Pain Management in Hospital Medicine

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Disclosures

I have nothing to disclose
Assessment of Pain

Scale (0-10)
Various non-verbal pain scales (grimacing, tearing, etc.)
Arousability (RASS in the ICU)
Splinting of the incision
Pupil size
Response to a trial of therapy
"If you give fentanyl, and the blood pressure drops, then you haven’t given enough fentanyl!"

Opioid Side Effects Are A Spectrum

By varying the opioid dose you can move between:
Screaming in pain
Awake and comfortable
Nauseous, itching, somnolent
Dead (from respiratory depression)
You can move up and down the spectrum by:
Changing the opioid dose
Giving a reversal agent
Changing the pain intensity
Match opioid fluctuation to pain fluctuation
**Opioid Reversal: Naloxone**

If the patient has stable vital signs, titrate low doses of naloxone to reverse somnolence or respiratory depression

40 - 80 mcg IV q1-5 min.

_Naloxone doesn't cause pain, a naloxone overdose does_

Useful as a trial of therapy for altered mental status

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**Opioid Toxicity: Respiratory Depression**

Oxygen absorption:
- pulse oximetry

Carbon dioxide excretion:
- No good non-invasive test
- ABG (must be drawn from an arterial line)
- RR has a poor correlation with acidosis
- Arousability (the “sedation scale”) is the best way to detect acidosis
Post-op Patients Requiring Naloxone
Gordon DB et al. Pain Manag Nursing 2005

All adult inpatient post-op patients at one academic center for one year
56 out of 10,511 (0.53%) needed naloxone
  63% had RR > 12
  48% had no sedation scores recorded
65% of episodes occurred within 24 hours after surgery
Patients were older and received more concomitant sedatives than matched controls
No significant difference in opioid quantity or route

Pulse Oximetry Can (sort of) Monitor Both Oxygenation and Ventilation

A normal oxygen saturation on room air rules out severe hypoxia AND hypercarbia.
**PaCO2 > 80 Causes Hypoxia**

Alveolar Gas Equation:
\[
\text{PaO2} = \text{FiO2}(713) - \text{PaCO2}(1.2)
\]

As your PaCO2 exceeds 80, you become hypoxic unless you are on supplemental oxygen.

<table>
<thead>
<tr>
<th></th>
<th>FiO2</th>
<th>PaCO2</th>
<th>PaO2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal</td>
<td>0.21</td>
<td>40</td>
<td>102</td>
</tr>
<tr>
<td>Opioid Respiratory Depression on Room Air</td>
<td>0.21</td>
<td>80</td>
<td>54</td>
</tr>
<tr>
<td>Opioid Respiratory Depression on Supplemental Oxygen</td>
<td>0.30</td>
<td>80</td>
<td>118</td>
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</tbody>
</table>

**PaCO2 > 80 Also Means Acidosis**

The Henderson-Hasselbach Equation
\[
\text{pH} = \frac{\text{pCO2} + \text{pH} \cdot 10^{10/2}}{\text{pCO2} + \text{pH} \cdot 10^{10/2}}
\]

If the HCO3 remains normal, as the PaCO2 rises above 80 mmHg, the pH will fall below 7.1.

PaCO2 of 80 mmHg is the "red line”

Acidosis can affect cardiovascular function.

Hypercarbia causes somnolence and thus spirals into more hypercarbia.
Opioid Toxicity: Prophylactic Oxygen

Hypoxia rapidly causes permanent injury
Acidosis in the absence of hypoxia is relatively well tolerated
Oxygen may “buy you time” to detect and treat the problem before permanent injury occurs.

Opioid Respiratory Monitoring

If you can provide highly reliable continuous pulse oximetry (with rapid response to ALL alarms by trained personnel):
    Avoid prophylactic oxygen and use oxygenation as a surrogate for ventilation
If you are not willing to bet your patient’s life on continuous pulse oximetry:
    Consider prophylactic supplemental oxygen to minimize and delay hypoxia
    Regularly assess arousability and respiratory rate as surrogates for ventilation
**Constipation**

Opioid induced constipation is iatrogenic
Give laxatives BEFORE the problem happens

**Opioid Antagonists for Opioid Bowel Dysfunction**

Peripherally acting mu-opioid antagonists
  - Alvimopan (Entereg) PO
  - Methylnaltrexone (Relistor) SC

Centrally and peripherally acting mu-opioid antagonist
  - Naloxone PO
**Methylnaltrexone**

FDA approved only for opioid induced constipation in palliative care
Trials in post-operative ileus have not consistently shown a benefit
8-12 mg SC QOD, use beyond 4 months not well studied
Roughly 40-50% of patients in palliative care do not respond
Possible increased risk of GI perforation: Health Canada Issues Notice August 2010
Advanced illness and conditions associated with impaired structural integrity of the GI wall (eg, cancer, GI malignancy, GI ulcer, Ogilvie's syndrome, concomitant use of certain medications including bevacizumab NSAIDs and steroids) may be at greater risk of perforation

**Oral Naloxone for Ileus**

Extensive elimination by hepatic first pass metabolism, resulting in negligible (<2%) systemic bioavailability
Immediate release oral version difficult to titrate to opioid consumption
Prolonged release version in development might work better
Slow release theorized to avoid saturation hepatic enzymes used for first pass metabolism
**Oral Naloxone for Ileus**

