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A Feasibility Study of an Ambulatory Non-invasive Ventilation (NIV) Set Up Model using Intelligent Volume Assured Pressure Support mode in MND

3 December 2019
17th Allied Health Professionals Forum

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PhD Candidate



Disclosures



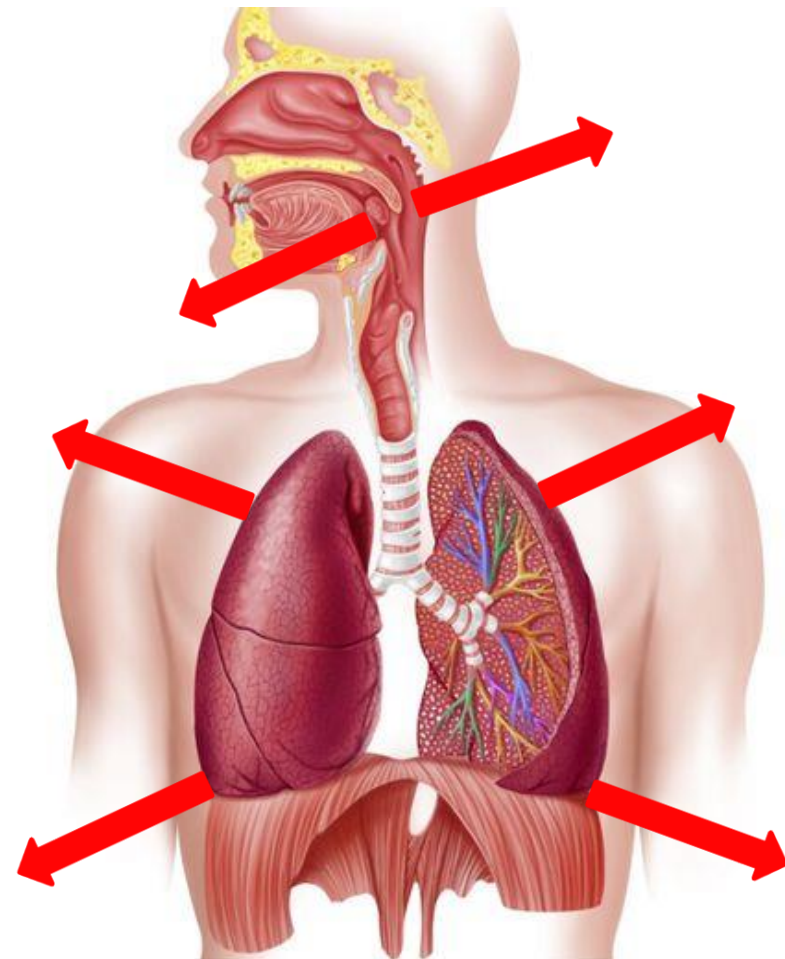
Research in-kind support: ResMed Australia

- ResMed Lumis 150 ST-A ventilators
- Oximeter modules and pulse oximeters
- Full face masks

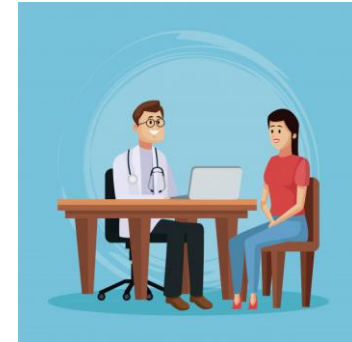
24th Annual Nina Buscombe Award 2019

Macquarie University PhD Clinical Medicine Travel Fund

Non-Invasive Ventilation



Objectives



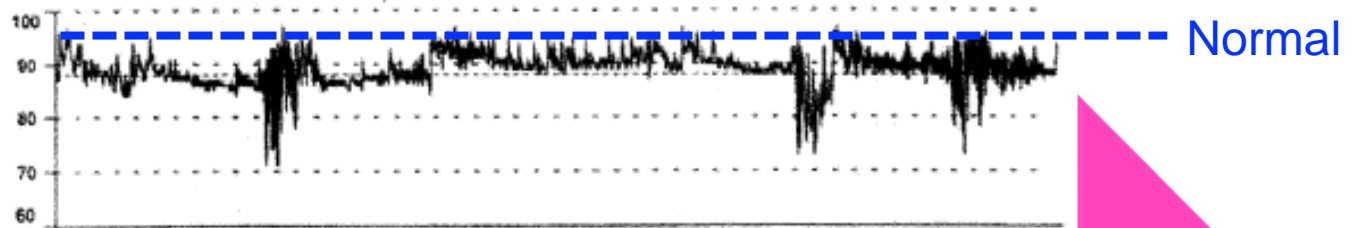
1. To evaluate the feasibility of an outpatient NIV therapy set-up model.
2. To review the adherence rate of NIV therapy.
3. To consider the issues of care in NIV therapy set up.

