Immunisations under sedation at a tertiary paediatric hospital in Melbourne, Australia from 2012-2016

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NHMRC Research Fellow, Murdoch Children’s Research Institute
Outline

1. Background
   • Immunisation pain and anxiety
   • Pain management strategies in immunisation
   • Conscious sedation
   • Immunisation under sedation service at RCH Melbourne

2. Aim and Method

1. Results

1. Limitations

1. Conclusions

1. Acknowledgements
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Immunisation *pain and anxiety*

- Can be a source of distress for children and their families

- For some children, if this is not addressed, it can lead to long-term consequences such as *needle phobia*
  - severe and persistent anxiety and fear of needles

- Needle phobia often results in *immunisation (and health care) avoidance*
  - Individual: at risk of vaccine preventable diseases
  - Family: may risk financial penalty due to Australia’s “No Jab, No Pay” policy
  - Community: impact on the success of immunisation programs

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Optimal management of *needle phobic* patients

Maintains the comfort of the child during the 3 phases of the immunisation

**Before**
- Planning
- Preparation
- Pharmacological

**During**
- Physical
- Psychological

**After**
- Promoting recovery and resilience
Pain management strategies for immunisation

- **Planning:** Parent/child information - effective\(^1,2\)
- **Preparation:** Positioning in upright position, swaddling infants - effective\(^1,2\)

- **Pharmacological:** include
  - Oral sucrose - effective in infants
  - Vapocoolant sprays (ethyl chloride) - minimal effect only
  - Topical anaesthetic creams - effective (BUT usefulness limited by time to dermal anaesthesia)
    - Eutectic Mixture of Local Anesthetics (EMLA®) or amethocaine (AnGel®)

- **Physical:** Distraction techniques include:
  - Play/music therapy - mixed results\(^3\)
  - Technology devices - mixed results\(^4\)
  - Vibrational instruments - mixed results\(^5\)

- **Psychological:** Address the core reason for the phobia

But despite all these measures…

Some children continue to miss/avoid or refuse immunisations due to fear of the procedure
Immunisation under conscious sedation

- **Currently no data and no best practice guidelines**
  - For use of conscious sedation in paediatric immunisations

- **Nitrous oxide (N₂O)** is optimally suited...
  - Fast onset, fast offset
  - Anxiolytic, amnestic and analgesic
    - Used routinely in paediatric emergency departments
      - for fracture manipulation and minor surgical procedures
    - N₂O in combination with EMLA® anesthetic cream
      - superior to either monotherapy for pain reduction in IM injections and IV cannulation¹

¹Carbajal R et al, Pediatrics 2008, Hee et al, Pediatric Anesthesia 2003
Immunisation under conscious sedation

- **Oral Midazolam** is also optimally suited...
  - Anxiolytic and amnestic
  - No analgesic properties
  - Maximal effect is within 15 to 20 minutes, can last for up to two hours
  - Shown to be effective for conscious sedation and control anxiety in children undergoing dental treatment\(^1\)
    - Also used in combination with N\(_2\)O

\(^1\)Alcaino EA, Annals of the Royal Australasian College of Dental Surgeons, 2000
Immunisation Service at RCH Melbourne

• Offers a unique service to the subset of patients who have:
  – *Failed routine attempts* at immunisation in the community using standard distraction and minimally invasive techniques

• Particularly important for a subset of pediatric patients:
  • *Needle phobia*
  • *Anxiety disorders*
  • *Developmental disorders*
  • *Behavioural disorders (Eg: Autism spectrum disorder)*

• Routine attempts at immunisation in these patients may:
  – Trigger physical aggression, combative or extremely distressing behaviour
  – May endanger themselves, their families or immunisation providers
# Immunisation of Needle Phobic Patients Triage Form

