



# Staff Knowledge and Adherence to Supplemental Oxygen Therapy Guidelines within an Acute Aged Care Setting

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## Background

Supplemental oxygen therapy is a commonly used therapy to prevent and treat hypoxaemia. In the healthcare setting it is considered to be like a drug.<sup>1</sup> Like any drug, when used inappropriately, it can cause harm.<sup>2,3,4</sup>

According to the Thoracic Society of Australia and New Zealand (TSANZ) Oxygen Guidelines for Acute Oxygen Use in Adults (TSANZ supplemental oxygen therapy guidelines), oxygen should be prescribed and administered for specific indications, with a documented target oxygen saturation range. The prescription should be documented on the patient's medication chart.<sup>1</sup>

The TSANZ guidelines outline the concept of titrating supplemental oxygen to within a specific target oxygen saturation ranges depending on the patient situation and risk factors.

Westmead Hospital has adopted these principles. Unfortunately, anecdotal evidence and IIMS entries suggest that the current guidelines are not being adhered to.

Adherence to prescribing and administration of supplemental oxygen has been widely studied internationally and the overall conclusion is that prescription of supplemental oxygen is poor.<sup>5-11</sup> Additionally, there is some suggestion that knowledge regarding supplemental oxygen is also poor.<sup>10-11</sup>

## Aim

To assess current adherence to supplemental oxygen therapy guidelines in an Acute Aged Care inpatient setting.

To assess the knowledge of staff working in an Acute Aged Care inpatient setting regarding supplemental oxygen therapy administration.

## Methods

**Study design :** Before-and-after study

**Subjects:** Staff (Medical, Nursing and Allied Health) working in an Acute Aged Care inpatient setting.

**Data collected:** Baseline and follow up ward audits evaluating adherence to the TSANZ supplemental oxygen therapy guidelines. All patients were assessed to see:

- 1) If they were receiving supplemental oxygen
  - 2) If they required supplemental oxygen
  - 3) If the prescription was documented on the medication chart and
  - 4) If the target range for SpO<sub>2</sub> was documented.
- The baseline and follow up audits were repeated on 3 separate days to account for changes in staffing.

Baseline and follow up questionnaire results evaluating knowledge.

**Intervention:** Educational activities specifically targeted to the professional groups' needs and preferences (inservices, posters, newsletters, reminders). Key stakeholders were involved in the design of the activities.

## Data analysis

Baseline data are presented as percent and range.

Pre and post data compared using Fishers Exact Test, Chi-square or unpaired T Test.

A p value of <0.05 was considered statistically significant.

## Results

Ward audits were carried out on 3 separate occasions over a one month period to evaluate adherence to the TSANZ supplemental oxygen therapy guidelines. Adherence was poor. See table 1.

Pre-intervention audit	
Patients on O <sub>2</sub>	14
Patients requiring O <sub>2</sub>	7 (50%)
O <sub>2</sub> prescribed	0 (0%)
Target SpO <sub>2</sub> range	2 (14%)

**Table 1: Ward audit - adherence**

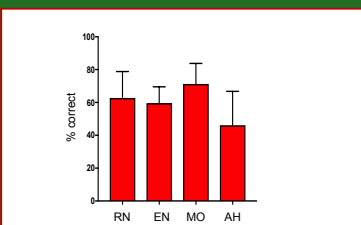
Data shown as n (%). O<sub>2</sub>: oxygen  
SpO<sub>2</sub>: oxygen saturation as measured by pulse oximetry

Questions	No. correct	% correct
Is supplemental oxygen a drug?	62	90%
What is low oxygen concentration in blood?	42	61%
What does FiO <sub>2</sub> mean?	61	88%
What does SaO <sub>2</sub> mean?	28	41%
What is the SpO <sub>2</sub> normal range for elderly?	14	20%
What is the target SpO <sub>2</sub> range for an at-risk patient?	61	88%
Is OSA a risk factor for hypercapnia?	57	83%
What is the target SpO <sub>2</sub> range for a non at-risk patient?	16	23%
What is the correct flow range for a simple face mask?	10	15%
Where do you read the flow rate on a flow meter?	23	33%
Does oxygen relieve breathlessness?	30	44%
What are the S&S suggestive of hypoxaemia?	43	62%
What are the S&S suggestive of hypercapnia?	48	70%
How should oxygen be prescribed?	59	86%
What delivery device would you use for a patient with COPD?	38	55%
What devices deliver controlled oxygen?	60	87%
What devices deliver uncontrolled oxygen?	48	70%
Can nurses administer oxygen without an order?	65	94%

