High Flow Nasal Cannula (HFNC) Oxygen in Adults

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Who wants another oxygen delivery device??
What is it?

- High flow: up to 70 litres per minute
- Humidified: 100% relative humidity
- Heated to 37 degrees
- Comfortable soft silicone nasal prongs
- $\text{FiO}_2$ 21-100%
  - Dependent on oxygen flowmeter used.
Newer units

- **Airvo 1**
  - up to 50L/min in 5L increments
- **Airvo 2**
  - up to 60L/min in 1L increments
- **Vapotherm, Comfort Flo, Aquinox**

- **Costs**
  - Unit +/- $2000 (Airvo 2 including stand and pole)
  - Consumables ~$55 per patient
Mechanisms and Benefits

• High flow rates
  – Predictable \( \text{FiO}_2 \) by minimising entrainment of room air
  – Rinsing/washout of airway dead space
  – Anatomic \( \text{O}_2 \) reservoir in upper airway
• Low, variable PEEP
• Decreased WOB
• Heat and Humidification
  – Comfort
  – ? muco-ciliary clearance benefit
• Well tolerated compared to conventional masks and NIV masks
• Quick and easy to initiate
Case

- 85 y.o female
- BAT call
- Trip and fall 1.5 hours ago
- Compound right fracture/dislocation of ankle
- Midazolam and morphine given by CDA.
- GCS 6
- Nil apparent head injury, placed in C spine collar
- Maintaining own airway.
- Triage Cat 2 to Resus
MIST on arrival

- Mechanical trip/fall on floor in hostel
- Obvious open right ankle fracture
- Stable vitals, now GCS=14
- Treatment by paramedics
  - 20mg morphine
  - 2mg midazolam,
  - 10mg metoclopramide
  - 700mls Hartmann’s
- O/A ED GCS=15
- Denies neck pain (hard collar insitu)
Past medical history

- IHD- CABG 2004
- CCF
- Hypertension
- Depression
- GORD
- Osteoarthritis
On examination

• A= patent
• B= Good AE on 15L NRB SaO₂ 99%, RR24
• C= Diaphoretic, HR 100 bpm irreg, BP 130/70
• D= GCS=15
• Obvious deformity to right ankle
Deterioration soon after arrival

- RR rate increased 28
- Increased work breathing ++
- $\text{SaO}_2$ 96% 15L NRB
- Lying flat with hard collar
Initial Management

- Frusemide 40mg
- NIV commenced via conventional facemask.
- Remained lying flat with hard collar insitu
- NIV not tolerated
- Saturation falls to 89%
- HR 140, BP 150/90
Commenced on HFNC

- Flow 50L & FiO₂ 50%
- Significant improvement within 20 minutes
  - RR 14
  - Sp02 98%
- Flow continued at 50L, FiO₂ decreased 30%
- Re-sedated for ankle reduction and admitted for ORIF.
HFNC in Adults: Indications and applications

- Any patient in respiratory distress who requires oxygen therapy.
- Hypoxia
- Alternative or bridge to NIV
- Patients who don’t tolerate NIV or are being weaned
- Pre-oxygenation for RSI
- Palliation of respiratory distress
- Caution with hypercapnoea
Contraindications

- Patients with significant facial trauma
- Any circumstance where PEEP was contraindicated
- Patients who require continuous nebulisers (spacers can be given in conjunction with HFNC)
Our experience

- Improved patient comfort and compliance +++
- Significantly easier for nursing staff to manage.
- Decreased need for NIV.
- Alternative for patients who don’t tolerate NIV.
- Weaning from NIV
- Invaluable modality for both adults and children
Issues/concerns

- Weaning to facilitate ward transfer
  - Need wards to have same equipment.
  - Now at RPA CCU, ICU, Respiratory, Head and Neck, Paediatric and Oncology wards all have HFNC capability.

- Transport:
  - UPS/Battery currently only approved for Airvo2 in NZ
  - Rapid transfers possible without heat pad.
  - High oxygen utilisation limits retrieval use.

- Potential to underestimate severity of disease
- Barotrauma
- Aerosolisation of respiratory viral pathogens?
- Hypercapnoec respiratory failure
Evidence

- Good evidence for ability to deliver fixed FiO\textsubscript{2}, humidification and low level PEEP of 3.2-5.2 cm H\textsubscript{2}O

- Reasonable Evidence of efficacy in ICU setting:
  - Hypoxia (mainly resp infection, post operative hypoxia, post extubation)
    - Decreased RR, improved sats
    - Decreased NIV use and intubation
    - Patient comfort and preference
Evidence in ED

- One study in ED (Lenglet Respir Care 2012)
- Prospective observational feasibility study
- Enrolled 178 patients with hypoxic respiratory failure and gave them “standard care with 10-15L via NRB mask
- 17 patients who failed standard care were given HFNC therapy
- Improvements in SaO2, decrease RR noted
- Well tolerated
HFNC vs Standard oxygen therapy in ED (commencing next week)

- Prospective randomised trial at RPA and Canterbury
- Utilising 10 loan Airvo 2 provided by manufacturer but with consumables purchased by LHD.
- Inclusion: dyspnoea, RR ≥25, SaO₂ ≤93% on room air
- Exclusion: need immediate intubation or NIV, facial/chest trauma, pneumothorax.
- Primary outcomes: Fall in RR of 20%, subsequent need for NIV or ventilation.
- Secondary outcomes: ED LOS, disposition to high dependency vs normal ward, Hospital LOS, Adverse events, Patient comfort.
Conclusions

• Relatively cheap
• Simple
• Safe
• Anecdotally we have had a good experience at RPA and are advocates
• Theoretical and non ED evidence favourable, but no real studies in ED setting.
Questions

Thanks to Nerida Bell, CNC.