How to Assess Pain in Newborn Babies?

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Aims of this presentation

- The history of infant pain assessment
- Current knowledge and knowledge gaps
- Implications for treatment of pain
- Implications for research on pain medicines
Measuring pain...  
...is ‘monkey business’

What’s a gorilla with toothache do...? She apes us and asks for help, of course.
Measuring pain in children

What we’ve learned?

- Just ask
- Children can do it
  - Developmentally appropriate tools
- Even infants can do it
  - Indirect measures
What do we know?

- In healthy and moderately ill infants brief acute pain can be accurately and reliably detected using:
  - Behaviour
  - Cardio-respiratory signs
  - Stress hormone levels
## Infant pain measures:

<table>
<thead>
<tr>
<th>Cardio-respiratory and Autonomic</th>
<th>Neuroendocrine</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heart Rate</td>
<td>Cortisol</td>
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<tr>
<td>Blood pressure</td>
<td>Catecholamines</td>
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<tr>
<td>Respiratory Rate</td>
<td>Beta-endorphin</td>
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<tr>
<td>$O_2$ saturation</td>
<td>Glucose</td>
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<tr>
<td>Palmar sweat</td>
<td>Insulin</td>
</tr>
<tr>
<td>Skin blood flow</td>
<td>Nitrogen balance</td>
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<tr>
<td>Heart rate variability</td>
<td></td>
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</table>

<table>
<thead>
<tr>
<th>Behavioural</th>
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<tbody>
<tr>
<td>Facial action</td>
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<tr>
<td>Body movement</td>
<td></td>
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<tr>
<td>Vocalisation</td>
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<tr>
<td>Sleep</td>
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<td>Feeding</td>
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</table>
Limitations of indirect pain measures

- Do not measure pain (nociception) *per se*
- Measure intensity of:
  - Pain-related distress
  - Pain reactivity
- Are influenced by contextual factors:
  - Previous pain
  - Level of arousal
Indirect pain measures can also detect...

- Response to treatment
  - Non-pharmacological
  - Pharmacological
### Response to non-pharmacological treatments

<table>
<thead>
<tr>
<th>Intervention</th>
<th>Mean PIPP</th>
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<tbody>
<tr>
<td>Control</td>
<td>9.81</td>
</tr>
<tr>
<td>Prone</td>
<td>10.28</td>
</tr>
<tr>
<td>Pacifier w/ water**</td>
<td>8.47</td>
</tr>
<tr>
<td>Pacifier w/ sucrose**</td>
<td>7.86</td>
</tr>
<tr>
<td>Pacifier w/ water</td>
<td>10.19</td>
</tr>
<tr>
<td>Sucrose alone**</td>
<td>9.77</td>
</tr>
<tr>
<td>Pacifier w/ sucrose**</td>
<td>8.16</td>
</tr>
</tbody>
</table>


Abdominal skin reflex

- ASR useful in mapping intensity and location of wound hypersensitivity
- ASR detected referred visceral pain
- ASR responsive to changes in analgesia

Andrews K, Fitzgerald M. *Pain* 2002; Andrews et al., *Pain* 2002
NEOPAIN Lancet 2004

Changes in heart rate

Changes in respiratory rate

Premature infant pain profile scores

Morphine infusion n=244/446
Placebo infusion n=201/444
Pain scores and postoperative morphine requirements

- **COMFORT score** (Bouwmeester 2003; 2001; van Dijk 2002)
  - Infants ≤ 7 days required less
  - Less epinephrine/norepinephrine response
  - No difference intermittent vs bolus

- **NIPS/VAS** (Simons 2003)
  - No difference between morphine and placebo groups
Procedural pain and stress during the early postoperative period

L. Franck, R. Howard, A. Aynsley-Green

- Pre and 3 min post-procedure (pain and stress)
- Pain scores, C-R, plasma cortisol, morphine levels
Procedural pain

Stressful procedures (n=12):
  - nappy care
  - re-positioning
  - mouth-care
  - endotracheal suction

Painful procedures (n=18):
  - chest drain removal
Mean change pre-post procedure

- **COMFORT**: Mean+SE Painful procedure
- **PIPP**: Mean+SE Painful procedure
- **CRIES**: Mean+SE Painful procedure
- **CHIPP**: Mean+SE Painful procedure
- **LF HRV**: Mean+SE Stressful procedure
- **HF HRV**: Mean+SE Stressful procedure
- **HR**: Mean+SE Painful procedure
- **mBP**: Mean+SE Painful procedure

* significance > 0.05
** significance > 0.01
Preliminary findings

- Pain scores and mBP discriminated between responses to painful and stressful procedures in critically ill infants following cardiac surgery
- Pain scores are highly correlated; C-R parameters are highly correlated
- Few associations found between pain scores and C-R parameters
- Post-CDR pain scores inversely correlated with pre-procedure analgesia
Assessment of Adverse Effects

- Poor data on prevalence and risk factors
- Rarely the primary outcome variable in research
- Poor quality measures
Implications for pain treatment

- Pain treatment decisions are subjective and not based on routine standardised assessment
- Evaluation of the effectiveness of pain treatment decisions does not routinely occur
- Inability to distinguish between effects of sedatives and analgesics
- Pain treatment is not evidence-based
Implications for research on pain medicines

- Endpoints of pain assessment remain undefined
- Sensitivity and specificity need to be improved
- Analgesic and sedative effects must be distinguished
- Measures of important side effects of analgesia must be developed
Conclusions 1

- Should we bother with pain assessment in babies?
- Yes—established validity of some tools for some situations
- Yes—importance for communication and audit
Conclusions 2

Which measures?
- Whichever one clinicians will use!! AND use to make decisions about treatment
- Careful use of sedatives alone
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