**Table 2: Initial questionnaire**

Data shown as n (%). FiO<sub>2</sub>: fraction of inspired oxygen; SaO<sub>2</sub>: oxygen saturation as measured by arterial blood gas; SpO<sub>2</sub>: oxygen saturation as measured by pulse oximeter; S&S: signs and symptoms; COPD: chronic obstructive pulmonary disease.

The initial questionnaire demonstrated poor knowledge. Only 15% of staff could identify the safe flow rates for a simple face mask – potentially putting patients at risk of hypercapnia and only 23% could identify the target SpO<sub>2</sub> range for a non at risk patient (see table 2). Mean scores were similar across the disciplines (Diagram 1).



**Diagram 1: Pre-intervention mean results scores**

RN: Registered Nurse; EN: Enrolled Nurse; MO: Medical Officer; AH: Allied Health (Physiotherapist).

## Results

Following the targeted educational interventions, both the ward audits and the percent of correct answers to the knowledge questionnaire improved (see tables 3 & 4).

	Pre & Post-intervention audits		
	Pre (n=14)	Post (n=7)	P
Patients requiring O <sub>2</sub>	7 (50%)	5 (71%)	0.380
O <sub>2</sub> prescribed	0 (0%)	7 (100%)	<0.001
Target SpO <sub>2</sub> range	2 (14%)	6 (86%)	0.008

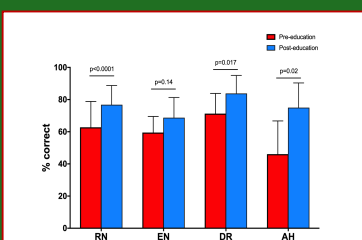
**Table 3: Ward audit – post intervention**

Data shown as n (%). O<sub>2</sub>: oxygen  
SpO<sub>2</sub>: oxygen saturation as measured by pulse oximetry  
There was a statistically significant improvement in oxygen prescription and documentation of the target SpO<sub>2</sub> range.

Questions	Pre and Post-intervention Questionnaire		P value
	Audit 1 % correct	Audit 2 % correct	
Is supplemental oxygen a drug?	90	97	0.095
What is low oxygen concentration in blood?	61	86	0.001
What does FiO <sub>2</sub> mean?	88	94	0.208
What does SaO <sub>2</sub> mean?	41	48	0.384
What is the SpO <sub>2</sub> normal range for elderly?	20	61	<0.001
What is the target SpO <sub>2</sub> range for an at-risk patient?	88	99	0.017
Is OSA a risk factor for hypercapnia?	83	90	0.193
What is the target SpO <sub>2</sub> range for a NON at-risk patient?	23	44	0.10
What is the correct flow range for a simple face mask?	15	35	0.005
Where do you read the flow rate on a flow meter?	33	69	<0.001
Does oxygen relieve breathlessness?	44	76	<0.001
What are the S&S suggestive of hypoxaemia?	62	69	0.404
What are the S&S suggestive of hypercapnia?	70	78	0.289
How should oxygen be prescribed?	86	96	0.036
What delivery device would you use for a patient with COPD?	55	73	0.025
What devices deliver controlled oxygen?	87	97	0.025
What devices deliver uncontrolled oxygen?	70	76	0.088
Can nurses administer oxygen without an order?	94	96	0.1714

**Table 4: Questionnaire – post intervention**

Data shown as n (%). FiO<sub>2</sub>: fraction of inspired oxygen; SaO<sub>2</sub>: oxygen saturation as measured by arterial blood gas; SpO<sub>2</sub>: oxygen saturation as measured by pulse oximeter; S&S: signs and symptoms; COPD: chronic obstructive pulmonary disease.



