
  – Requires VOLUME ➔ 40ml
• Effective blockade of Femoral nerve +/- LCNT
• Accuracy requires experience
• Nerve damage possible

Ultrasound Guided
• Equipment
• Time
• Training
• May be offset by
  – ? Higher success rate
  – ? More rapid onset
  – ? Safer
  – ? Less volume LA
• Nerve damage possible
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Relative CONTRAINDICTION to Anterior thigh Block
→ FEMORAL ARTERY GRAFT

Ultrasound guidance recommended
3 in 1 NB  SMD= -0.85 (-1.38-+0.35)  $I^2 = 85$
 n= 153 (65vs87)

Epidural analgesia  $I^2 = 0$
 n= 145 (72vs73)

Fascia Iliaca SMD=-1.38 (-2.75- -0.0004) $I^2=97$
 n=421 (224vs197)

Femoral  SMD=-1.01 (-1.46- -0.57)  $I^2= 12$
 n=109 (47vs62)

Psoas Compartment NB  $I^2 = na$
 n= 40 (20vs20)

Combination SMD= -2.68 (-3.68- -2.14)  $I^2= 19$
 n=135 (80vs55)
Non significant results for “3 in 1” & FIB

High Heterogeneity

3 in 1 NB  SMD= -0.85 (-1.38 - 0.35)  I² = 85%

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Non significant results for “3 in 1” & FIB

High Heterogeneity

3 in 1 NB  SMD= -0.85 (-1.38 - 0.35)  I² = 85%
Non significant results for “3 in 1” & Fascia Iliaca

High Heterogeneity

No pooled analysis possible

3 in 1 NB  SMD=-1.38 (-2.75 -0.0004)  I²=97%
n= 153 (65vs87)

Fascia Iliaca  OR= -1.38 (-2.75 -0.0004)  I²=97%
n=421 (224vs197)

Psoas Compartment NB
n= 40 (20vs20)

Combination SMD= -2.68 (-3.68 -2.14)  I²= 19%
n=135 (80vs55)
• Systemic analgesia = 3 RCTs
  – Parecoxib vs. IV diclofenac & pethidine
  – Intrathecal clonidine

• Multimodal Analgesia = 2 cohort studies
  – Tramadol & paracetamol vs. standard care
  – Traction vs. morphine vs. paracetamol vs. standard care
Evidence
PRE-Hospital Analgesia

- opioids
- Methoxyflurane

Key messages

1. Intravenous morphine, fentanyl and tramadol are equally effective in the prehospital setting (N) (Level II).
2. Nitrous oxide is an effective analgesic agent in prehospital situations (N) (Level IV).
3. Methoxyflurane, in low concentrations, may be an effective analgesia in the hospital and prehospital setting (N) (Level IV).
4. Ketamine provides effective analgesia in the prehospital setting (N) (Level IV).
5. Moderate to severe pain is common in both adult and paediatric patients in the prehospital setting (N) (Level IV).

The following tick boxes ✓ represent conclusions based on clinical experience and expert opinion.

✓ The ideal prehospital analgesic agent should be simple to use, safe, effective, not lead to delays in transport and have a rapid onset and short duration of action so that it can be repeated as often as necessary and titrated to effect for each patient. Consideration should be given to both choice of analgesic drug and route of administration (N).

✓ Non-pharmacological measures are effective in providing pain relief and should always be considered and used if practical (N).
Femoral Nerve Block
“3 in 1” or Fascia Iliaca

Fractured neck of femur
In patients with a fractured neck of femur in the emergency department, a ‘3 in 1’ femoral nerve block with bupivacaine, combined with IV morphine was more effective than IV morphine alone, with a faster onset of analgesia (Fletcher et al, 2003 Level II). A facia iliaca block with mepivacaine, significantly improved pain scores and reduced IV morphine requirements and sedation, compared with IM morphine (Foss et al, 2007 Level II). For safety reasons, ropivacaine or levobupivacaine may be the preferred local anaesthetics (see Section 5.1).
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**Fractured neck of femur**

<table>
<thead>
<tr>
<th>Local Anaesthetic</th>
<th>Maximum dose mg/kg</th>
<th>Onset (mins)</th>
<th>Anaesthesia (hours)</th>
<th>Analgesia (hours)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2% Lignocaine + HCO3 + adren 5mcg/ml</td>
<td>6</td>
<td>10-20</td>
<td>2-5</td>
<td>3-8</td>
</tr>
<tr>
<td>0.5% Ropivacaine</td>
<td>3</td>
<td>15-30</td>
<td>4-8</td>
<td>5-12</td>
</tr>
<tr>
<td>0.75% Ropivacaine</td>
<td>3</td>
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<td>5-10</td>
<td>6-24</td>
</tr>
</tbody>
</table>

- **Ropivacaine or Levobupivacaine** (2.5-3.0mg/kg)
  - less CVS toxic than bupivacaine
  - longer lasting than lignocaine

*Table from www.nysora.com*
Evidence

Pain management for emergency departments

Effective management of acute pain in the ED requires:

1. **Assessment** of the pain. All clinical assessment of pain should be based on the patient’s perception of pain and their subjective experience. The use of a validated pain scale is indicated. See section 1.

2. Provision of **appropriate analgesia** in an appropriate time frame via an appropriate route. See section 2.

3. **Reassessment** of pain to determine the effect of treatment and assess for adverse effects. Regularly reassess and document the patient’s pain every 5–15 minutes if severe*, or every 30–60 minutes if less severe.

