Acute Pain – a 10 year audit

Colm Lanigan and
The Acute Pain Team
University Hospital Lewisham
Acknowledgements

- Nikki Luffingham
- Dee Condon
- Tamzin Bunton
- Consultant colleagues
  - Silvia Leonardi
- Surgical colleagues
- Trainees
- Nurses, Physiotherapists, Pharmacists, secretaries
- managers
Objectives

• Review data collected over a decade by one Acute Pain Team
• Review factors affecting outcomes seen
• Compare with published data
• Conclusions
• Future concerns
University Hospital Lewisham

- A* DGH in SE London
- Serves about 300,000
- Surgical wards: 11 → 6
- 10 theatres, ~14K ops pa
- Busy Emergency Department
- Gynae, Gen Sx, Ortho + Trauma, Vasc, Paed, ENT

- 22 consultant anaesthetists, 2 Chronic Pain consultants
- 3 CNS, 1 HCA, 1 Con PA pw
- 5 day acute pain ward rounds per wk
- After hours anaesthetic support
Lewisham population

- 3% ↑ 2001 to 2008, but forecast ↑ by 25% between 2006 & 2013
- Average age 34.7 years
  - 25% 0-19 yrs old
  - 5% over 75 years old
- BME has risen from 39% to 49.4% in 2007
- 39th of 400 most deprived local authority area in England
26% of 11,905 cases were listed as emergency (red)
## Hospital statistics 2010

<table>
<thead>
<tr>
<th></th>
<th>UHL</th>
<th>DVH</th>
<th>SLH</th>
<th>KCH</th>
<th>GSTT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Doctors per 100 beds</td>
<td>82</td>
<td>61</td>
<td>74</td>
<td>174</td>
<td>129</td>
</tr>
<tr>
<td>Nurses per 100 beds</td>
<td>208</td>
<td>167</td>
<td>174</td>
<td>319</td>
<td>311</td>
</tr>
<tr>
<td>3 yr mortality*</td>
<td>99</td>
<td>108</td>
<td>106</td>
<td>97</td>
<td>86</td>
</tr>
<tr>
<td>1 yr mortality*</td>
<td>97</td>
<td>106</td>
<td>107</td>
<td>96</td>
<td>91</td>
</tr>
<tr>
<td>Deaths after surgery</td>
<td>78</td>
<td>154</td>
<td>102</td>
<td>97</td>
<td>102</td>
</tr>
</tbody>
</table>

Hospital Standardised Mortality Ratio  (National = 100)

http://www.drfosterhealth.co.uk/qualityreports/trust
Methods

• APS started 1996 with Nikki Luffingham & me
• PCA, Epi, PCEA patients only seen daily by CNS
• Data entry by CNS & HCA
• Database since 1998 (Dr Maher Michel, BSUH)
• Data analysis by CL
• Yearly from 1/8/2001
Methods

• APS started 1996 with Nikki Luffingham & me
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• Yearly from 1/8/2001

• Pain Score on movement
  0=none
  1=mild
  2=moderate
  3=severe

• Severe PONV
• Severe Itching
• RR<=8
• complications

~ 20-25% of inpatients get Epidurals / PCA
What standard to use? (patients reports %)

Acute Pain Patients seen in 10 yrs

Data loss in 2003; PCEA introduced in 2004
Percentage usage by technique

- Epidural
- PCEA
- PCA
PCA: day 1 pain severity on movement (%)
Why are the results so bad?

- Patient?
- Surgeon and surgery?
- Anaesthetist & anaesthetic technique?
- Nursing?
- Other?
Patient Controlled Analgesia (PCA)

A-B = analgesic corridor; below A = pain; above B = side effects
ALFINE =
Alfentanil 1mg + Morphine 10 mgs in 10 mls

Titrate 0.5 - 2 ml iv q 4 mins and check response

**Side Effects**

- No pain
- Pain

**Graph**

- Alfentanil
- Morphine

**Time**
PCA

- Site of iv / sc
- Bolus dose: Stat vs 1 min
- Lockout period
- No 4 hour max
- No background infusion
- Other agents Rx