**Diagram 2: Pre-post intervention mean results scores**

Data shown as mean (±SD). RN: Registered Nurse; EN: Enrolled Nurse; MO: Medical Officer; AH: Allied Health (Physiotherapist).

The mean knowledge score (total) significantly improved for the group (61.5 ± 17 pre 76.8 ± 13 post, p<0.0001) as did the scores for the individual disciplines (except for ENs which may have been a type 2 error due to small sample size).

## Discussion

Despite the Thoracic Society of Australia and New Zealand (TSANZ) Oxygen Guideline for Acute Oxygen Use in Adults being published in 2015, adherence is poor in an 'Acute Aged Care' inpatient setting. Patients in non respiratory areas are at the same risk of any patient receiving supplemental oxygen and is therefore important that the guidelines are reinforced in all inpatient areas, not just respiratory wards.

In order to improve adherence, we evaluated knowledge and then designed targeted educational interventions, addressing areas of need.

The interventions were designed using feedback from staff and delivered based on staff preference. We utilised key staff members (champions) to promote the project.

After a 3 month period, both adherence and knowledge has improved.

Deficiencies remain, some patients are still being administered oxygen inappropriately (29%) and target SpO<sub>2</sub> ranges are not documented 100% of the time however, significant improvements have been made.

Continued education is required to ensure knowledge regarding flow rates for simple face masks and target SpO<sub>2</sub> ranges improve.

## Conclusions

Adherence to the Thoracic Society of Australia and New Zealand (TSANZ) Oxygen Guideline for Acute Oxygen Use in Adults is poor in an Acute Aged Care setting in a large tertiary teaching hospital, however a targeted project evaluating oxygen knowledge with targeted ongoing educational intervention can improve adherence in the inpatient setting.

The challenge now is to roll it out throughout the hospital and to maintain adherence via ongoing auditing.

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## References

1. Beasley R, Chien J, Douglas J, Eastlake L, Farah C, King G, Moore R, Pilcher J, Richards M, Smith S, & Walters H. Thoracic Society of Australia and New Zealand oxygen guidelines for acute oxygen use in adults: 'swimming between the flags'. *Respirology*. 2015; 20: 1182-1191.
2. Blackman T C. Evidence for oxygen use in the hospitalised patient: is more really the enemy of good? *Resp Care*. 2013; 58(10): 1679-1683.
3. Martin D S & Grootjoh MPW. Oxygen therapy and Anaesthesia: too much of a good thing? *Anaesthesia*. 2015; 70(5): 518-522.
4. Kane B, Decalmer S & O'Driscoll B R. Emergency oxygen therapy: from guideline to implementation. *Breath*. 2013; 9(4): 247-254.
5. Dodd ME, Kellef F, Davis A, Webb AK, Haworth CS & Niven RM. Audit of oxygen prescribing before and after the introduction of a prescription chart. *BMJ*. 2000; 321: 864.
6. O'Driscoll BR, Howard LS, Buchnall C, Welham SA, & Davison AG. British Thoracic Society emergency oxygen audits. *Thorax*. 2011; 66(8): 734-735.
7. Howell M. An audit of oxygen prescribing in acute general medical wards. *Professional Nurse*. 2001; 17(4): 221-224.
8. Neves JT, Lobato MJ & EMO working Group. Oxygen therapy multicentric study – A Nationwide audit to oxygen therapy procedures in Internal Medicine wards. *Pneumologia*. 2012; 18(2): 80-85.
9. Mahmoud AHO, Alseedi HAF, Awad HMAA, Ahmed AH & Elhoussein GEMO. Assessment of knowledge and practice of nurses regarding oxygen therapy in Elmak Nimir University Hospital. *European Journal of Pharmaceutical and Medical Research*. 2016; 3(4): 30-35.
10. Asciak R, Fenech VA, Gatt J & Montefort S. Oxygen prescription and administration in the Emergency Department and medical wards in Mater Dei Hospital. *Malta Medical Journal*. 2011; 23(2): 19-23.
11. Heiliger S. Improving oxygen prescribing rates by tailoring interventions for specific healthcare professional groups. *BMJ Quality*. 2016; 5:u209520.w4033.