Methods

Macquarie University Human Research Ethics Committee approval Ref: 5201600806

Shortness of
Breath

Overnight oximetry



T0

NIV Set Up

T1

Clinic Review

T3

Clinic Review

T6

Study Ends



Outpatient NIV set up model



90 minutes



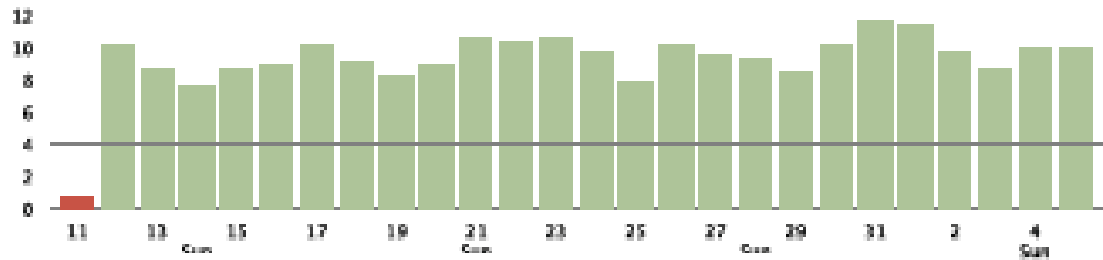
- Respiratory consultation
- Patient and partner/carer
- Mask fitting, ventilator care
- 30 mins familiarisation period
- Fine-tuning opportunities

Discharged home

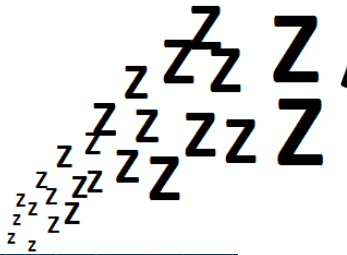
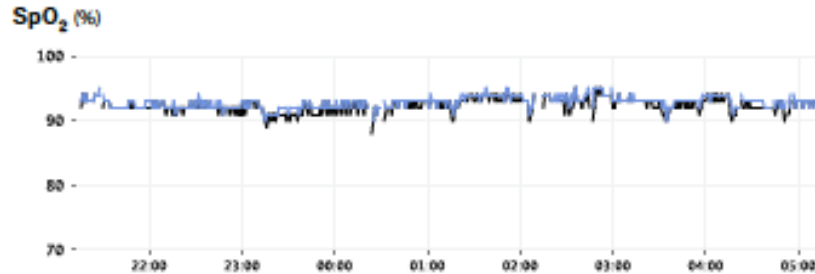


Ventilator adjustments and monitoring of use

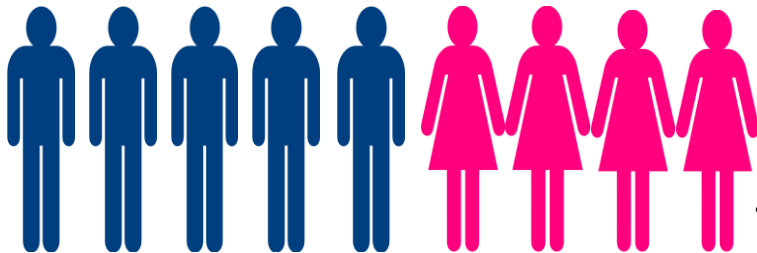
Usage - hours



Detailed report



Demographics & Baseline Characteristics



Age: 58 years

BMI: 28.7 kg/m² (overweight)

