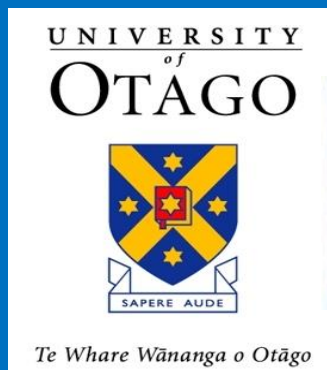


Measuring Fatigue in aeromedical clinicians: Is it a significant issue?

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Fatigue and Aeromedical Transport

Background

- Aviation cockpit crews subjects of extensive fatigue research and associated risk management strategies
- Aeromedical clinicians: **little published on fatigue and performance**
- There is **no gold standard for measuring fatigue** or performance in the aeromedical environment

Questions

- What does routine measurement tell us about the extent to which fatigue is experienced by clinicians transporting high dependency patients by air?
- What factors in aeromedical transport missions are impacting on the level of fatigue being experienced by clinicians?
- Is the pattern of reported fatigue consistent with what we understand about other safety critical transport and clinical environments?

Study Aim

- Assess extent and pattern of self-reported fatigue in clinicians undertaking inter-hospital transport of critical care and high dependency patients
- Trial PVT (reaction-time) testing in the clinical environment

Methods

- Prospective observational study design
- 2 specialist inter-hospital transport teams (PICU and ICU) flight nurses, ICU registrars (senior residents)
- Fatigue reporting, pre- and post-mission
- Collected over a 4 month period

Methods

Data collection (self-reporting)

- Mission, shift, and sleep details
- Samn-Perelli fatigue ratings, pre- and post-mission
- VAS fatigue and performance ratings

PVT (reaction time) also pilot tested for a subset of missions

Samn-Perelli (SP) Fatigue Scale

At present I feel:	
1. Fully alert and wide awake	
2. Very lively, responsive but not at peak	
3. Ok, somewhat fresh	
4. A little tired, less than fresh	
5. Moderately tired, let down	
6. Extremely tired, very difficult to concentrate	
7. Completely exhausted, unable to function effectively	

Visual Analogue Scale (VAS) Fatigue

At present I feel (please mark the line below with an “x” at the point which best describes how you feel)



Psychomotor Vigilance Task (PVT)



- Reaction-time test
- Respond to visual stimulus
- 5 minute duration
- Distraction-free
- Scoring - mean of 1/reaction time, and number of lapses $>500\text{ms}$

Analysis

- Non-parametric paired t-tests and correlational analysis
- Logistic model
 - 6 or 7 on the Samn-Perelli scale
- Linear mixed effects model
 - to test for association of factors to fatigue (end of mission)

Results: Baseline Characteristics

	Flight Nurse (n = 29)	Doctor (n = 33)
Age (SD)	41	34
Mean experience (range)	6 (0 – 20) years	0.7 (0 – 3) years
Regular sleep disturbance	12 (41%)	5 (15%)
Epworth Sleepiness Score > 10	5 (17%)	2 (6%)
Refused a mission due to fatigue (past 6/12)	3	0
Shouldn't have flown due to fatigue (total no. missions)	7 (17)	3 (5)

