Improving Pain Management in Acutely Injured Patients

Richard Kutz MD, Freeman Suber MD, Paul Kispert MD, Kevin Curtis MD, Gil Fanciullo MD, Horace Henriques MD

Dartmouth-Hitchcock Medical Center
Lebanon, NH
Why Pain Control?

• Evidence shows pain control allows:
  ▪ Earlier patient mobilization
  ▪ ↓ Neuroendocrine side effects of injury
    • Slightly lower cardiac complications
  ▪ ↓ Incidence DVT / PE
  ▪ ↓ Pulmonary complications
  ▪ ↓ Vascular graft occlusion

• Poor pain control associated with:
  ▪ Increased incidence of chronic pain syndromes
  ▪ Post-Traumatic Stress Disorder
  ▪ Increased morbidity and mortality
“Opiophobia”

- Pain medication is frequently withheld by providers from acutely injured patients:
  - Fear of masking injuries (neurologic)
  - Fear of hemodynamic side-effects
  - Fear of respiratory compromise
  - “Culture of uncertainty” surrounding use of opioids
Pain a Priority for JCAHO in 2000

- Recognized poor provider and patient education regarding pain management leading to inadequate care

- Designed measures to overcome barriers within hospitals to facilitate appropriate pain management strategies:

  - Assessment
  - Education
  - Pain Management
  - Pain as the “5th Vital Sign”
  - Patients
  - Providers
How well do we treat pain after trauma?

• Literature Review
  ▪ No studies examining acute pain management in trauma patients
  ▪ Need to extrapolate from similar population of patients

• There is ample literature demonstrating poor pain management in:
  ▪ ER patients with acute injuries
  ▪ Post-op patients
How well do we treat pain after trauma?

- Pilot study performed in 2002

- Reviewed charts of consecutive trauma patients for a 1 month period meeting these criteria:
  - Age ≥ 16 years
  - Blood pressure ≥ 90 mmHg
  - GCS 14-15 upon arrival
  - Associated rib, spine, extremity, or pelvic fractures

- 47 patients identified
How well do we treat pain after trauma?

• Of the 47 Patients:
  - 15% received *no* pain medication in trauma bay
    • These are patients with fractures!
  - For those who received pain medication:
    • Mean time to administration after arrival was 72 minutes (range 7 - 219 mins)
    • 80% received second dose of medication (30)
    • *None* received third dose of medication
How well do we treat pain after trauma?

• Conclusion
  ▪ We can clearly manage pain better!

• Aim
  1. Increase the percentage of patients receiving pain medication during their acute workup
  2. Decrease the time from arrival to first dose of analgesia
Development of Pain Management Protocol

- Protocol developed by a multidisciplinary team:
  - Trauma service
  - Emergency department
  - Pain Management service

- Fentanyl based analgesia protocol
Study Design

- Before and after cohort design
- Enrolled patients into protocol from 9/15/2003 through 1/31/2004
- Compared to time period matched retrospective cohort from 9/15/2002 through 1/31/2003
  - Time period prior to protocol design
  - Avoided “Hawthorne Effect”
Inclusion and Exclusion Criteria

• Inclusion Criteria
  ▪ Age > 14 years
  ▪ Meet criteria for Trauma team activation

• Exclusion Criteria
  ▪ Allergy to Fentanyl
  ▪ Acute change in mental status complicating trauma assessment
  ▪ GCS of 15 with patient refusal of analgesia
  ▪ GCS of 15 with verbal pain scale rating of ≤ 4
Data Recorded for Included Patients

1. Time of arrival
2. Heart Rate and Blood Pressure
3. Glasgow Coma Scale
4. Time of each dose of analgesia
5. Dosage of each administration of analgesia
6. Time and results of pain assessments
   - Verbal 1-10 scale
7. Estimated weight
8. Adverse events within 30 minutes of analgesia administration
   - Allergy
   - Need for intubation
   - Change in group (C → B or B → A)
Protocol

• Patients assigned to groups based on physiology:

  Group A – *Unstable physiology*

  Group B – *Stable Physiology*

  Group C – *Normal Physiology*
Protocol

• **Group A – Unstable Physiology**
  - Patient has one or more of the following:
    - Glasgow Coma Scale ≤ 8 (indication for intubation)
    - Heart Rate < 60 or > 120 without chronic explanation
    - Systolic BP < 90 mmHg without chronic explanation
    - Acute mental status changes - psychosis, intoxication, head injury, or metabolic changes complicating trauma evaluation
  
  • **Intervention:**
    - Analgesia NOT recommended
    - Reevaluate every 15 minutes
Protocol

• **Group B – Stable Physiology**
  - Patient does not meet Group A criteria and has:
    - Glasgow Coma Scale: 9 – 12
    - Heart Rate: 60 – 120
    - Systolic BP: 90 – 120 mmHg
    - MS changes not complicating surgical or trauma assessment
  
  - **Intervention:**
    - Analgesia administered in individual doses with continuous reassessment of physiologic status
    - **Weight < 40 Kg:** Fentanyl 10-15 mcg IVP every 15 mins PRN
    - **Weight ≥ 40 Kg:** Fentanyl 25-50 mcg IVP every 15 mins PRN
Protocol

- **Group C – Normal Physiology**
  - Patient does not meet Group A or B criteria, and has:
    - Glasgow Coma Scale: > 13
    - Heart Rate: 60 – 120
    - Systolic BP: > 120 mmHg
      - or < 120 if documented normal for patient
    - Mechanism of injury normally treated with opioids
  