   * severe pain is defined as a pain score of 7 or more or significant distress.

It is important to remember non-pharmacological analgesic techniques such as:

1. immobilisation of injured limbs or body parts
2. ice and elevation
3. explanation of the cause of pain and likely outcomes to allay anxiety
4. keeping the patient in as calm an environment as possible
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• Self report
• Pain scales
• Analgesia:
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- Self report
- Pain scales
- Analgesia:
  - Time, drug, dose, route
- Reassess
- Document
- Non-pharmacological
Principles of quality analgesia

1. Effective analgesia in the ED requires appropriate assessment and re-assessment, use of the appropriate drug(s) in appropriate doses, via the appropriate route within an acceptable time frame.

2. Pain is subjective and an individual's perception of pain may be influenced by factors such as beliefs, mood and ability to self-assess.

3. Pain management requires the assessment of a patient's pain and ability to self-assess.

4. The use of pain scales is recommended.4

5. The use of pethidine should be discouraged in favour of other opioids.3

6. For acute, severe pain, titrated doses of IV opioids provide effective analgesia.4

7. Paracetamol and non-steroidal anti-inflammatory drugs (NSAIDs) provide effective analgesia for acute pain. If used together, the quality of analgesia improves.4

8. For acute pain not requiring IV opioids, the oral route is the preferred route of administration. Parenteral or rectal NSAIDs have no advantage over oral NSAIDs.4 Non-oral routes of administration are useful if patients are nauseated, vomiting or the oral route is not available.

9. Side-effects, adverse effects and contraindications of analgesics should always be considered. Dose adjustments may be required in the elderly or for those with diminished drug clearance (e.g. renal or liver dysfunction).

10. Effective pain management should be a key component in managing patients with substance abuse disorders, just as it is for patients without such disorders.

11. Subcutaneous morphine is not appropriate for initial acute pain management; however, the subcutaneous route may be an option as a comfort maintenance strategy once IV opioids have controlled the initial intense episode.

12. When IV morphine is administered for acute pain, the overall incidence of nausea and vomiting is low, regardless of whether these patients are given prophylactic metoclopramide or not.5

13. If opioids are required for home management of severe pain, patients should preferably be medically reviewed the next business day post discharge from the ED, or as soon as is otherwise possible. The quantity of discharge opioid medication should not exceed this period. Maximum Pharmaceutical Benefit Scheme quantities and pack sizes should not be prescribed if unlikely to be needed.

Practice point...

Fasting patients (nil by mouth) may be administered oral analgesia unless they have (or are suspected of having) one of the following conditions:

- bowel obstruction
- perforated viscus
- compromised swallow e.g. stroke
- compromised airway.
Principles of quality analgesia

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5. The use of pethidine should be discouraged in favour of other opioids.

6. For acute, severe pain, titrated doses of IV opioids provide effective analgesia.

7. Pain may be controlled with nonsteroidal anti-inflammatory drugs (NSAIDs) provided by any route other than oral. If used together, the quantitation must be properly monitored.

8. If opioids are required, the oral route is the preferred route. Parenteral or rectal NSAIDs have a place in severe cases. Non-oral routes of administration are useful if patients are nauseated, vomiting or the oral route is not available.

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- bowel obstruction
- perforated viscus
- compromised swallow e.g. stroke
- compromised airway.
NO PETHIDINE.....ever!?*

*Skin testing proven allergy to all else

ANNOTATE prescriptions “OK while fasting”

TITRATE Opioids

Practice point...
Fasting patients (nil by mouth) may be administered oral analgesia unless they have (or are suspected of having) one of the following conditions:

- bowel obstruction
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- compromised swallow e.g. stroke
- compromised airway.
Annotation of prescription

1. Guides nursing staff
2. Helps patients

<table>
<thead>
<tr>
<th>Date</th>
<th>Medication (Print Generic Name)</th>
<th>Route</th>
<th>Dose</th>
<th>Hourly frequency</th>
<th>Max dose24hrs</th>
<th>Time</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>16/11</td>
<td>OXY NORM</td>
<td>OR</td>
<td>5-10mg</td>
<td>PRN</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>16/11</td>
<td>MORPHONE</td>
<td>SC</td>
<td>2.5-5.0mg</td>
<td>PRN</td>
<td></td>
<td>2/24</td>
<td></td>
</tr>
</tbody>
</table>

**Indication:**
- Pain

**Prescriber Signature:**
- Doctor

**Pharmacy:**
- 25/02/2012 32

**5-10mg**

**2.5-5.0mg**
Pain Scales

Assessment and reassessment of pain requires an ongoing effort of analysis to determine the severity of the pain and the medication used. Reassessment should also consider the potential adverse effects of analgesia.

**Numerical rating score (NRS)**

This may be used for adults and for children over the age of 6 to 8 years. Instruct the patient to rate their pain intensity on a scale of 0 (‘no pain’) to 10 (‘the worst pain imaginable’). Some patients may find this difficult with only verbal instructions but may be able to point to the number on the scale that describes the intensity of their pain.

<table>
<thead>
<tr>
<th>PAIN SCORE 0–10 NUMERICAL RATING</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
</tr>
<tr>
<td>No pain</td>
</tr>
</tbody>
</table>

**Verbal Descriptor Scale (VDS)**

VDS scales have been shown to be sensitive and reliable, and are considered to be the best choice for elderly patients, including those with mild to moderate cognitive impairment.

