

# Carbon dioxide levels surgical helmets

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## Background

Surgical helmets and togas protect the patient and the surgeon


Episodes of headaches and nausea in togas

Two incidents of de-scrubbing

Spontaneous resolution

Respiration within a confined area can increase CO<sub>2</sub> levels

# Higher CO2 Levels

Substance		CAS number	Workplace exposure limit			
			Long-term exposure limit (8-hr TWA reference period)		Short-term exposure limit (15-minute reference period)	
			ppm	mg.m <sup>-3</sup>	ppm	mg.m <sup>-3</sup>
Carbon dioxide		124-38-9	5000	9150	15000	27400

- Affects Cognition:
  - > 1000, >1400, > 2500, > 2700 ppm
- Affects practical performance
  - > 1500, > 2500 ppm

## AIMS

- Investigate the CO2 levels within surgical helmets
  - Are levels higher than the HSE guidelines?
  - Are levels high enough to potentially impact surgical performance
- Value of 2500 ppm

# Methods

- Bluetooth monitor inside helmet
- Stryker Flyte Toga



THR	TKR	REV THR	REV TKR	ASSIST	PAEDS CASE	TOTAL
21	4	4	1	3	1	<b>34</b>

**5 Surgeons**

Mean CO2:

Combined data = 2972 ppm

Mean > 2500 ppm 26 cases

Mean > 5000ppm = 0 cases

# Results

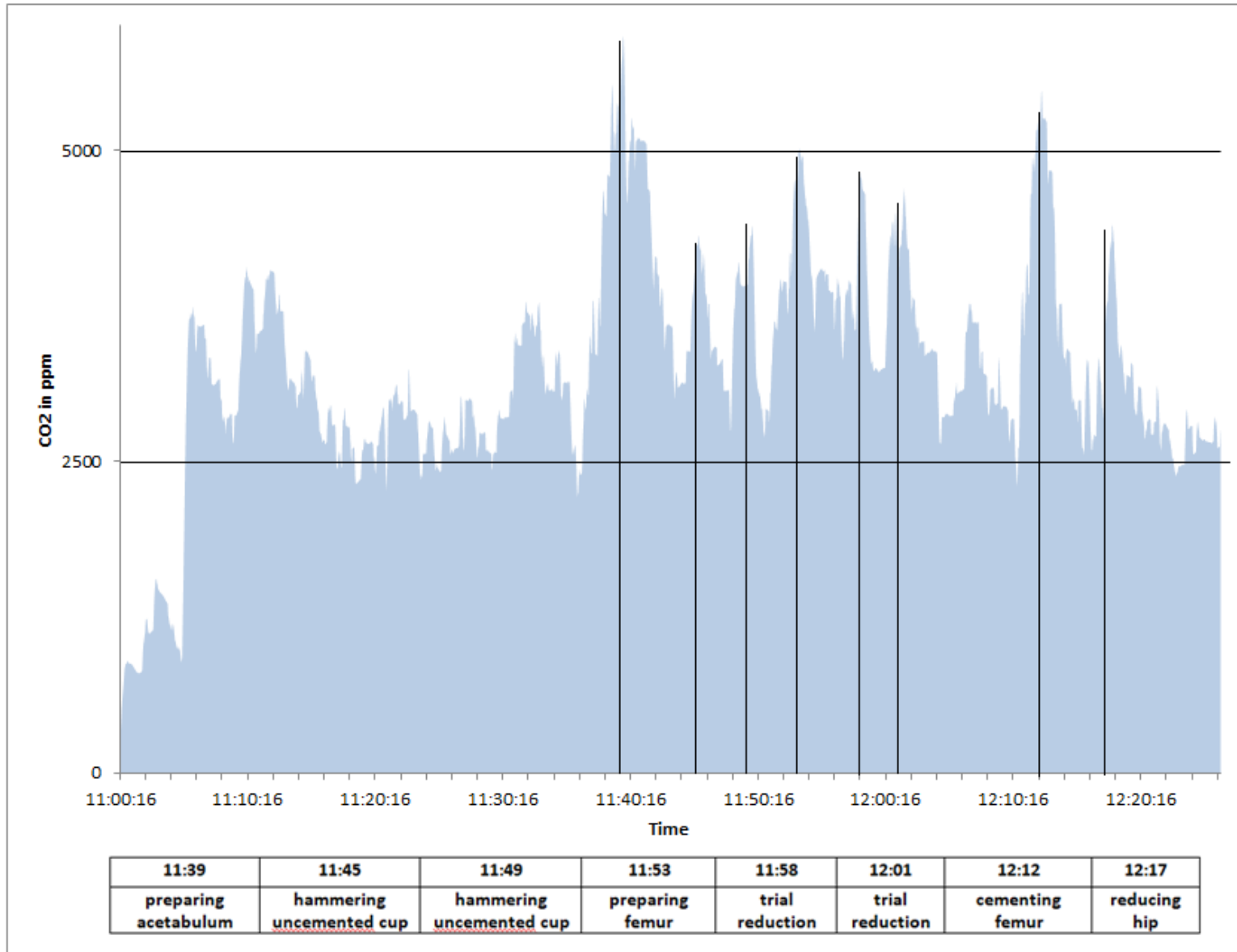
**Operative Time spent > 2500ppm: 70.0 %**