Revised ALS Functional Rating Scale: 37

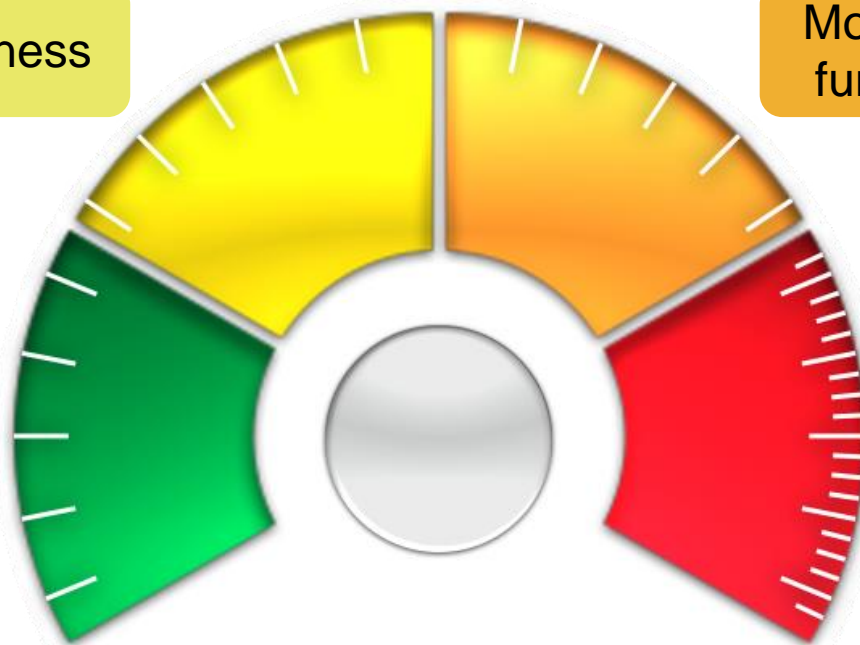
Travel distance to MQ > 200km for 3 patients