This type of scale uses descriptor terms such as: ‘none’, ‘mild’, ‘moderate’, ‘severe’, ‘excruciating’.

**FLACC behavioural pain assessment scale**

The FLACC Scale is a behavioural scale for scoring pain in children between the ages of two months and seven years or in persons unable to verbally communicate. Each of the five categories (faces, legs, activity, cry, consolability) is scored from 0 to 2 and the scores are added to get a total score from 0 to 10.

Behavioural pain scores need to be used within the context of the child’s psychological status, anxiety and other environmental factors.

<table>
<thead>
<tr>
<th></th>
<th>0</th>
<th>1</th>
<th>2</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Face</strong></td>
<td>No particular expression or smile</td>
<td>Occasional grimace or frown, withdrawn, disinterested</td>
<td>Frequent to constant frown, clenched jaw, quivering chin</td>
</tr>
<tr>
<td><strong>Legs</strong></td>
<td>Normal position or relaxed</td>
<td>Uneasy, restless, tense</td>
<td>Kicking, or legs drawn up</td>
</tr>
<tr>
<td><strong>Activity</strong></td>
<td>Lying quietly, normal position, moves easily</td>
<td>Squirming, shifting back and forth, tense</td>
<td>Arched, rigid, or jerking</td>
</tr>
<tr>
<td><strong>Cry</strong></td>
<td>No cry (awake or asleep)</td>
<td>Moans or whimper, occasional complaint</td>
<td>Crying steadily, screams or sobs, frequent complaints</td>
</tr>
<tr>
<td><strong>Consolability</strong></td>
<td>Content, relaxed</td>
<td>Reassured by occasional touching, hugging or “talking to”, distractible</td>
<td>Difficult to console or comfort</td>
</tr>
</tbody>
</table>

**Faces rating scale (FRS)**

[Faces rating scale image]
Pain Scales

Assessment and reassessment should be done at the discretion of the treating clinician and the medication used. Reassessment should also consider the potential adverse effects of analgesia.

**Numerical rating score (NRS)**

This may be used for adults and for children over 7 years. Instruct the patient to rate their pain intensity from 0 to 10 (the worst pain imaginable). Some patients may be unfamiliar with only verbal instructions but may benefit from the scale that describes the intensity of their pain.

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Behavioural pain scores may be affected by the context of the child’s psychological and environmental factors.
Pain Scales

Assessment and reassessment are important for determining the ongoing effect of any pain treatment and the medication used, and for potential adverse effects.

Numerical rating score

This may be used for adult patients, and is a simple way of assessing pain. Instruct the patient to rate their pain intensity on a scale of 0 (‘no pain’) to 10 (‘the worst pain imaginable’). Some patients may find this difficult with only verbal instructions but may be able to point to the number on the scale that describes the level of pain they are feeling.

Verbal Descriptor Scale

VDS scales have been shown to be a relatively simple and effective tool and considered to be the best choice for elderly patients, including those with mild to moderate cognitive impairment. This type of scale uses descriptor terms such as: ‘none’, ‘mild’, ‘moderate’, ‘severe’, ‘excruciating’.

25/02/2012

FUNCTION NOT IMPAIRED BY PAIN

FUNCTION MILDLY-MODERATELY IMPAIRED BY PAIN

FUNCTION SEVERELY IMPAIRED BY PAIN

SELF REPORT OR OBSERVER REPORT AND FUNCTIONAL ACTIVITY SCORE = FAS

FLACC behavioural pain assessment scale

The FLACC Scale is a behavioural scale for scoring pain in children between the ages of two months and seven years or in persons with severe cognitive impairment. It consists of five dimensions: face, no particular expression;grimacing; postural changes; activity; and cry or vocalisation. Scores range from 0 to 2 and are added together to give a context of the pain.

| Face       | No particular expression | Occasional grimace | Frown, | Frequent to constant frown, clenched jaw, pillow, or legs | Occasional or steady, rigid, pressing
|-------------|--------------------------|------------------|-------|----------------------------------------------------------|-----------------------------------------------
| 0           | 1                         | 2                | 3     | 4                                                          | 5
| No pain     |                           |                 |       |                                                           |                                             

Western Health
Fractures and dislocation

Key messages:

1. Immobilisation, resting the injured limb and suspected fracture are important.

2. Femoral nerve block in combination with IV opioids are more effective than IV opioids alone in treating pain from fractured neck of femur.4

3. Anticipate procedures where some movement is required, such as x-ray, and ensure adequate analgesic cover.

<table>
<thead>
<tr>
<th>ANALGESIC TECHNIQUES</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>For severe pain use</strong>...</td>
</tr>
<tr>
<td><strong>Morphine</strong> 2.5 to 5mg IV as an initial dose, then titrated to effect every 5 to 10 minutes with further incremental doses of 2.5 to 5mg IV8</td>
</tr>
<tr>
<td>In elderly patients or those with cardiorespiratory compromise, an initial morphine dose of less than 2.5mg IV and incremental doses of 0.5 to 1mg should be considered.</td>
</tr>
<tr>
<td>Patients should be reassessed to determine if the dose has been effective or if there are any adverse effects (especially sedation).</td>
</tr>
<tr>
<td>If morphine is contraindicated, consider fentanyl at 25 to 50 micrograms IV as initial equivalent dose.8</td>
</tr>
</tbody>
</table>

| **For less severe pain use**... |
| **Paracetamol** 1g orally 4 hourly prn (to a maximum dose of 4g per 24 hour period)9 |
| If the oral and rectal routes are contraindicated, paracetamol can be given IV 1g 6 hourly9 with or without |
| **Oxycodone** immediate release 5 to 10mg* orally 4 to 6 hourly pm9 |
| *For moderate pain in patients who are opioid naïve, start with 5mg oxycodone. If this is tolerated, but there is an inadequate response, a further 5mg may be given after 30 to 60 minutes. Larger and more frequent doses may be necessary. Failure to respond to oxycodone may be an indication to prescribe titrated IV morphine. |

For fractured neck of femur...