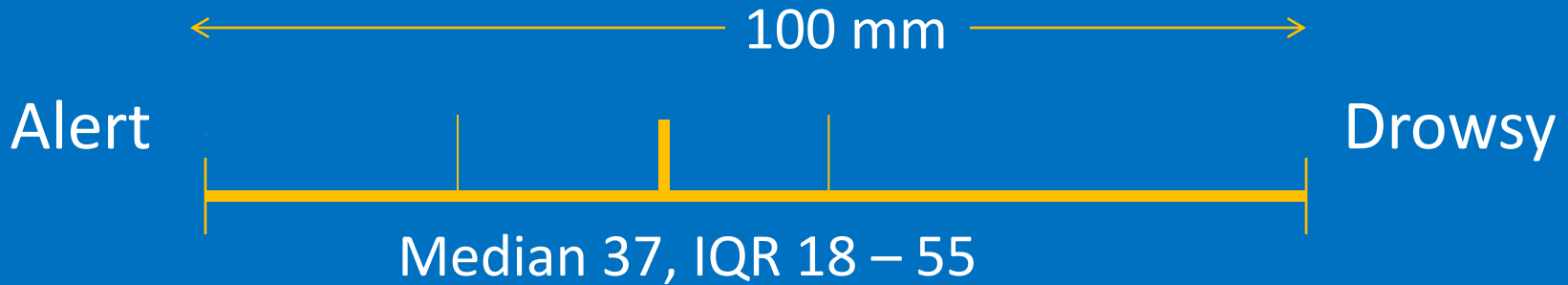
Results

Fatigue reports returned	n = 403
Average Mission duration (SD)	5.7 (2.8) hours
Transport mode	Fixed wing – 61% Helicopter – 19 % (Road) – 20%
Night missions (midnight to 6am)	32%
On-call status	28%
Average sleep previous 24 hours	7 hours
Average sleep during mission	4 minutes

Samn-Perelli (SP) Fatigue Scale

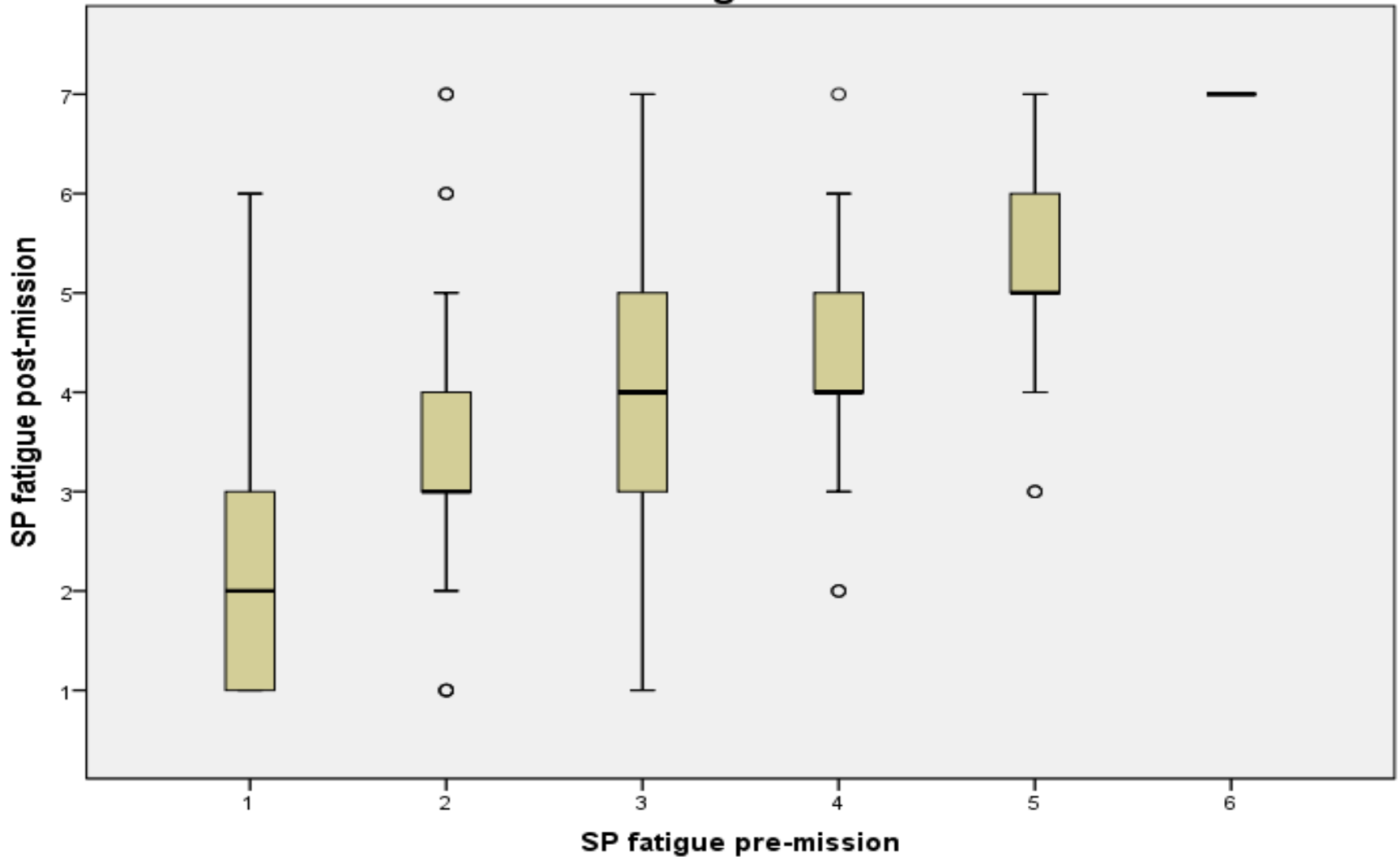
At present I feel:	SP score post-mission Number (%)
1. Fully alert and wide awake	49 (12.2%)
2. Very lively, responsive but not at peak	66 (16.4%)
3. Ok, somewhat fresh	74 (18.4%)
4. A little tired, less than fresh	104 (25.8%)
5. Moderately tired, let down	77 (19.1%)
6. Extremely tired, very difficult to concentrate	27 (6.7%)
7. Completely exhausted, unable to function effectively	6 (1.5%)