- 100-age (= mg/1\textsuperscript{st} day)
- “Press it every 5 mins”

- Paracetamol
- Antiemetics regular + rescue
Variation in PCA morphine usage for appendicetomy, n=60
Average PCA use for Joint surgery

- Hip: 128
- Knee: 155
- Shoulder: 19
- Elbow: 5
- Revision hip: 15
- Revision shoulder: 27
- Revision knee: 15

Morphine (mgs/day)
Average PCA use for soft tissue injury

<table>
<thead>
<tr>
<th>Procedure</th>
<th>Morphine (mgs/day)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Extensive repair of muscle (&gt;2cm e.g. rotator cuff)</td>
<td>25</td>
</tr>
<tr>
<td>Stabilisation of patella</td>
<td>30</td>
</tr>
<tr>
<td># ribs</td>
<td>40</td>
</tr>
<tr>
<td>Repair of knee ligaments</td>
<td>50</td>
</tr>
<tr>
<td>Fasciotomy of leg (ant/post compartment)</td>
<td>55</td>
</tr>
<tr>
<td>1st repair Achilles tendon</td>
<td>60</td>
</tr>
</tbody>
</table>
Average PCA use for #

- n = 104
- 1st ORIF
- 1st ORIF long bone
- 1st #NOF open fixation
- 2nd OR #long bone+intermed fixation
- 2nd OR intra-artic # of bone
- 2nd ORIF
- Ist OR of intra-artic # long bone

Morphine (mg/day)

- 1st ORIF: 30
- 1st ORIF long bone: 20
- 1st #NOF open fixation: 50
- 2nd OR #long bone+intermed fixation: 50
- 2nd OR intra-artic # of bone: 50
- 2nd ORIF: 60
- Ist OR of intra-artic # long bone: 50
Epidurals vs PCA: pain on movement day 1: (%)
Epidural analgesia – better than parenteral opioid administration regardless of

– analgesic agent used
– location of catheter
– type of surgery
– type of pain
– time of pain

1. Werawatganon & Charuluxanun, 2005 Level I
2. Wu et al, 2005 Level I
3. Guay, 2006 Level I
4. Nishimori et al, 2006 Level I
5. Marret et al, 2007 Level I
Epidural vs PCEA: day 1

**EIA**
- Pain $\geq 2$
- Pain $< 2$

**PCEA**
- Pain $\geq 2$
- Pain $< 2$
Summary of pain outcomes: EIA vs PCEA

<table>
<thead>
<tr>
<th></th>
<th>Day 1</th>
<th></th>
<th>Day 2</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>EIA</td>
<td>PCEA</td>
<td>EIA</td>
<td>PCEA</td>
</tr>
<tr>
<td>% Pain &gt;=2</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Average 2001-3*</td>
<td>13</td>
<td>21</td>
<td>9</td>
<td>11</td>
</tr>
<tr>
<td>Average 2008-10</td>
<td>19</td>
<td>32</td>
<td>13</td>
<td>19</td>
</tr>
</tbody>
</table>

All outcomes are worse now than before &
PCEA is worse than Epidural Infusion Analgesia

*PCEA 2005-7
EIA vs PCEA

EIA better than PCEA
- Analgesia

PCEA better than EIA:
- Nausea
- Vomiting
- Motor block

(Wu et al, 2005 Level I)

PCEA better than EIA
- Pain control
- Need for top-ups
- Need for systemic analgesia
- Patient satisfaction
  (Nightingale et al, 2007 Level II)
EIA+PCEA vs PCEA

Gastrectomy:
• better dynamic pain scores ↑ total doses
• ↑ pruritus
  (Komatsu et al, 1998 Level II)
• better sleep
  Komatsu et al, 2001 Level II

Lower abdominal surgery:
• ↔ pain scores
• ↑ total cumulative doses
• ↑ side effects
• PCEA ropivacaine & fentanyl
  (Wong et al, 2000 Level II)

Pelvic reconstruction:
• ↔ pain scores
• bupivacaine-fentanyl PCEA
  (Nolan et al, 1992 Level II)
Why is PCEA worse?