**Operative Time spent > 5000ppm: 5.5 %**

**Median procedure length 82 minutes (36-207)**

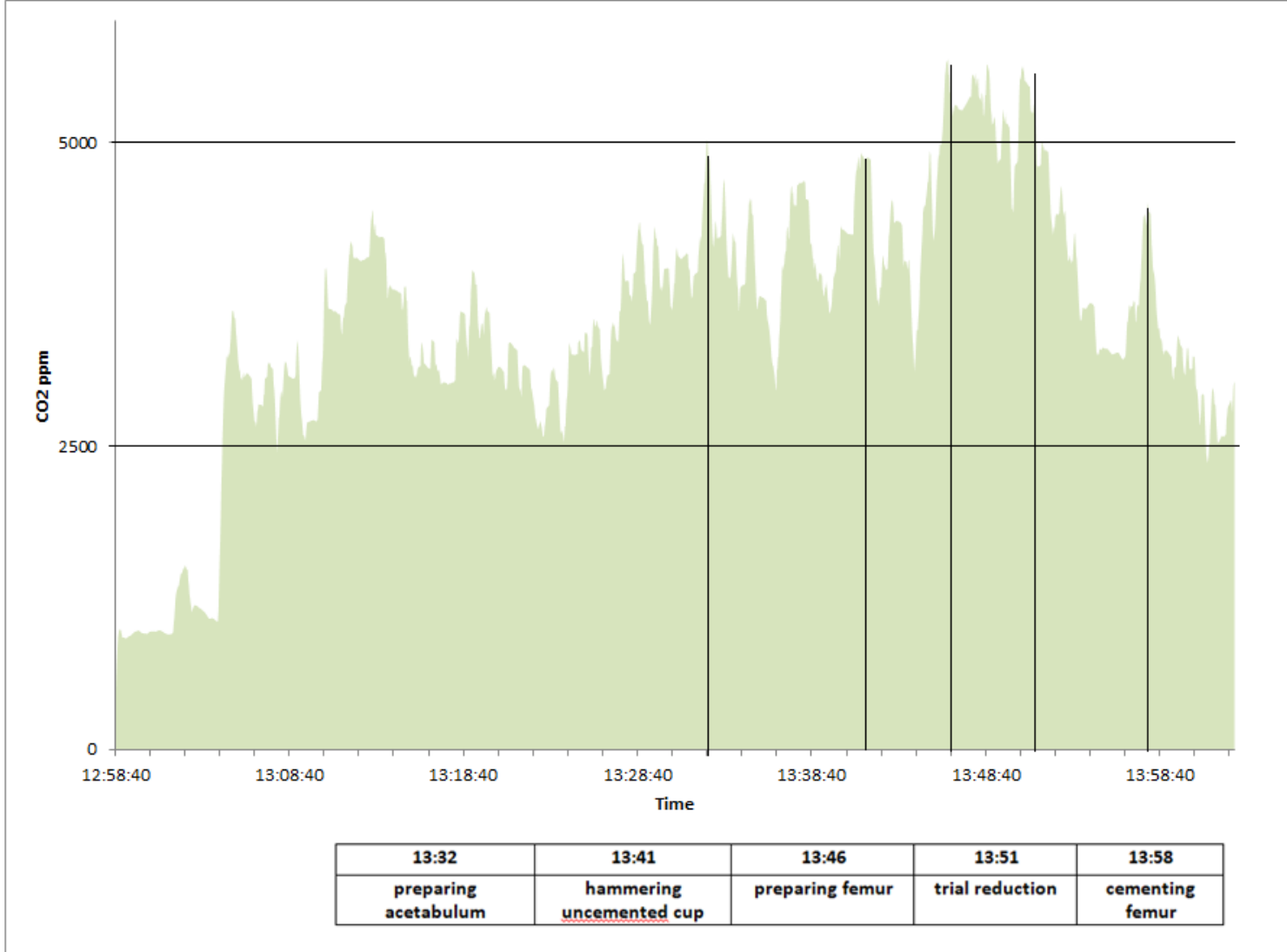
# Example case 1

Fellow  
Primary  
THR



# Example case 2

Consultant  
primary  
THR  
Pt BMI 40



**Limitations** Pilot study Limited experimental data  
No objective cognitive/practical assessments in surgical helmets

# Conclusion

- Large proportion of operating time spent > 2500 ppm, level of possible cognitive inhibition
- > 5000ppm at points – correlates with activities, but Within HSE level
- We continue to use Togas in our unit
  - Belief in the benefit for patients and clinicians
- Suggest higher fan speed (from experimental data) Further research needed to investigate this

## References

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