Mild breathlessness

Moderate respiratory
function impairment

Normal blood gas

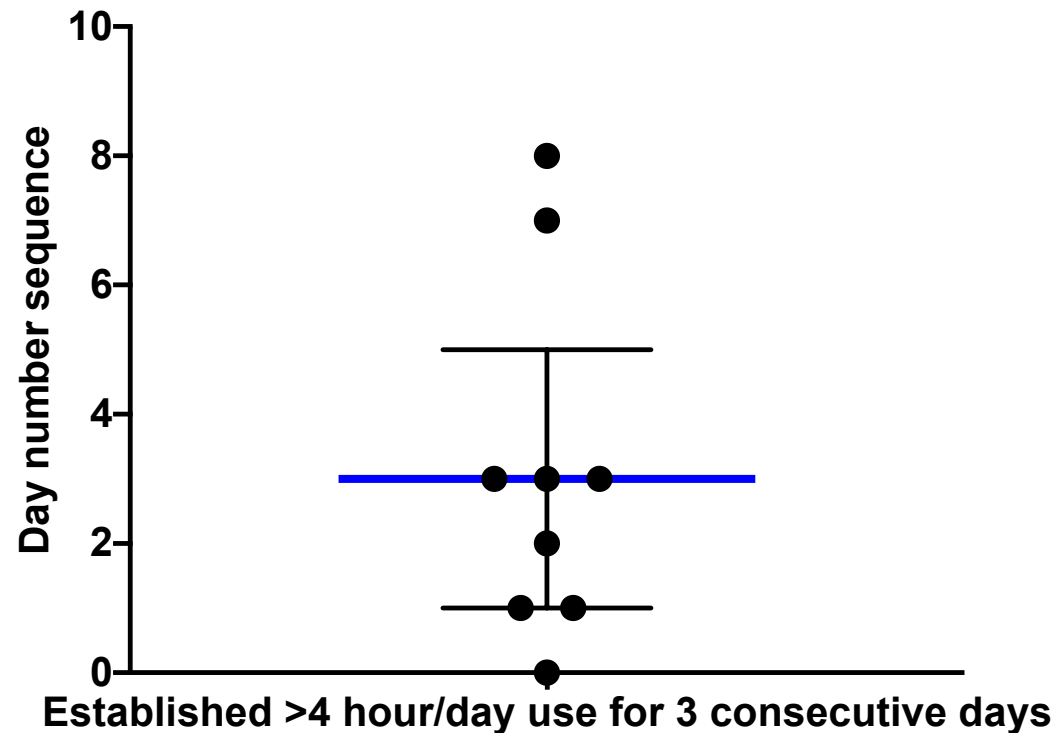
Severe sleep
disordered breathing



Time taken to establish ventilator use at home

Median: Day 3

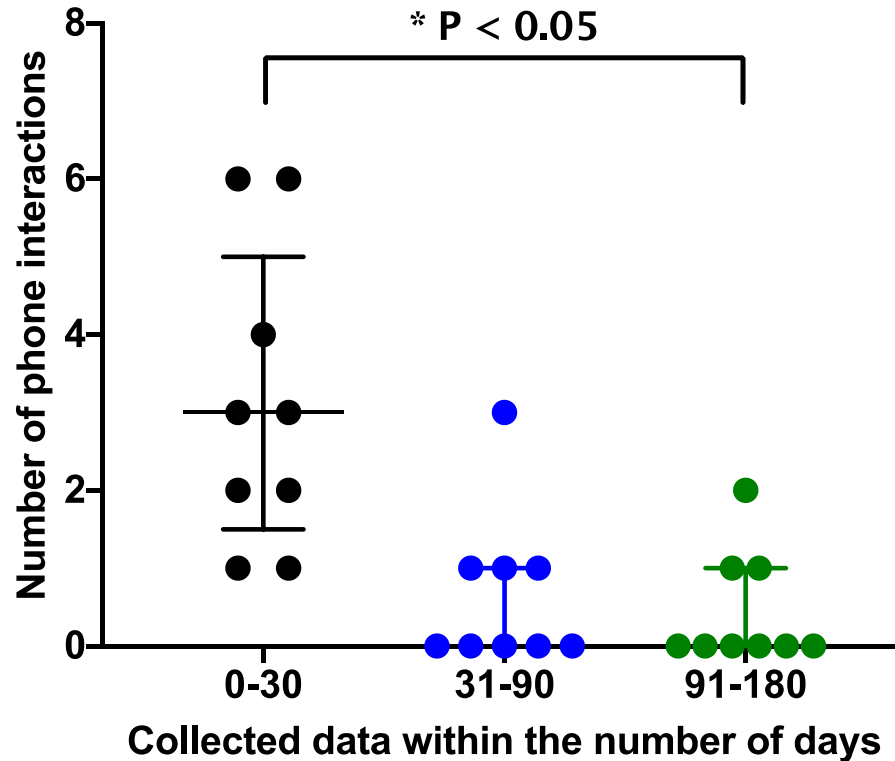
Time taken to establish > 4 hour/day ventilator use in first month