Liu M Wittbrodt Eur J Pain Symptom Manage 2002
- 9 chronic opioid patients with constipation randomized to 0-2-4 mg PO TID
- All patients on active therapy had improvement in bowel function
- 3 patients had increased pain

Meissner W et al. Pain 2000
- 22 chronic pain patients with constipation placed on a dose escalation 3 mg po tid then 6 mg then 9 mg then 12 mg
- Mean naloxone dose 17.5 mg/d
- Mean number of days with laxation increased from 2.1 to 3.5 (p < 0.01) in the 6 day study period
- No difference in pain scores

**Opioid Induced Constipation: Neostigmine**

Acetylcholinesterase Inhibitor
- Typically used with glycopyrrolate for neuromuscular blockade reversal in the OR
- Up to 2 mg IV
- Can cause significant bradycardia and bronchoconstriction
  - Cardiac Monitoring
  - Glycopyrrolate at the bedside
Opioid Choice

Codeine

Some patient metabolize to inactive agents so unpredictable
Just a morphine pro-drug
Morphine

Histamine release
Active metabolites that accumulate in renal failure

Dilaudid (hydromorphone)

Unfamiliarity = won't give morphine 10 mg but will give dilaudid 2 mg
Also may accumulate in renal failure
**Fentanyl**

- May not have metabolites that accumulate in renal failure
- Not a faster offset after prolonged use
- May have better side effect profile (bigger sweat spot)
- No oral form
  - Lollipop / lozenge may be associated with tolerance
  - PCA fentanyl patch

**Methadone**

- Dose change takes several days to take effect
- PO to IV conversion -> cut in half
- Divide up TID for pain
- Comes as a liquid
  - MS Contin in the intubated ICU patient
- QT interval
Demerol = not for pain

Interact with MAO-I inhibitors
   And possibly SSRI
Normeperidine causes seizures

Tramadol

Weak opioid agonist
Became DEA Schedule IV in August 2014
   ? Some antidepressant effect
May not add much coadministered with conventional opioids
Opioid conversion

Table must have dose intervals
Cross tolerance imperfect
  Reduce answer by 50%
  Don't use a conversion table

Opioid titration
(PCA as example)

Hit rate a marker of strength
  1/hr is strong, 3/hr is weak
Can't sustain more than 3 demand injections/hr
Demand dose must be big enough to work, or they won't hit it
Basal rates are not for pain
  Basal rates bad (mortality)
Ignore opioid dose need to "break" the crisis
**Opioid prescription style**

- One short acting agent, always PRN
- One long acting agent, always ATC
- Use the same drug for short and long if possible (insurance making this hard)
- Dose range orders, not numeric based pain scales
- Divide up the doses in small frequent doses
- Non-opioid adjuncts ATC
  - Split opioid out from tylenol
    - Pure hydromorphone usually not available

**Oral opioid are superior in (almost) EVERY way**

- Cheap
- Not dependent on IV access
- No conversion needed for hospital discharge
- Guaranteed to get an arousability assessment before each dose
- No (real world) difference in speed of onset
  - IV prn for procedures
- EXCEPT can't store at the bedside for oral PCA
Getting off IV / PCA

Don't need permission
Don't get a hamburger and a PCA
Don't hit your button unless you've taken your pill
  Make pill prn frequent (so they can stack)
  Take button away if they aren't taking their pill

The drug seeking patient

Another advantage or oral opioids: can't get Rush Limbaugh'ed
  If they stay, they may actually need to stay
**Inpatient pain "contracts"**

You get "x" when you come to the hospital
You agree to go back to orals at "y" rate
Otherwise it is not a contract, it is just a recipe
Ok to delay conversion if they can't take PO's yet

**Outpatient pain "contracts"**

Only get meds from me
Call me immediately if you get run over by a bus
Agree to random drug tests
Looking for other drugs
Looking for the drugs they are SUPPOSED to be taking
If you are non-compliant you will be fired from my clinic
"It isn't safe to prescribe these medications if you don't cooperate with the safety measures"
**Pill count**

What "extra" do they have on hospital discharge because they weren't using it at home? Book quick outpatient visit so you don't have to prescribe much.

**Stick to their outpatient meds while an inpatient**

"Leftovers" at home  
Primary care doc familiar with the drug and it's titration  
Local pharmacy stocks it  
Insurance covers it
Non-Opioid Adjuncts

Tylenol

4 mg too much
IV available
$35 per vial
**NSAIDS**

- Renal
- Bone
- GI bleed
- MI / CVA
  - Naprosyn better
- SAIDS

**Other non-opioid adjuncts**

- Gabapentin / pregabalin
  - Don’t have to load pregabalin as much
  - Gabapentin can start at 300 - 600 mg po TID as an inpatient
- Tricyclic's
  - Sleep
- Ketamine
- Local Anesthetics
Non-pharmacologic adjuncts

Exercise / PT
Improve sleep
The gold standard: cure the underlying disease
Remove the painful stimulus
  Trach the intubated ICU patient
  Remove foley, NG tube, etc.

Danger of a Pain Service

Separates the symptom management from the disease treatment
  Serve as a consult service: do not write orders if possible
Multi-disciplinary pain clinic

Interventional therapy
Exotic non-opioid adjuncts
Physical therapy
Psych
Support / Advice

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