Raising the Standard of Care for Respiratory Support with Nasal High Flow in high acuity areas - a controlled study

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Declarations

• Dr T S Browne has not received any financial gain from Fisher & Paykel Healthcare Limited

• Fisher & Paykel Healthcare Limited supplied the equipment and provided a small study grant

• The data were independently analysed by Y Jiang – Dept. Statistics, University of Auckland
Introduction

• Tauranga Hospital ICU / HDU / CCU is a combined 20 bedded unit in New Zealand

• Historically O₂ therapy was achieved with standard nasal cannula, Hudson mask, non-invasive ventilation / CPAP, invasive ventilation

• Nasal High Flow Cannula were not used routinely

• QUESTION: Could we raise the standard of care for oxygen delivery by introducing Nasal High Flow Cannula as a standard of practice?
Methods

• Observational historic controlled two-phase study of 864 adult and 69 paediatric patients

• Retrospective (Phase I) data were extracted from anonymised clinical records and AORTIC database reports during the first 40 hours post admission to the ICU/HDU/CCU. Prospective (Phase II) data collected thereafter

• The predicted benefit ratio between the two phases was deemed to be equivalent

• The equipment (Airvo™ flow source and Optiflow™ high flow nasal cannula) was provided by Fisher & Paykel Healthcare Limited

• **INCLUSION**: All spontaneously breathing patients with a requirement for O₂ therapy and no contraindication to NHFC as per manufacturer specification
Retrospective (Phase I) data collection

Retrospective (Phase I) data were collected (N=450) during the period 25 May 2012 – 25 November 2012

AIM:

• Retrospective analysis of the diagnostic data to determine a list of the most common diagnostic admission categories for the ICU/HDU/CCU

• Establish current practice for O$_2$ therapy in the first 40 hours post admission to the ICU/HDU/CCU
Prospective (Phase II) data collection

- The process of recruitment during the Prospective Phase II continued until the numbers of patients per diagnostic category in each group equalled those in the Retrospective Phase I

- CCU 3 diagnostic categories
  - e.g. Acute MI, CCF, rhythm disturbance
- ICU 9 diagnostic categories
  - e.g. Post Cardiac arrest, sepsis – non-urinary
- HDU 11 diagnostic categories
  - e.g. Metabolic, post op GI neoplasm
Overall no significant differences between adult patient characteristics between phases at baseline
Outcomes
(First 40 hours post admission)

• **Primary**
  • Highest type of respiratory support device required

• **Secondary**
  • Optiflow Therapy usage data e.g. O₂ % and flow rates used
  • Length of stay in ICU, HDU, CCU and Hospital
  • Vital status at discharge ICU, HDU, CCU and Hospital
  • Destination at discharge ICU, HDU, CCU and Hospital
  • Number of therapy failures requiring escalation in type of respiratory support
Data analysis

The following analyses / tests were applied according to the data types:

• Descriptive summaries of the data at each phase by ICU/HDU/CCU and diagnostic categories:
  • mean and SD for continuous variables
  • frequency and percentage for categorical variables

• Tests of statistical significance between the two phases done for all patients and by ICU/HDU/CCU categories:
  • Two sample t-test for continuous variables
  • Chi-square or Fisher’s exact test for categorical variables
Highest level of respiratory support all adult participants (ICU/HDU/CCU)

<table>
<thead>
<tr>
<th></th>
<th>Retrospective n=450</th>
<th>Prospective n=414</th>
</tr>
</thead>
<tbody>
<tr>
<td>Resp. support all</td>
<td>257 (57%)</td>
<td>231 (56%)</td>
</tr>
<tr>
<td>*NIV</td>
<td>223 (49%)</td>
<td>10 (2%)</td>
</tr>
<tr>
<td>*Optiflow</td>
<td>7 (1%)</td>
<td>192 (46%)</td>
</tr>
<tr>
<td>INV</td>
<td>27 (6%)</td>
<td>29 (7%)</td>
</tr>
</tbody>
</table>

*Significant differences were found in NIV and Optiflow modes between the two cohorts

(Chi-square Test, p-values <.0001)
**Highest level of respiratory support - CCU**

<table>
<thead>
<tr>
<th></th>
<th>Retrospective n=249</th>
<th>Prospective n=248</th>
</tr>
</thead>
<tbody>
<tr>
<td>Resp. support all</td>
<td>107 (43%)</td>
<td>67 (27%)</td>
</tr>
<tr>
<td>*NIV</td>
<td>107 (43%)</td>
<td>7 (3%)</td>
</tr>
<tr>
<td>*Optiflow</td>
<td>0</td>
<td>60 (24%)</td>
</tr>
<tr>
<td>INV</td>
<td>NA</td>
<td>NA</td>
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</tbody>
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*Significant differences were found in both modes between the two cohorts (Fisher’s Exact Test, p-values <.0001)*
Highest level of respiratory support - HDU

<table>
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<tr>
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<th>Retrospective n=162</th>
<th>Prospective n=130</th>
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<tbody>
<tr>
<td>All resp. support</td>
<td>116 (72%)</td>
<td>128 (98%)</td>
</tr>
<tr>
<td>*NIV</td>
<td>112 (70%)</td>
<td>3 (2%)</td>
</tr>
<tr>
<td>*Optiflow</td>
<td>4 (2%)</td>
<td>125 (96%)</td>
</tr>
<tr>
<td>INV</td>
<td>NA</td>
<td>NA</td>
</tr>
</tbody>
</table>

*Significant differences were found in both modes between the two cohorts (Fisher’s Exact Test, p-values <.0001)
# Highest level of respiratory support - ICU

<table>
<thead>
<tr>
<th></th>
<th>Retrospective</th>
<th>Prospective</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n=39</td>
<td>n=36</td>
</tr>
<tr>
<td>All resp. support</td>
<td>34 (87%)</td>
<td>36 (100%)</td>
</tr>
<tr>
<td>NIV</td>
<td>4 (10%)</td>
<td>0</td>
</tr>
<tr>
<td>Optiflow</td>
<td>3 (7%)</td>
<td>7 (19%)</td>
</tr>
<tr>
<td>INV</td>
<td>27 (69%)</td>
<td>29 (80%)</td>
</tr>
</tbody>
</table>

No significant differences were found in all modes between the two cohorts (Fisher’s Exact Test, p-values >0.05)
Paediatric Data

- 35 Phase I Retrospective patients and 34 Phase II Prospective patients

- Significant differences were found for:
  - Age in years (2.3 vs. 5.9; p-value=0.001)
  - Weight (12.6 vs. 21.6; p-value=0.02)
  - Optiflow use (0 vs. 13; p-value <.0001)
    - Mean flow rate 13.5 L/min
    - Mean FiO₂ 51.2%
    - Mean SpO₂ 96.1%
    - Mean duration on therapy 10.5 hours
Conclusions

• Significant differences seen in the level (type) of respiratory support required for HDU and CCU patients (NHFC largely replacing NIV)

• No significant differences seen in the level of respiratory support required for ICU patients - it was unchanged

• No difference seen in length of stay in hospital or ICU/HDU/CCU (combined data)

• No difference seen for mortality (combined data)

• NHFC introduced to paediatric patients

• Therapy failure rates in both phases were consistent and comparatively low (no change in intubation rates)

• **Take home message:** NHFC largely replaced NIV in HDU / CCU with no change in intubation rates