Phone contact interactions

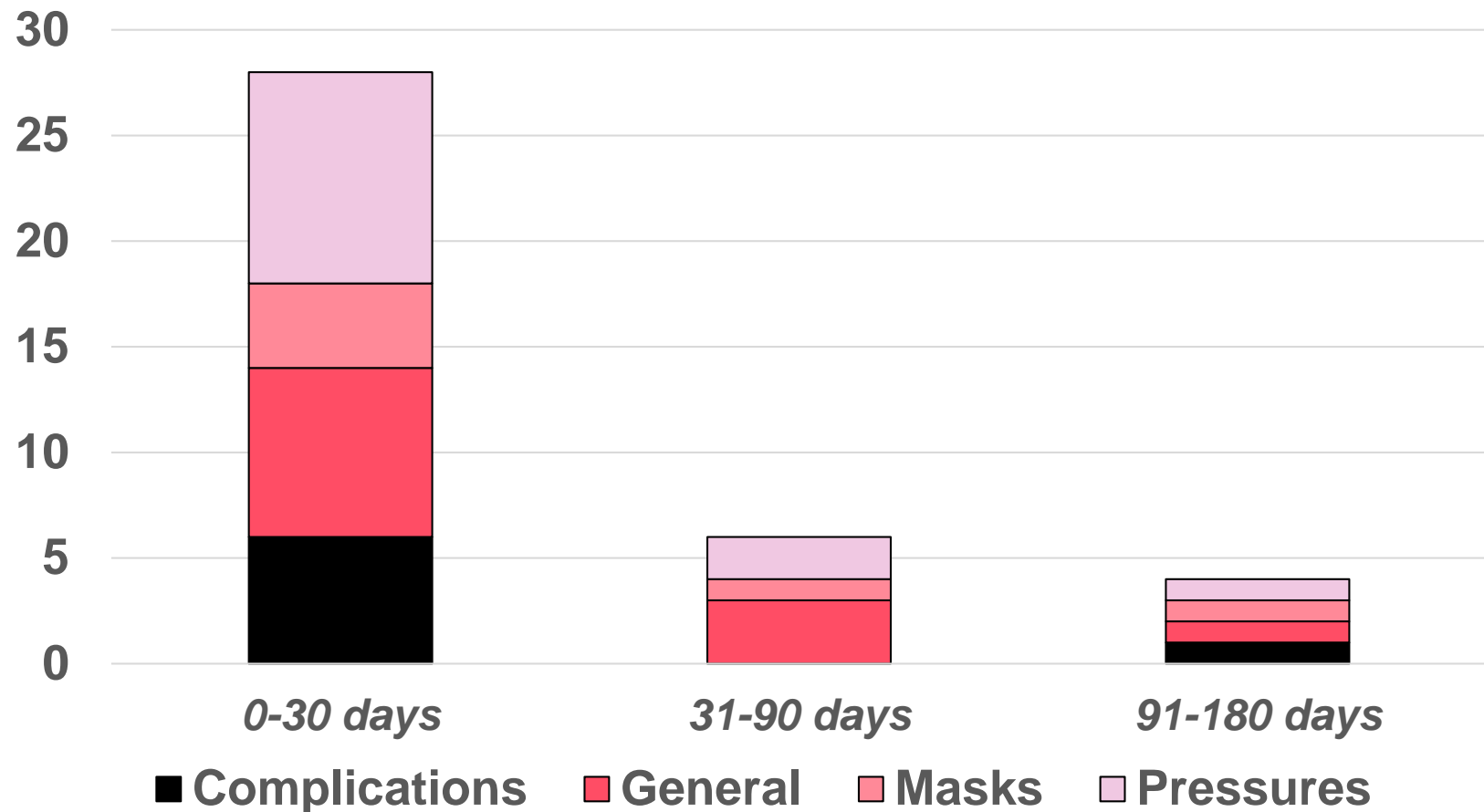
Majority occurred in first month

Summary of phone contact interactions



Number and types of phone contacts

Reduced over time



Complications

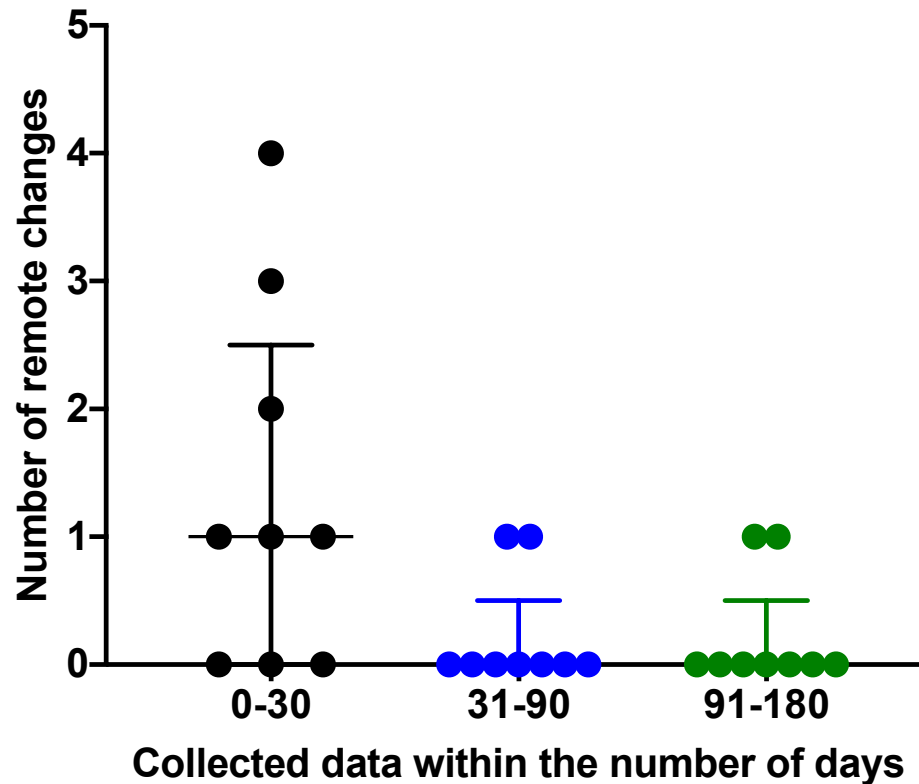
Most common in the first month

	Complication	Management
T1	Nose bleed	Topical Vaseline, Increase humidification
	Sinusitis	Temporary NIV cessation Intranasal medication Sinus irrigation Increase humidification
	Difficulties falling asleep	Sleep hygiene Check mask fitting Mood disorder
	Claustrophobia	Check mask fitting Alternate mask options Mood disorder
T3	None	
T6	Cracked humidifier - accidental	Humidifier replacement
	Tear in mask	Mask replacement