- Epidural failures?
- Wrong site?
- Wrong infusion rate?
- Wrong bolus dose?
- Neither adjusted?
- Wrong concentration?
- More side effects?
- Or something else?
Epidural numbers vs failure rate *

<table>
<thead>
<tr>
<th></th>
<th>Trainee</th>
<th></th>
<th>Consultant</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Epidural</td>
<td>52/367</td>
<td>14%</td>
<td>144/1178</td>
<td>12%</td>
</tr>
<tr>
<td>PCEA</td>
<td>40/314</td>
<td>13%</td>
<td>99/983</td>
<td>10%</td>
</tr>
</tbody>
</table>

*Need to convert to alternative analgesic technique

Excludes failure to insert epidural
Excludes those with < 6 epidurals
Epidural patients with moderate to severe pain by time of year

6 week periods analyzed over the 10 yrs by season linked to arrival of trainees

Dr Swinda Esprit, SpR
Technical causes of epidural failure:

53 catheter migration
44 catheter disconnection
21 leaking
14 not stated
5 occlusion

- Lockit device
- Loop it
- Stress loop
- Tape filter and catheter

“Epifix”
Wrong site?

Supra-umbilical incisions need thoracic epidurals!
Motor Block with lumbar or thoracic epidurals

\( n = 20, \) **Lumbar (yellow/blue), Thoracic (red/green),** left & right legs

1 = no block; 2 = flex knees, 3 = no flexion; 4 = no movement

Patients with thoracic epidurals had significantly less motor block using 0.1% bupivacaine / Fentanyl 2mcg/ml
Effect of Fentanyl concentration on Motor block (Bromage scale) with lumbar epidurals

<table>
<thead>
<tr>
<th>Grade</th>
<th>Criteria</th>
<th>Bupivacaine 0.1% + Fentanyl</th>
<th>Number</th>
<th>2 mcg/ml</th>
<th>4 mcg/ml</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>Unable to move legs or feet</td>
<td>2 mcg/ml</td>
<td>18</td>
<td>18</td>
<td>22</td>
</tr>
<tr>
<td>3</td>
<td>Unable to flex knees, but free movement of feet</td>
<td>4 mcg/ml</td>
<td>22</td>
<td>18</td>
<td>22</td>
</tr>
<tr>
<td>2</td>
<td>Just able to flex knees with free movement of feet</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Free movement of legs &amp; feet</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The chart shows the distribution of grades for different concentrations of Bupivacaine 0.1% + Fentanyl.
Wrong settings? PCEA pressure effects

If repeated boluses are needed, increase the infusion rate!
# Severe PONV

<table>
<thead>
<tr>
<th></th>
<th>EIA</th>
<th>PCEA</th>
<th>PCA</th>
</tr>
</thead>
<tbody>
<tr>
<td>N</td>
<td>1857</td>
<td>1610</td>
<td>7059</td>
</tr>
<tr>
<td>Day 1</td>
<td>7.6%</td>
<td>10%</td>
<td>12%</td>
</tr>
<tr>
<td>Day 2</td>
<td>3.5%</td>
<td>4.8%</td>
<td>4.2%</td>
</tr>
</tbody>
</table>

Little clinical difference between techniques
approx 10% on Day 1

Incidence halves by Day 2
PONV day 1: PCA (top) vs EIA+PCEA
Severe pruritus

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<td>N</td>
<td>1857</td>
<td>1610</td>
<td>7059</td>
</tr>
<tr>
<td>Day 1</td>
<td>9.4%</td>
<td>12%</td>
<td>10%</td>
</tr>
<tr>
<td>Day 2</td>
<td>3.7%</td>
<td>4.0%</td>
<td>2.5%</td>
</tr>
</tbody>
</table>

Little clinical difference between techniques approx 10% on Day 1

Incidence more than halves by Day 2
Severe sedation

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<th>PCEA</th>
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<tr>
<td>N</td>
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<td>1610</td>
<td>7059</td>
</tr>
<tr>
<td>Day 1</td>
<td>1.3%</td>
<td>0.5%</td>
<td>1.7%</td>
</tr>
<tr>
<td>Day 2</td>
<td>0.7%</td>
<td>0.5%</td>
<td>0.5%</td>
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Small differences between techniques approx 1.5% on Day 1