## Patient Details:

**NAME:**

**DOB:**

**GENDER:**  
☐ M  ☐ F

**MRN:**

**CONTACT DETAILS (Parent/guardian):**

- **Name:**
- **Address:**
- **Email:**
- **Phone:**
- **Who will attend:**

**INTERPRETER REQUIRED:**  
☐ YES  ☐ NO

**MEDICARE NUMBER:**

**REFERRAL RECEIVED:**  
☐ YES  ☐ NO

**REASON FOR REFERRAL:**

**RELEVANT MEDICAL HISTORY (including phobia trigger):**

**PREVIOUS VACCINE ATTEMPTS:**  
☐ YES  ☐ NO

**PREVIOUS SEDATION:**  
☐ YES  ☐ NO

**VACCINES REQUIRED:**

## Telephone Discussion

**Date:** _____________  
**Sign:** _______________

- Discussed option of child psychologist:
- Discussed topical analgesia:
- Discussed nitrous oxide:
- Discussed midazolam:
- Discussed buzzy:
- Discussed role of distraction/play therapy:
- Discussed fasting times/send info with app’t:
- Emailed links to MVEC needle phobia page:
- Other:

**Appointment date:** _____________

**DMU bed booked:**  
☐ YES  ☐ NO  
**Date:** _____________

**AIR printed and attached:**  
☐ YES  ☐ NO

## Future Plan:

**Outcome:**

**Future Plan:**
# Immunisation of Needle Phobic Patients Triage Form

## TELEPHONE DISCUSSION

<table>
<thead>
<tr>
<th>Date: ____________________</th>
<th>Sign: ____________________</th>
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<table>
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<tr>
<th>Yes</th>
<th>No</th>
<th>N/A</th>
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<th>□ YES</th>
<th>□ NO</th>
<th>Date: ____________________</th>
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<tbody>
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<tr>
<th>AIR printed and attached:</th>
<th>□ YES</th>
<th>□ NO</th>
</tr>
</thead>
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</tbody>
</table>

## Future Plan:

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Needle phobia

Many people may find the experience of having a needle an unpleasant one. However for some people, the experience is much more difficult, presenting as a real phobia characterised by both severe and persistent anxiety and fear. As a result, this patient group often avoid needle-related experiences. This is especially noticeable in children and young people, who may be skittish of the initial inoculation. Some children may:

**Resources**

The Royal Children’s Hospital Clinical Practice Guidelines for Procedural Pain Management

The Royal Children’s Hospital Kids Health Info Fact Sheets: Sedation – Nitrous Oxide

The Royal Children’s Hospital comfort kids- for kids

The Royal Children’s Hospital comfort kids- for parents

The Royal Children's Hospital Be Positive (B+) videos “Coming to Immunisation Clinic” and “Having some Nitrous Oxide”

Buzzy

Smart phone apps Smiling Mind and Okee
Sedation - Nitrous oxide

Nitrous oxide is an anaesthetic gas. It can be given to your child to help them feel calm and relaxed while undergoing minor surgery. It is a very safe procedure and has been used for many years for procedures such as dental work. It is often referred to as laughing gas.

How did you like this fact sheet? Click here to do a short RCH survey.

Before the procedure

Nitrous oxide helps most children feel drowsy and relaxed, and is usually completed with minimal discomfort or distress to your child.

Comfort Kids

About Comfort Kids

"It's everyone's business to minimise pain, distress and anxiety during routine procedures."

Visit our website for more information on Comfort Kids.
Be Positive

Be Positive (B+)

Be Positive (B+) is your way of finding out more about positive vibes, how and when, you have to...

Having some nitrous oxide

Some people call it happy gas or laughing gas. Its real name is Nitrous Oxide.
RCH *Immunisation under sedation* service

- Children/adolescents are seen by an Immunisation paediatrician
- Admitted as day patients to the Day Medical Unit
- Receive immunisations with a combination of
  - Topical agents- local anaesthetic cream *(AnGel)*
  - Distraction techniques
    - Play/music therapy
    - Buzzy/I-pads
  - Nitrous Oxide - titrated up to 70%
  - +/- Midazolam - oral, 0.3mg/kg (up to 20mg)

- Aims
  - to minimise pain and anxiety before/during/after procedure
  - To achieve successful immunisation
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Immunisation under sedation project
2. Aim and Method