Femoral nerve block in combination with IV Morphine.4

...continued over page
Fractures and dislocation

Key messages:

1. Immobilisation, resting the injured limb, and suspected fracture are important.

2. Femoral nerve block in combination with IV opioids are more effective than IV opioids alone in treating pain from fractured neck of femur.

3. Anticipate procedures where some movement is required, such as x-ray, and ensure adequate analgesic cover.

---

Femoral Nerve Block

PARACETAMOL for SEVERE PAIN also and NSAID if no CI

---

ANALGESIC TECHNIQUES

For severe pain use…

**Morphine** 2.5 to 5mg IV as an initial dose, then titrated to effect every 5 to 10 minutes with further incremental doses of 2.5 to 5mg IV.

In elderly patients or those with cardiorespiratory compromise, less than 2.5mg IV and incremental doses of 0.5 to 1mg IV.

Patients should be reassessed to determine if the dose can be increased and if there are adverse effects (especially sedation).

If morphine is contraindicated, consider fentanyl at 25μg initial equivalent dose.

For less severe pain use…

**Paracetamol** 1g orally 4 hourly prn (to a maximum dose of 4g per 24 hour period).

If the oral and rectal routes are contraindicated, paracetamol can be given IV 1g 6 hourly.

**Oxycodone** immediate release 5 to 10mg* orally 4 to 6 hourly pm.

*For moderate pain in patients who are opioid naïve, start with 5mg oxycodone. If this is tolerated, but there is an inadequate response, a further 5mg may be given after 30 to 60 minutes. Larger and more frequent doses may be necessary. Failure to respond to oxycodone may be an indication to prescribe titrated IV morphine.

For fractured neck of femur…

Femoral nerve block in combination with IV Morphine.
Femoral Nerve Block

**TITRATE** Opioids in ADDITION to Paracetamol

**PARACETAMOL** for SEVERE PAIN also NSAID if no Cl
Paracetamol

- Oral route preferred even while fasting
- Avoid rectal route ➞ poor absorption
- IV if oral unsuitable
- IV dose ➞ $$$
- Paracetamol efficacy may be reversed by 5HT3 antagonists

- Avoid giving a dose within 3–4 hours of a previous paracetamol dose.
- Maximum daily doses less than 4g may be preferred in adult patients with liver disease or at risk for paracetamol hepatotoxicity.
- Liver function tests should be checked in patients with alcohol abuse, suspected liver disease or malnutrition.
- IV paracetamol is significantly more expensive than oral and doses, but no more efficacious. IV paracetamol should be reserved for patients in whom the oral or rectal routes are contraindicated.

25/02/2012
Paracetamol

- Avoid giving a dose within 3–4 hours of a previous paracetamol dose.
- Maximum daily doses less than 4g may be preferred in adult patients with liver disease or at risk for paracetamol hepatotoxicity.
- Liver function tests should be checked in patients with alcohol abuse, suspected liver disease or malnourishment.
- **IV paracetamol is significantly more expensive than oral and doses, but no more efficacious. IV paracetamol should be reserved for patients in whom the oral or rectal routes are contraindicated.**

Western Health Pre-operative Oral Paracetamol Dose

Withhold if paracetamol in the past 4 hours

<table>
<thead>
<tr>
<th>Weight kg</th>
<th>Loading dose (g)</th>
<th>Subsequent dose</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;50</td>
<td>1.0</td>
<td></td>
</tr>
<tr>
<td>50-65</td>
<td>1.5</td>
<td>1g QID*</td>
</tr>
<tr>
<td>&gt;65</td>
<td>2.0</td>
<td></td>
</tr>
</tbody>
</table>

* reduce dose if cachectic, malnourished, extreme small stature, suspect glutathione deficient etc
Morphine

- Elderly patients and those with reduced cardio-respiratory reserve often require lower doses of morphine. An initial morphine dose of less than 2.5mg IV and incremental doses of 0.5–1mg should be considered.
- Doses in this manual assume patients are opioid naïve. Patients taking long-term opioids, e.g. MS Contin, OxyContin, Fentanyl patches, will generally require higher doses to manage acute pain. Seek further advice.
- Monitoring of patients receiving IV morphine must include sedation score (e.g. Glasgow Coma Scale), respiratory rate and arterial oxygen saturation, if possible. Doses must not be administered in the waiting room environment.
- Morphine should be used with caution in patients using partial agonists such as buprenorphine tablets (Subutex, Suboxone). It is controversial as to whether morphine should be used in patients using buprenorphine patches (Norspan). Seek specialist advice.

