

2015/2016 Summer Studentship Project Application Form

Send to: Research Office, University of Otago Christchurch, PO Box 4345, Christchurch, by 5pm on **3 July 2015**

Supervisor Information (First named supervisor will be the contact):

Supervisor's Name and Title(s): Dr Lutz Beckert and Dr Paul Kelly

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Research Category (Choose one category only – to be used for judging the students' presentations):

Clinical

Project Title (20 words MAXIMUM):

Nasal pressure profile during treatment with high flow humidified therapy

Project Description:

Introduction:

High flow, heated, humidified therapy with or without supplemental oxygen is a relatively recent innovation, which is finding its place in respiratory care in the ICU, acute general medicine and also outpatient setting. High flow nasal cannula (HFNC) devices have been shown to be comfortable and have recently been shown to reduce the need for intubation in ICU patients (DOI:10.1056/NEJMoa1603326) and equally effective as BiPAP in a post-operative setting (DOI:10.1001/jama.2015.5123).

The physiological mechanism/s for this beneficial effect are not fully understood, however, have been related to increased humidification, a reduction in the dead space ventilation with a reduction of the CO₂, and possible a positive air pressure (PAP) effect. We have previously investigated the effects of HFNC oxygen therapy on intra-tracheal oxygen, carbon dioxide and temperature during a normal ventilatory cycle. Little is known about the upper airway PAP conditions during HFNC delivery.

The purpose of this project is to investigate the effect of HFNC therapy at different flow rates on the nasal airway pressure during a normal ventilatory cycle.

Aim:

Measure the effect of high flow therapy at different flow rates and cannula sizes on the nasal airway pressure utilising two different methods to record nasal pressure, intra-nasal pressure transducer and nasal cannula.

Method:

We will recruit and consent 20 healthy subjects to measure intra-nasal pressures during therapy with HFNC at different flow rates and constant humidity and temperature.

Nasal pressure will be measured by two methods:

- 1) After application of topical local anesthetic a small bore (intra-cardiac) Mikro-Tip pressure catheter will be placed into the post nasal space in the upper pharynx.
- 2) Nasal cannula will be used in addition to the HFNC and connected to a pressure transducer.

Breathing pattern will be measured using respiratory inductance plethysmography.

Participants will be asked to breathe with their mouth closed and open at different flow rates. After pressure equalisation (20 breath) for each mouth state, we will change the flow rates as per table.

Data will be recorded via a pressure transducer on a PowerLab and a correlation between flow rates and nasal pressure will be explored.

The following flow rates will be used:

Flow rate (L/min)	Cannula size	Pressure catheter	Nasal cannula	Mouth state
15	Medium	✓		Closed & Open
30	Medium	✓		Closed & Open
45	Medium	✓		Closed & Open
60	Medium	✓		Closed & Open
15	Medium	✓	✓	Closed
30	Medium	✓	✓	Closed
45	Medium	✓	✓	Closed
60	Medium	✓	✓	Closed
15	Large	✓		Closed & Open
30	Large	✓		Closed & Open
45	Large	✓		Closed & Open
60	Large	✓		Closed & Open

Student Prerequisites (eg. Medical Student) if applicable:

Medical student preferred