Immunisations under sedation at RCH Melbourne

• **Aim:** We aimed to evaluate the:
  • Number and type of patients
  • Pain minimization and sedation methods used
  • Outcomes of the procedures

• **Method:**
  • A retrospective review of medical records on all patients who had immunisation under sedation between Jan 2012 to Dec 2016 (5 years)
  • De-identified data was collected
  • Ethics approval was obtained from the RCH HREC (#DA001-2016-93).
3. Results
Total number of patients immunised under sedation by year (n=213)
### 3. Results
Demographics of patients admitted for immunisation under sedation

<table>
<thead>
<tr>
<th>Diagnosis</th>
<th>Successful Patients, n (%)</th>
<th>Male (%)</th>
<th>Median Age (years)</th>
<th>IQR</th>
<th>Unsuccessful Patients, n (%)</th>
<th>Male (%)</th>
<th>Median Age (years)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Needle Phobia</td>
<td>76 (58.9)*</td>
<td>50</td>
<td>13 (12-14)</td>
<td></td>
<td>7</td>
<td>57.1</td>
<td>13 (12.25-14)</td>
</tr>
<tr>
<td>Autism Spectrum Disorder</td>
<td>29 (22.5)</td>
<td>89.7</td>
<td>13 (12-15)</td>
<td></td>
<td>2</td>
<td>100</td>
<td>11.5 (11-12)</td>
</tr>
<tr>
<td>Anxiety Disorder</td>
<td>13 (10.1)</td>
<td>30.8</td>
<td>13 (13-14.25)</td>
<td></td>
<td>0</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Developmental Disability</td>
<td>7 (5.4)</td>
<td>100</td>
<td>13 (13-14.5)</td>
<td></td>
<td>0</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Intellectual Disability</td>
<td>4 (3.1)</td>
<td>50</td>
<td>13 (12.5-13)</td>
<td></td>
<td>1</td>
<td>100</td>
<td>15</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td>129</td>
<td>59.7</td>
<td>13 (12-14)</td>
<td></td>
<td><strong>10</strong></td>
<td>77.8</td>
<td>13 (12-15)</td>
</tr>
</tbody>
</table>

- **Majority of diagnosis needle phobia**
- **Male majority except anxiety**
- **Median age 13 years**

Total of 139 = 129 successful + 10 (4.7%) unsuccessful
- failure was due to direct refusal of oral sedation medication or combativeness making nitrous oxide sedation unviable
### 3. Results

**Immunisation encounters and sedation types by diagnosis**

<table>
<thead>
<tr>
<th>Diagnosis</th>
<th>Encounters, n (%)</th>
<th>Patients w N2O only n, (%)</th>
<th>Patients w N2O &amp; Midazolam n, (%)</th>
<th>Patients w Midazolam only n, (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Needle Phobia</td>
<td>124 (58.3) *</td>
<td>72 (58.1)</td>
<td>42 (41.9)</td>
<td>0</td>
</tr>
<tr>
<td>Autism Spectrum Disorder</td>
<td>50 (21.6)</td>
<td>20 (40)</td>
<td>27 (54)</td>
<td>3 (6)</td>
</tr>
<tr>
<td>Anxiety Disorder</td>
<td>19 (10.1)</td>
<td>8 (42.1)</td>
<td>10 (52.6)</td>
<td>1 (5.3)</td>
</tr>
<tr>
<td>Developmental Disability</td>
<td>11 (5.8)</td>
<td>5 (45.5)</td>
<td>6 (54.5)</td>
<td>0</td>
</tr>
<tr>
<td>Intellectual Disability</td>
<td>9 (4.3)</td>
<td>6 (66.7)</td>
<td>2 (22.2)</td>
<td>1 (11.1)</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>213</strong></td>
<td><strong>111 (54.7)</strong></td>
<td><strong>87 (42.8)</strong></td>
<td><strong>5 (2.5)</strong></td>
</tr>
</tbody>
</table>