OPIOID TOLERANT Patients require higher doses
Seek advice from APMS ? PCA ? ketamine

- Continue opioids
- Leave any patch on
- Pain service advice
- Addiction medicine advice
Morphine

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SEDATION SCORE IS NOT THE GCS or AVPU
GCS & AVP are INSENSITIVE tools for assessment of OPIOID Induced Ventilatory Insufficiency (OIVI)
The National Inpatient Medication and Adult Deterioration Detection System Charts: Notes of caution
Quality in Health Care (ACSQHC) with the aim of improving patient safety.
However, we believe that caution is needed when prescribing and titrating prn opioids for the management of acute pain and therefore in the use of these charts.

**National Inpatient Medication Chart and “maximum 24-hour doses”**
The National Inpatient Medication Chart Local Management Guidelines outline how this chart should be used and what alterations are and are not allowed to be made by local jurisdictional working groups.

The NIMC currently requires a “maximum 24-hour dose” to be entered for all medications prescribed on a prn

What was safe today may not be safe tomorrow or even in a few hours time!

We believe that it is important to encourage all staff to titrate the amount of opioid given to each patient, which requires regular assessment of both pain and sedation – increasing sedation being used as a more reliable indicator of early opioid-induced ventilatory impairment (OIVI) than a decrease in respiratory rate.

The sedation scoring system used by many of us and promoted by the Victorian Quality Council records sedation on a four-point scale of 0 to 3 – see Table 1. While a score of 1 is used in many institutions (to indicate a patient who will stir in response to a mild stimulus but without waking them completely), it is not used by others, as a sedation score of 2 could remain applicable (appropriate) for prn opioid prescriptions.

**Adult Deterioration Detection System charts and a patient’s level of sedation**
In order to titrate opioids safely, therefore, the nurses should monitor and record a patient’s sedation score on a regular basis and increasing sedation should be taken to mean a deterioration in the patient’s condition related to opioid administration (until proven otherwise). If a sedation score of 2 or higher is noted, appropriate and urgent intervention is indicated.

However, there is no ability to record sedation scores on the ADDS chart. A patient’s level of consciousness is reported using the AVPU scale (A = alert, V = responds to voice, P = responds to pain and U = unconscious).

**SEDATION SCORE is the 6th Vital Sign**
<table>
<thead>
<tr>
<th>A</th>
<th>ALERT</th>
</tr>
</thead>
<tbody>
<tr>
<td>V</td>
<td>VOICE</td>
</tr>
<tr>
<td>P</td>
<td>PAIN</td>
</tr>
<tr>
<td>U</td>
<td>UNRESPONSIVE</td>
</tr>
</tbody>
</table>

Table 1: Sedation Scores

<table>
<thead>
<tr>
<th>GCS</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Eyes</td>
<td>Do not open</td>
<td>Open to pain</td>
<td>Open to voice</td>
<td>Open spont</td>
<td>n/a</td>
<td>n/a</td>
</tr>
<tr>
<td>Verbal</td>
<td>none</td>
<td>Incomprehensible words</td>
<td>Inappropriate</td>
<td>Confused, disoriented</td>
<td>Oriented, normal conversation</td>
<td>n/a</td>
</tr>
<tr>
<td>Motor</td>
<td>none</td>
<td>Abnormal Extension Decerebrate</td>
<td>Abnormal Flexion Decorticate</td>
<td>Flex/withdraws to pain</td>
<td>Localises pain</td>
<td>Obeys commands</td>
</tr>
</tbody>
</table>

*may not be used in some centres where a score of 1 is used whether or not the patient is asleep as a sedation score of 2 could be missed*

Sedation Score: Mild (SS=1) & Moderate (SS=2 PaCO2=50mmHg)

<table>
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<th>A</th>
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<tr>
<th>Score</th>
<th>Description</th>
</tr>
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<tbody>
<tr>
<td>0</td>
<td>awake, alert</td>
</tr>
<tr>
<td>1</td>
<td>mild sedation, easy to rouse</td>
</tr>
<tr>
<td>2</td>
<td>moderate sedation, easy to rouse, unable to remain awake</td>
</tr>
<tr>
<td>3</td>
<td>difficult to rouse</td>
</tr>
</tbody>
</table>

Note: May not be used in some centres where a score of 1 is used whether or not the patient is asleep as a sedation score of 2 could be missed.

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For more information, please visit:
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- Both 1 & 2 easy to rouse
- BUT Moderate sedation (2) is UNABLE to STAY AWAKE
- AVPU & GCS cannot differentiate between 1 & 2
- Hence AVPU & GCS are insensitive measures of OIVI

### Oxycodone
- Doses in this manual assume patients are opioid naïve. Patients taking long-term opioids, e.g. MS Contin, OxyContin, Fentanyl patches, will generally require higher doses to manage acute pain. Seek further advice.
- Immediate release products should be used for managing acute pain, e.g. OxyNorm capsules, Endone tablets.
- Doses of immediate release oxycodone can be repeated after 30–60 minutes until adequate pain relief is achieved. If a patient not previously taking opioids does not achieve pain relief after 20mg given over approximately 4 hours, the diagnosis should be reviewed.