VAS Fatigue post-mission



- Significant increase in post-mission fatigue ($p < 0.01$)
- Correlation between fatigue (VAS) and self-rated performance ($r = -0.4, p < 0.01$)

Relationship between pre-mission and post-mission Samn-Perelli fatigue ratings



Prediction of severe levels of fatigue

	Odds Ratio	95% CI	P-value
Pre-mission fatigue (SP scale 1 to 7)	2.19	1.43 – 3.34	<0.0001
Mission duration (hours)	1.32	1.12 – 1.56	0.0001
Night mission	4.05	1.52 – 10.77	0.001
Mission difficulty (0 to 1)	4.71	0.9 – 24.5	0.06

- Pre-mission SP scores are predictive: OR = 2.2
- For every SP scale step higher at start, the odds of being 6 or 7 (SP) at the end of the mission increased by 2.2 (OR)

Factors associated with post-mission fatigue

Significant factors	Non-significant factors
	Service type (ICU or PICU)
Pre-mission fatigue	Transport mode
Mission duration	Shift type (roster/on-call)
Day or night mission	Number of consecutive shifts
Mission difficulty	Sleep previous 24 hours
	Role (flight nurse or doctor)
	Acuity of patient
* p<0.01	Sole clinician

Psychomotor Vigilance - PVT

- Significant difference between pre and post-mission reaction-times, $p = 0.01$
- No significant difference number of lapses >500ms from pre to post mission
- Effect of distraction in a clinical setting?
- Practice or training effects?
- Compensating?

Discussion

- Severe fatigue (reported) was noted relatively frequently
- Baseline fatigue, mission duration, logistic difficulty of a mission and time of day are all significant predictors of clinician fatigue
- Prospective study design based on work clinicians actually undertook, but the environment may have been distracting for objective tests

Discussion cont.

- Findings from the clinical setting support the validity of the assessment tools - routine fatigue risk management
- Future methodology should account for performing objective tests in a busy clinical environment
- Use of simulation in future research to assess the impact of fatigue on performance

Conclusions

- Clinician fatigue is common in aeromedical missions even of moderate duration
- Fatigue in aeromedical crews has implications for clinical care and aeromedical patient safety
- Measuring 'human factors' aspects of clinician performance may provide valuable insight for managing fatigue

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