- **Intervention:**
  - Analgesia administered in individual doses with continuous reassessment of physiologic status
  - **Weight < 40 Kg:** Fentanyl 10-15 mcg IVP every 15 mins PRN
  - **Weight ≥ 40 Kg:** Fentanyl 25-50 mcg IVP every 15 mins PRN
Traditional Ordering of Pain Medications

Variable pain management

Patient Arrives

10 mins

Primary Survey
Post-Protocol Pain Medication Administration

Patient Arrives

Primary Survey

10 mins
Results – Study Groups

• Pre-Protocol Period (9/15/02 – 1/31/03)
  ▪ 102 patients met inclusion criteria
  ▪ 48 patients excluded
  ▪ 54 patients analyzed

• Post-Protocol Period (9/15/03 – 1/31/04)
  ▪ 142 patients met inclusion criteria
  ▪ 75 patients excluded
  ▪ 67 patients analyzed
Results – Time to First Dose of Analgesia

**Pre-Protocol**

Mean: 53.6 mins (± 13.5 min)

**Post-Protocol**

Mean: 27.9 mins (± 6.5 min)  \( p < 0.001 \)
Average Time to First Dose of Analgesia (minutes)

<table>
<thead>
<tr>
<th></th>
<th>All Patients</th>
<th>Group A</th>
<th>Group B</th>
<th>Group C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-Protocol</td>
<td>53.6</td>
<td>57.6</td>
<td>62.7</td>
<td>44.4</td>
</tr>
<tr>
<td>Post-Protocol</td>
<td>27.9</td>
<td>43.6</td>
<td>19.3</td>
<td>23.6</td>
</tr>
<tr>
<td><strong>p</strong></td>
<td><strong>&lt; 0.001</strong></td>
<td><strong>0.289</strong></td>
<td><strong>0.019</strong></td>
<td><strong>0.018</strong></td>
</tr>
</tbody>
</table>

* indicates statistical significance.
Number of Pain Assessments per Patient

![Bar chart showing the average number of pain assessments per patient before and after the protocol. Pre-Protocol has an average of 1.03 assessments with n = 56, while Post-Protocol has an average of 2.13 assessments with n = 143. The p-value is less than 0.001.]

* Number of assessments significantly increased in all 3 study groups.
Number of Doses of Analgesia Given per Patient

Total Doses of analgesia given while in trauma bay
## Number of Analgesic Doses Ordered

<table>
<thead>
<tr>
<th>Analgesic</th>
<th>Pre-Protocol</th>
<th>Post-Protocol</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Fentanyl</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0-25 mcg</td>
<td>4</td>
<td>53</td>
</tr>
<tr>
<td>50-75 mcg</td>
<td>15</td>
<td>104</td>
</tr>
<tr>
<td>100 mcg</td>
<td>11</td>
<td>5</td>
</tr>
<tr>
<td><strong>Morphine</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1-2 mg</td>
<td>54</td>
<td></td>
</tr>
<tr>
<td>3-4 mg</td>
<td>20</td>
<td></td>
</tr>
<tr>
<td>&gt; 4 mg</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td><strong>Toradol</strong></td>
<td>3</td>
<td></td>
</tr>
</tbody>
</table>
Post-Protocol Improvement in Pain Score

Group B and C patients having at least 2 pain assessments recorded

<table>
<thead>
<tr>
<th>Improvement in Pain Score</th>
<th>Count</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 - 2 points</td>
<td>11</td>
<td>31%</td>
</tr>
<tr>
<td>3 - 4 points</td>
<td>8</td>
<td>22%</td>
</tr>
<tr>
<td>&gt; 4 points</td>
<td>5</td>
<td>14%</td>
</tr>
<tr>
<td>No Δ</td>
<td>9</td>
<td>25%</td>
</tr>
<tr>
<td>Worse</td>
<td>3</td>
<td>8%</td>
</tr>
</tbody>
</table>

64% of patients had little improvement, no change, or worsening of their pain rating.
Adverse Events

- Defined as:
  - Need for intubation
  - Allergic symptoms
    - Hives, angioedema, bronchospasm
  - Upgrading of group between assessments
    - i.e. from Group C to B or Group B to A

- Pre Protocol
  - 2 Patients intubated prior to any analgesia

- Post Protocol
  - 3 events
    - 2 Intubated prior to any analgesia
    - 1 Patient rapidly dropped SBP before any analgesia
Conclusions

• Implementation of the pain protocol significantly:
  - Increased the number of patients receiving analgesia
  - Reduced the time to first dose of analgesia
  - Increased the number of recorded pain assessments by providers

• More patients received multiple doses of analgesia

• No difference in observed adverse events between the groups
Conclusions – Is it effective?

- 64% of patients with 2 recorded pain assessments had little improvement, no change, or worsening of their verbal pain scale following doses of fentanyl
  - Study did not specifically address this issue
  - Not enough data to compare to pre-protocol period
  - Perhaps dosing is inadequate
    - Few adverse events noted
  - 1-10 verbal pain scale may be too subjective
    - **Gold Standard:** Are you comfortable? (Yes / no)
Future Directions

• Examine dose response more closely
  ▪ Need to increase dosing of fentanyl

• Implement protocol for pediatric patients

• Compare protocol to Fentanyl PCA for selected patients

• Improve pain management from 90 minutes after admission
  ▪ PCA immediately following initial evaluation
Thank You!

- “You may feel some pressure”
- “Little bee sting” (placing 14 gauge IV)
- “We need to manipulate this fracture site. It will only take a second.”
- “They’re paralyzed. We don’t need local for the DPL.”
- “We’ll just put the cast on now, no time to wait for morphine.”
- “We won’t be able to accurately follow their neuro exam after morphine.”
- “They have been in the ED for 4 hours without pain medication, what difference will another hour make?”