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<tr>
<th>AGE – years</th>
<th>Subcutaneous MORPHINE (mg) If eGFR &gt; 50</th>
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<th>Oral OXYNORM (mg) (capsule or liquid)</th>
<th>Oral MORPHINE SULPHATE mg (liquid) If eGFR &gt; 50</th>
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<tbody>
<tr>
<td>20-40</td>
<td>7.5 – 12.5</td>
<td>110 - 190</td>
<td>10 -20</td>
<td>15 - 30</td>
</tr>
<tr>
<td>41-60</td>
<td>5.0 – 10.0</td>
<td>80 - 150</td>
<td>5 -15</td>
<td>7 - 22</td>
</tr>
<tr>
<td>61-70</td>
<td>2.5 – 7.5</td>
<td>40 - 110</td>
<td>5 -10</td>
<td>7 - 15</td>
</tr>
<tr>
<td>70-85</td>
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<td>&gt;85</td>
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**Western Health**
Dose interval: typically 2 or 3 hourly prn; may be 1 hourly prn in some patients
### Ongoing opioids:
- Oral route preferred
- Dose range based on age
- Avoid morphine if eGFR < 50
- Co-prescribe laxatives & anti-emetics

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Western Health

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- Dose range based on age
- Avoid morphine if eGFR < 50
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### Table: Opioid Dose Ranges

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<th>Subcutaneous FENTANYL (mcg)</th>
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</tr>
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<tbody>
<tr>
<td></td>
<td>If eGFR &gt; 50</td>
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**Western Health**

Dose interval: typically 2 or 3 hourly prn; may be 1 hourly prn in some patients

- **Trade names vs. generic**
- IR, CR, SR, XR formulations
Which Opioid?
Morphine, Fentanyl, Oxycodone

- All available in parenteral form
- No oral fentanyl
  - transbuccal only for opioid tolerant, cancer pain
- Consider
  - Pre hospital morphine dose?
  - Speed of onset
    - Morphine is significantly slower than fentanyl
  - Renal impairment?
  - Active metabolites (from the pre-hospital morphine)
    - M6G: significant delayed excretion
    - M3G: central AE s, ? Contribute to delirium
  - Age: fentanyl may cause less confusion in elderly
### Table 1. Pharmacology Comparison between Fentanyl and Morphine in Adults

<table>
<thead>
<tr>
<th></th>
<th>Morphine</th>
<th>Fentanyl</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rapid distribution half-life ($t_{1/2} \pi$, min)</td>
<td>1.2–2.5</td>
<td>1.0–1.7</td>
</tr>
<tr>
<td>Slow distribution half-life ($t_{1/2} \alpha$, min)</td>
<td>9–13.3</td>
<td>13–28</td>
</tr>
<tr>
<td>Elimination half-life ($t_{1/2} \beta$, h)</td>
<td>1.7–2.2</td>
<td>3.1–7.9</td>
</tr>
<tr>
<td>Blood-brain equilibration half-life ($t_{1/2} k_{eo}$, min)</td>
<td>15–20</td>
<td>6.6</td>
</tr>
<tr>
<td>Volume of distribution, steady state (L/kg)</td>
<td>3.2–3.4</td>
<td>3.2–5.9</td>
</tr>
<tr>
<td>Clearance* (ml · kg$^{-1}$ · min$^{-1}$)</td>
<td>15–23</td>
<td>8–21</td>
</tr>
<tr>
<td>$pK_a$</td>
<td>7.93</td>
<td>8.43</td>
</tr>
<tr>
<td>% unionized at pH 7.4</td>
<td>23</td>
<td>8.5</td>
</tr>
<tr>
<td>Octanol: H$_2$O partition coefficient</td>
<td>1.4</td>
<td>816</td>
</tr>
<tr>
<td>% unbound drug at pH 7.4</td>
<td>70</td>
<td>16</td>
</tr>
<tr>
<td>Relative CNS penetrability†</td>
<td>1</td>
<td>133</td>
</tr>
</tbody>
</table>

* Calculated from blood level measured in plasma.
† Apparent octanol: H$_2$O partition coefficient at pH 7.4 multiplied by the free fraction of drug in plasma and describing the relative potential of the drug to penetrate the blood-brain barrier.

Adapted and modified from Musch and Frank, Inturrisi,$^{190}$ Scott.$^{32}$

---

**Anesthesiology**

1999; 90:576–99

**A Review of the Use of Fentanyl Analgesia in the Management of Acute Pain in Adults**

<table>
<thead>
<tr>
<th>Pharmacological Property</th>
<th>Morphine</th>
<th>Fentanyl</th>
</tr>
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<tbody>
<tr>
<td>Rapid distribution half-life ($t_{1/2}$, min)</td>
<td>1.2–2.5</td>
<td>1.0–1.7</td>
</tr>
<tr>
<td>Slow distribution half-life ($t_{1/2}$, $\alpha$, min)</td>
<td>9–13.3</td>
<td>13–28</td>
</tr>
<tr>
<td>Elimination half life ($t_{1/2}$, $\beta$, h)</td>
<td>1.7–2.2</td>
<td>3.1–7.9</td>
</tr>
<tr>
<td>Blood-brain equilibration half-life ($t_{1/2}$, $k_{eq}$, min)</td>
<td>15–20</td>
<td>6.6</td>
</tr>
<tr>
<td>Volume of distribution, steady state (L/kg)</td>
<td>3.2–3.4</td>
<td>3.2–5.9</td>
</tr>
<tr>
<td>Clearance ($\text{ml} \cdot \text{kg}^{-1} \cdot \text{min}^{-1}$)</td>
<td>15–23</td>
<td>8–21</td>
</tr>
<tr>
<td>$pK_a$</td>
<td>7.93</td>
<td>8.43</td>
</tr>
<tr>
<td>% unionized at pH 7.4</td>
<td>23</td>
<td>8.5</td>
</tr>
<tr>
<td>Octanol: H$_2$O partition coefficient</td>
<td>1.4</td>
<td>816</td>
</tr>
<tr>
<td>% unbound drug at pH 7.4</td>
<td>70</td>
<td>16</td>
</tr>
<tr>
<td>Relative CNS penetrability†</td>
<td>1</td>
<td>133</td>
</tr>
</tbody>
</table>

* Calculated from blood level measured in plasma.
† Apparent octanol: H$_2$O partition coefficient at pH 7.4 multiplied by the free fraction of drug in plasma and divided by the relative potential of the drug.