Incidence more than halves by Day 2
## RR < 8/min

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<td>7059</td>
</tr>
<tr>
<td>Day 1</td>
<td>0.2%</td>
<td>0.0%</td>
<td>0.2%</td>
</tr>
<tr>
<td>Day 2</td>
<td>0.1%</td>
<td>0.0%</td>
<td>0.0%</td>
</tr>
</tbody>
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Little clinical difference between techniques 
approx 0.2% on Day 1

Incidence more than halves by Day 2
# Complications of epidural analgesia

**Reported incidence (%)**

**Related to catheter insertion**
- Dural puncture: 0.32---1.23
- Neurological damage (transient): 0.016--0.56

**Related to catheter in situ**
- Epidural haematoma: 0.0004--0.03
- Epidural abscess: 0.01--0.05
- Catheter migration: 0.15--0.18

**Related to epidural drugs**
- Drug errors: Not known
- Respiratory depression: 0.13--0.4
- Hypotension: 3--30
- CNS toxicity: 0.01--0.12
- Motor block: 3

---

## Complications of epidural analgesia

### Reported incidence (%)

#### Related to catheter insertion

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<th>Incidence</th>
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<tbody>
<tr>
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<td>Not known</td>
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<tr>
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<td>0.13--0.4</td>
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<tr>
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</tr>
<tr>
<td>Motor block</td>
<td>3</td>
</tr>
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### NAP3

**Perioperative Epidural:**

- Overall harm: 1/5,800 – 1/12k
- Paraplegia or death: 1/16k – 1/98k

---

Wheatley RG, Schug SA, Watson D.


Epidural infection

0.015% to 0.05%
- Kindler et al, 1996 Level IV
- Rygnestad et al, 1997 Level IV
- Wang et al, 1999 Level IV

Long duration ↑ risk:
- X=11/7, none if < 2/7
- Immunocompromised
- Wang et al, 1999 Level IV

- 71% initial back pain
- 66% febrile
  - Reihsaus et al, 2000 Level IV
- 13% back pain, fever & neurological change
Recommend

- 6/8210 patients with epidural catheters over 16 years got abscesses
- 5/6 had fever & epidural site infection
- Conservative treatment (antibiotics only) may be effective if no neurological deficit

Cameron et al, 2007

Consider MRI if
- Fever + site infection

URGENT MRI if
- Fever + site infection
- PLUS one other sign (back pain / neuro deficit)
# Changes in 10 years

<table>
<thead>
<tr>
<th></th>
<th>2000</th>
<th>2011</th>
</tr>
</thead>
<tbody>
<tr>
<td>Consultants</td>
<td>17 (8 + 9)</td>
<td>24 (8 + 16)</td>
</tr>
<tr>
<td>Trainees</td>
<td>12</td>
<td>18</td>
</tr>
<tr>
<td>Nurses</td>
<td>1 solo</td>
<td>3 shared</td>
</tr>
<tr>
<td>PCA</td>
<td>1mg bolus</td>
<td>Often 1.5 mgs</td>
</tr>
<tr>
<td>Drugs</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fentanyl</td>
<td>none</td>
<td>occasional</td>
</tr>
<tr>
<td>Gabapentin</td>
<td>none</td>
<td>frequent</td>
</tr>
<tr>
<td>Ketamine</td>
<td>none</td>
<td>recently introduced</td>
</tr>
<tr>
<td>Ephedrine</td>
<td>none</td>
<td>30 mg po pre-mobilisation</td>
</tr>
<tr>
<td>Epidural regimes</td>
<td>7</td>
<td>3 (0.1%LB+F2/4; 0.125%B)</td>
</tr>
<tr>
<td>PCEA</td>
<td>none</td>
<td>79% of all epidurals</td>
</tr>
<tr>
<td>LA blocks</td>
<td>occasional</td>
<td>frequent, variable success</td>
</tr>
</tbody>
</table>
Future challenges

- Maximise analgesia
- Minimise harm
- Realistic expectations
- LA infusions / blocks
- Non-luer lock connectors
- Anticoagulants
- ERAS