*Includes 10 failed immunization encounters*

- Total of 213 immunisation encounters
- 32% had multiple sedation encounters
- 91% Needle phobia or Autism
- N₂O used in almost all vaccination encounters 97.5%
- N₂O sole agent in 54.7%
- EMLA recorded in 5.9% and Play therapy 3.9%
### 3. Results
Vaccines administered under sedation by type and number

<table>
<thead>
<tr>
<th>Vaccine Type</th>
<th># of doses</th>
<th>% of vaccine doses</th>
</tr>
</thead>
<tbody>
<tr>
<td>HPV</td>
<td>136</td>
<td>34</td>
</tr>
<tr>
<td>dTpa</td>
<td>81</td>
<td>20.25</td>
</tr>
<tr>
<td>Influenza</td>
<td>39</td>
<td>9.75</td>
</tr>
<tr>
<td>Varicella</td>
<td>28</td>
<td>7</td>
</tr>
<tr>
<td>Hepatitis B</td>
<td>24</td>
<td>6</td>
</tr>
<tr>
<td>Pneumococcal</td>
<td>17</td>
<td>4.25</td>
</tr>
<tr>
<td>Hepatitis A</td>
<td>11</td>
<td>2.75</td>
</tr>
<tr>
<td>MMRRV</td>
<td>10</td>
<td>2.5</td>
</tr>
<tr>
<td>MMR</td>
<td>9</td>
<td>2.25</td>
</tr>
<tr>
<td>Typhoid</td>
<td>8</td>
<td>2</td>
</tr>
<tr>
<td>Polio</td>
<td>6</td>
<td>1.5</td>
</tr>
<tr>
<td>Meningococcal ACWY</td>
<td>6</td>
<td>1.5</td>
</tr>
<tr>
<td>DTPa-IPV</td>
<td>6</td>
<td>1.5</td>
</tr>
<tr>
<td>Meningococcal C</td>
<td>5</td>
<td>1.25</td>
</tr>
<tr>
<td>Hib-MenC</td>
<td>4</td>
<td>1</td>
</tr>
<tr>
<td>Yellow Fever</td>
<td>3</td>
<td>0.75</td>
</tr>
<tr>
<td>Meningococcal B</td>
<td>2</td>
<td>0.5</td>
</tr>
<tr>
<td>DTPa-Polio-Hep B-Hib</td>
<td>2</td>
<td>0.5</td>
</tr>
<tr>
<td>Hepatitis A-Hepatitis B</td>
<td>2</td>
<td>0.5</td>
</tr>
<tr>
<td><em>Haemophilus Influenzae</em> type B (Hib)</td>
<td>1</td>
<td>0.25</td>
</tr>
<tr>
<td><strong>Total Doses</strong></td>
<td><strong>400</strong></td>
<td><strong>100</strong></td>
</tr>
</tbody>
</table>

Most common vaccines:
- Routine Year 7
- HPV, dTpa
- Varicella
- Influenza

400 vaccine doses administered
3. Results

Adverse events

- No patient adverse events following immunisation or sedation recorded
  - No unforeseen overnight admissions to hospital post-immunization

- 1 needle-stick injury to a nurse immuniser
- 1 parental injury whilst assisting with patient

- 10 patients were unable to complete their immunisations (failed sedation)

- During the process of the 5 year review, it was found that
  - 30 patients appeared to have failed to complete immunisation schedule
4. Limitations

• Retrospective review
• Incomplete dataset due to lack of transcribed or illegible information
  • Eg: little local anaesthetic cream or play therapy recorded
  • May reflect poor documentation rather than actual practice
5. Conclusion

- For a subset of pediatric population, where standard immunisation procedures have failed
  - Needle phobia
  - Anxiety disorders
  - Developmental disorders
  - Behavioural disorders

- Conscious sedation (using N2O and midazolam), RCH 2012-2016 (5 years)
  - Safe and effective
  - Overwhelming success rate 95.3% (129/139)
    - 400 vaccines
    - 213 immunisation encounters
    - 139 patients
6. Acknowledgements

Daryl Cheng
Sonja Elia

RCH Immunisation Service Team
  - Medical, Nurses and Admin
  - Rachel McGuire
  - Georgina Lewis

www.mvec.vic.edu.au