**Anesthesiology**
1999; 90:576–99

A Review of the Use of Fentanyl Analgesia in the Management of Acute Pain in Adults

there is a half-life for equilibration ($t_{1/2} k_{eo}$) resulting in a time lag before concentration changes in plasma are reflected in the effect compartment.

<table>
<thead>
<tr>
<th>Drug</th>
<th>Equilibration half life $t_{1/2} k_{eo}$</th>
<th>Elimination $t_{1/2}$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Morphine</td>
<td>2-4 hours</td>
<td>2-3 hrs</td>
</tr>
<tr>
<td>Fentanyl</td>
<td>5 mins</td>
<td>8-10 hrs</td>
</tr>
<tr>
<td>Methadone</td>
<td>8 mins</td>
<td>24-36 hrs</td>
</tr>
<tr>
<td>Alfentanil</td>
<td>1 min</td>
<td>1 hour</td>
</tr>
<tr>
<td>Remifentanil</td>
<td>1 min</td>
<td>0.5 hours</td>
</tr>
</tbody>
</table>
Plasma Concentration vs. Effect Site Onset (meiosis)

animal model


Plasma Concentration vs. Effect Site Onset (meiosis)

Plasma Concentration vs. Effect Site Onset (meiosis)


In Summary

• Evidence is low quality
• Femoral nerve block
• Non-opioids + opioids
  – Fentanyl is an alternative to morphine
  – Age appropriate dosing
  – What did they have in the ambulance?

• Consider the route
• Consider co-morbidities
• Attention to careful prescribing
Take Home Message

PAIN MANAGEMENT requires FREQUENT ASSESSMENT, INTERVENTION, REVIEW and DOCUMENTATION

ASSESSMENT

- Pain score + FAS (Functional Activity Score) + sedation score + HR + RR + BP + SaO2
- Source of pain (consider sources of pain other than fracture, such as pressure areas, bladder, bowels, chronic pain…)

INTERVENTION

- Consider cause(s) of pain and intervene appropriately (may need variety of interventions - analgesia, positioning, pressure care)
- Analgesia = Fascia Iliaca Block + Paracetamol + Opioid NB: Oral analgesics allowed (with small amount of water) while fasting
- Manage side effects

REVIEW

- Efficacy of intervention
- Observations following opioids
- Side effects of interventions (may include nausea, vomiting, constipation, sedation, confusion…)

DOCUMENTATION

- Document results of all assessments, interventions & reviews

Contact Specialised Aged Care (SAC) team or Acute Pain Management Service (APMS) for advice on pain management
OPIOIDS

• Single route & oral route is preferred

ORAL

• OXYCODONE 10mg ≈ 2-3x panadeine forte (codeine ineffective in 10%+ population)
• OXYNORM (short acting) q3h/6h/PRN
• OXYCONTIN (long acting) 6h/BD strict

SUBCUTANEOUS

• Morphine is sc/q2h PRN

<table>
<thead>
<tr>
<th>AGE</th>
<th>SC MORPHINE (mg)</th>
<th>OXYNORM (mg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>20 – 39</td>
<td>7.5 – 12.5</td>
<td>10 – 20</td>
</tr>
<tr>
<td>40 – 59</td>
<td>5.0 – 10.0</td>
<td>5 – 15</td>
</tr>
<tr>
<td>60 – 69</td>
<td>2.5 – 7.5</td>
<td>5 – 10</td>
</tr>
<tr>
<td>70 – 85</td>
<td>2.5 – 5.0</td>
<td>5 – 10</td>
</tr>
<tr>
<td>&gt; 85</td>
<td>2.0 – 3.0</td>
<td>2 – 5 liquid</td>
</tr>
</tbody>
</table>

• ↓ dosing: renal impairment, sedated, respiratory depression, small size & opioid sensitive
• ↑ dosing: if on long term opioids, heroin/methadone users
• Always co-prescribe:
  2 x anti-emetics &
  2 x laxatives PRN (not bowel surgery)

PAGE APMS #687 OR #848 FOR ADVICE

NOTE: These are GUIDELINES ONLY. Prescription and dosing must be individualised to each patient. If in doubt, ask APMS
# Prescribing Analgesics

## MILD PAIN [2-3/10]
- Paracetamol

## MODERATE PAIN [4-6/10]
- Add NSAID and/or tramadol or opioid

## SEVERE PAIN [7-10/10]
- Add opioid

### Paracetamol
- 1g/6/QID (IV if 6 contraindicated)
- ↓ dosing: cachexia, low weight, prolonged fasting, liver impairment

### Tramadol
- 50-100mg/6/IV/Q4H PRN (max 600mg/day)
- Precautions: SSRI/SNRI/TCA/MAOI/epilepsy
- ↓ dosing: elderly, severe renal/liver impairment