Number of remote ventilator adjustments

Majority occurred in first month

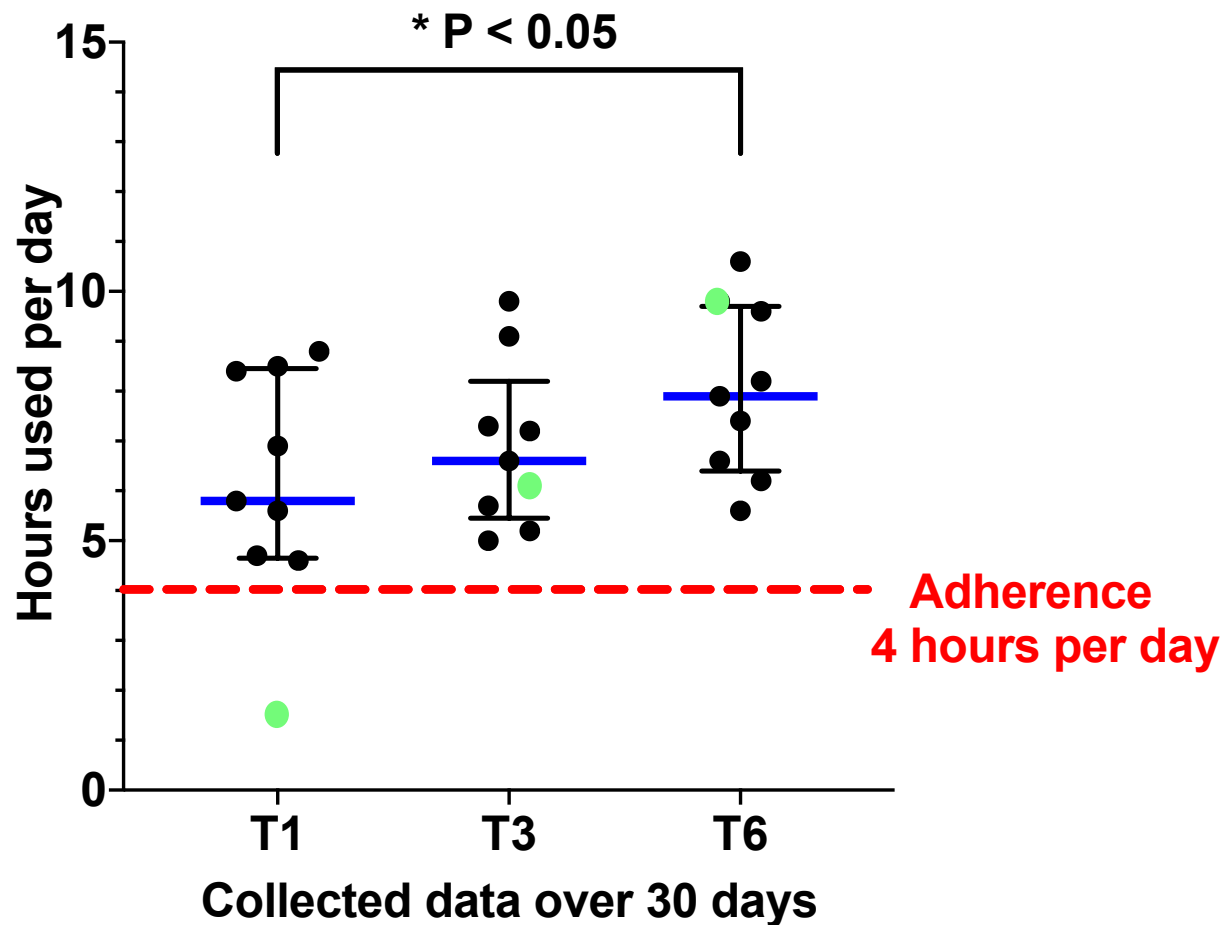
Remote ventilator adjustments



Patients' adherence to NIV therapy

Progressively increased over time

Ventilator hours used per day



Patients' comments on NIV use



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Mostly positive

Breathing

Feeling less breathless

Breathlessness improve with NIV and able to lie flat

Less Ventolin puffer use for breathlessness

Breathing better and able to sing in church

Sleep

Sleeping well through the night

Uninterrupted sleep

Improved sleep quality

Refreshing sleep

General

Clearer head

Able to walk 5km and continues to play golf

Less fatigued

More alert

Less restless

Improved sleep and feeling better

Patients' comments on NIV use



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Few negatives

Breathing

Very weak cough

Feels machine does not support his breath when he initiates it

Sleep

No change in daytime sleepiness

Broken sleep from muscle cramps

Dependent on ventilator to sleep

General

Waking distance limited to 500m

Taken two weeks to get used to machine

Conclusions



Ambulatory NIV therapy model is feasible

- Suitable MND patients:
 - Breathlessness
 - Sleep disordered breathing
- Adherence rates:
 - Initial adaptation occurred early
 - Increased adherence in six months
- Issues of care:
 - Improved patients' symptoms and well-being
 - Hospital admission avoided
 - Prompt and efficient NIV therapy
 - Pro-active monitoring and personalised care

Acknowledgement



Macquarie University Research Excellence Scholarship

PhD Supervisors:

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A/Prof Simon McMullan
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Friday 6 December 2019

SESSION 9B

RIVERSIDE THEATRE

RESPIRATORY SUPPORT

Chairs: J Andrews (USA) E Piro (USA)

10.30 – 11.00

C105 The multidimensional nature of respiratory failure in ALS

C Morélot-Panzini (France)

11.00 – 11.30

C106 The management of disordered breathing in MND

D Berlowitz (Australia)

11.30 – 11.50

C107 Slow vital capacity as a prognostic factor in ALS: A population-based study

A Calvo (Italy)

11.50 – 12.10

C108 A feasibility study of an ambulatory non-invasive ventilation set-up model using intelligent volume assured pressure support mode in MND

W Chow (Australia)

12.10 – 12.30

C109 The physiological effects of a single session of lung volume recruitment in people with MND

N Sheers (Australia)



QUESTIONS ?

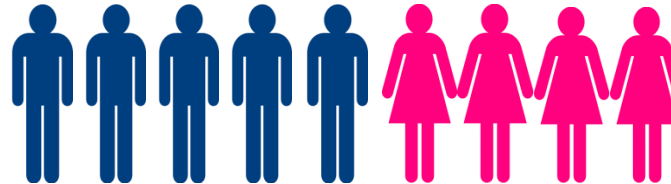
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Demographics & Baseline Characteristics