### NSAID
- Limit duration of NSAID where possible
- Ibuprofen: 5-10mg per kg/6/TDS (max 800mg/dose or 2.4g/day)
- Precautions:
  - peptic ulcer, renal impairment, hypovolaemia, CCF, coagulopathy, NSAID sensitive asthma, ACEI/IIIan tag + diuretic + elderly, others
- ↓ dosing: elderly

---

**NOTE:** These are GUIDELINES ONLY. Prescription and dosing must be individualised to each patient. If in doubt, ask APMS.
Any questions?
PAIN MANAGEMENT requires FREQUENT ASSESSMENT, INTERVENTION, REVIEW and DOCUMENTATION

ASSESSMENT
- Assess pain severity using a Pain Scale
  - Choice of pain scale depends on patient’s age, language, comprehension & cognitive state
  - Consider using family member or interpreter
  - Use pain scale consistently (leave a copy at bedside)
- Assess Sedation Score (SS) and Functional Activity Score (FAS) (Box 1)
- Assess source of pain (consider possible sources of pain including fracture, pressure areas, bladder, bowel, chronic pain)
- Assess current analgesia use – consider:
  - Previous analgesia (opioid naïve or tolerant / current NSAID use / recent Paracetamol use)
  - Total opioid dose and effects/side-effects in past 12-24 hours
  - Renal and hepatic impairment
- Drug, dose, route, effect
- Assess for side effects from prior interventions (may include nausea, vomiting, constipation, sedation, confusion, ...)

SEDATION SCORE (SS) & FUNCTIONAL ACTIVITY SCORE (FAS)

Box 1

<table>
<thead>
<tr>
<th>Sedation Score (SS)</th>
<th>Functional Activity Score (FAS)</th>
</tr>
</thead>
<tbody>
<tr>
<td>5: Asleep, stir to touch</td>
<td>A: Activity is unrestricted by pain (e.g., movement, moving in bed)</td>
</tr>
<tr>
<td>4: Alert</td>
<td>B: Activity is moderately limited by pain</td>
</tr>
<tr>
<td>3: Constantly drowsy, easy to rouse, can stay awake once woken</td>
<td>C: Activity is severely limited by pain</td>
</tr>
<tr>
<td>2: Somnolent, difficult to rouse, difficult to stay awake</td>
<td></td>
</tr>
<tr>
<td>1: Somnolent, drowsy, rouse easily, can stay awake once woken</td>
<td></td>
</tr>
<tr>
<td>0: Awake</td>
<td></td>
</tr>
</tbody>
</table>

INTERVENTION
- Consider source(s) of pain
- Multimodal analgesia to be considered for ALL patients = Fascia Iliaca Block + Paracetamol + Opioids (Box 2)
- Manage side effects

MULTIMODAL ANALGESIA

1. Fascia Iliaca Block
- As soon as possible by ED or Anaesthetic doctor
- NB: Volume and dose are critical
- Suggest: Rocuronium 3mg/kg diluted to 40 ml in NS/Intral
- Observations as per Box 5

2. Paracetamol
- PR Paracetamol not recommended
- Continue even while fasting
- Consider Fentanyl if: (i) T1 allergy to Morphone, or (ii) eGFR < 30ml/min

3. Opioid
- 1g oral STRICTLY TDS or QID (TDS = 0700, 1400, 2200) (QID = 0700, 1200, 1900, 2200)
- Box 3 for age appropriate dose ranges
- Box 4 for titration of dose
- Oral preferable to parenteral once initial severe pain is controlled
- Oral route NOT contraindicated if fasting
- Consider Fentanyl if:
- FAS = 2
- FAS = 2

Box 3 SUGGESTED dose range for intermittent oral and subcutaneous opioids (dose interval = 2/4 PRN)

<table>
<thead>
<tr>
<th>AGE (years)</th>
<th>S/C MORPHINE</th>
<th>S/C FENTANYL</th>
<th>OXYNORM (capsule or liquid)</th>
<th>MORPHINE (liquid)</th>
</tr>
</thead>
<tbody>
<tr>
<td>20-39</td>
<td>1.5 – 12.5</td>
<td>110 – 190</td>
<td>10-20</td>
<td>15 – 30</td>
</tr>
<tr>
<td>40-69</td>
<td>5.9 – 10.0</td>
<td>80 – 160</td>
<td>5-10</td>
<td>7-15</td>
</tr>
<tr>
<td>60-89</td>
<td>2.5 – 7.5</td>
<td>40 – 80</td>
<td>5-10</td>
<td>7-15</td>
</tr>
<tr>
<td>70-85</td>
<td>2.5 – 6.0</td>
<td>40 – 80</td>
<td>5-10</td>
<td>7-15</td>
</tr>
<tr>
<td>&gt;85</td>
<td>2.0 – 3.0</td>
<td>25 – 50</td>
<td>2.5 (liquid)</td>
<td>3-7</td>
</tr>
</tbody>
</table>

REVIEW
- Review response to interventions and for side effects and adjust management accordingly
- NB: opioid analgesia requires specific observations & documentation before dose & 1 hour post dose

DOUBLET
- Document every assessment, intervention and review

RESOURCES
- Intermittent Opioid Analgesia and Observations for Acute Pain Management
- Regional Analgesia
- Postoperative Acute Pain Assessment
- Opioid Analgesia
- Nursing Care of the Patient with a Lower Limb Regional Nerve Innervation

Contact the Acute Pain Management Service (APMS) for advice on management of any patient