Age 58 years

BMI 28.7 kg/m²

ALS Functional
Rating Scale 37



Borg scale 0.5

Erect FVC 67% predicted
Supine FVC 40% predicted
MIP 47 cmH₂O

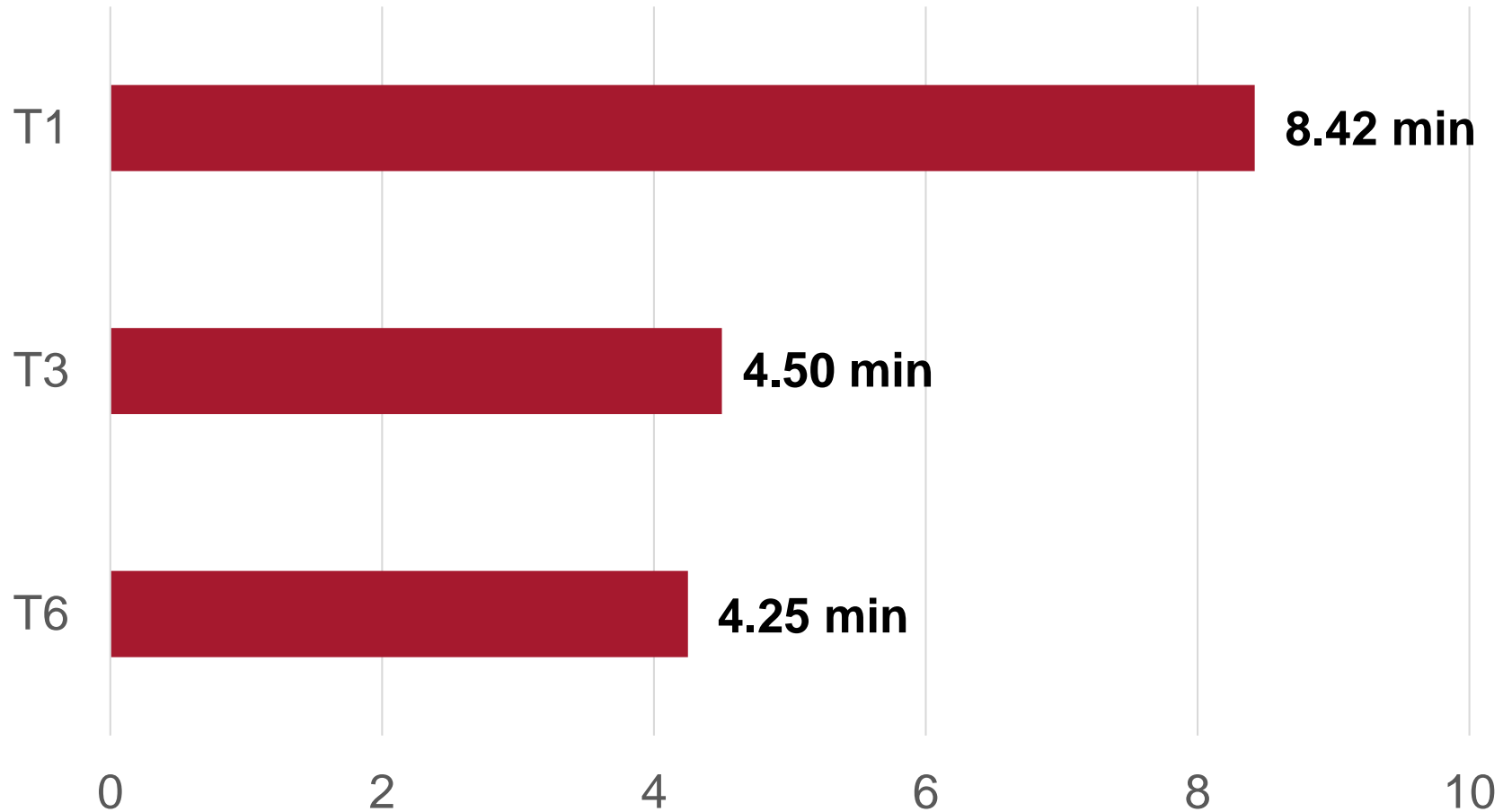


ABG
PaCO₂ 40 mmHg

SpO₂ < 90% = 27.30 TST%
Time < SpO₂ 88% = 38.10 min
Basal SpO₂ 91%
Min SpO₂ 78%

Average phone call duration

Reduced over time



Overnight Oximetry



Report Title

Patient Data		Name:	Gender:			
Age: 0	DOB:		BM: 0.0			
Physician:		Height: 0 in	ID:			
Note 1:		Weight: 0 lb				
		Note 2:				
Recording Date: 09 January 2019		Time: 00:30:48	Duration: 04:23:04			
Analyzed: 04:23:04						
Comments:						
Data storage rate of 4 seconds every sample.						
Event Data	SpO2	Pulse	%SpO2 Level	Events	Below(%)	Time(%)
Total Events	40	10	99 - 95	0	100	100.0
Time In Events (min)	35.7	3.8	94 - 90	3	95	61.9
Avg. Event Dur. (sec)	53.6	22.8	89 - 85	9	90	14.2
Index (1/hr)	9.1	2.3	84 - 80	11	85	6.1
% Artifact	0.1	0.1	79 - 75	9	80	4.4
Adjusted Index (1/hr)	9.1	2.3	74 - 70	5	75	2.8
%SpO2 Data			69 - 65	3	70	0.5
Basal SpO2(%)	93.8		64 - 60	0	65	0.0
Time (min) < 88%	31.5		59 - 55	0	60	0.0
Events < 88%	34		54 - 50	0	55	0.0
Max Single Time < 88%	184 sec at 03:26:16		49 - 45	0	50	0.0
Minimum SpO2 (%)	65		44 - 40	0	45	0.0
Avg. Low SpO2 (%)	80.4		39 - 35	0	40	0.0
Avg. Low SpO2 < 88%	78.8		34 - 30	0	35	0.0
Pulse Data						
Avg. Pulse Rate(bpm)	73.0					
Low Pulse Rate (bpm)	57					

Analysis Parameters

Desaturation Event: drop in SpO2 by at least 4% for a minimum duration of 10 seconds.
Pulse Event: Change in rate by at least 6 bpm for a minimum duration of 8 seconds.

Graphic Summary

SpO2 (10 % per division)



Event

Pulse (10 BPM per division)



Event

Time: 0:30 1:00 2:00 3:00 4:00