Respiratory Chemosensitivity and Sleep as Risk Factors for Postop OIRD

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Background


https://www.medicalnewstoday.com/articles/322925.php

Opioid induced respiratory depression (OIRD):

The frequency of significant respiratory depression among post-operative patients may be as high as 2% [1]

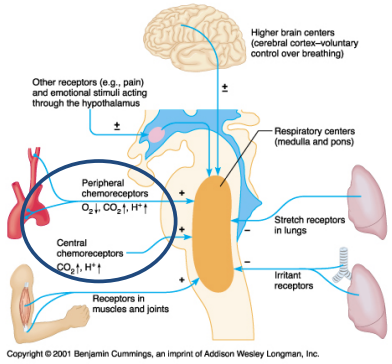
OIRD Risk Factors?

Age, sex
Comorbidities
Opioid dependence [2]

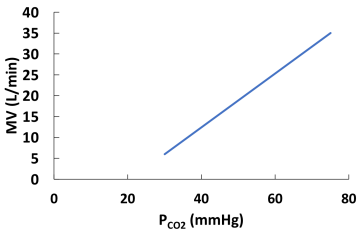
1. Golder, F.J., M.M. Hewitt, and J.F. McLeod, Respiratory stimulant drugs in the post-operative setting. Respiratory physiology & neurobiology, 2013. 189(2): p. 395-402.
2. Gupta, K., et al., *Risk factors for opioid-induced respiratory depression and failure to rescue: a review*. Curr Opin Anaesthesiol, 2018. **31**(1): p. 110-119.

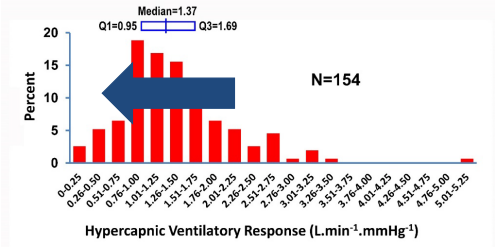
Background

Hypercapnic Ventilatory Response



(HCVR)





IRB-approved study conducted at Duke University Medical Center

Purpose

To provide data that will assess the role of respiratory chemosensitivity of patients receiving major surgery in determining postoperative respiratory depression due to opioids

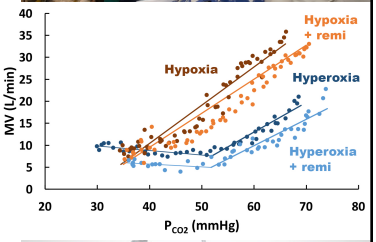
To determine whether respiratory events are more likely during sleep (and if so, what specific phases of sleep)

Methodology

- Patient Recruitment: Preoperative Screening Clinic
  - 18 years or older
  - Undergoing major, non-thoracic surgery
  - Exclusion criteria: pregnancy, history of adverse reaction to remifentanil, chronic use of opioids, sickle cell disease, coronary artery disease, and history of a neurological injury or stroke

Methodology

- Pre-surgery Testing
  - Respiratory chemosensitivity: Duffin's modified rebreathing method [3]
    - HCVR in setting of hyperoxia (150 mmHg) and mild hypoxia (50 mmHg)
    - Remifentanil effect site concentration: 2.0 vs. 0.7 ng/ml
  - Pre-Operative Sleep Study



http://www.itamar-medical.com/watchpat-central-plus/

3. Duffin, J., *Measuring the respiratory chemoreflexes in humans.* Respiratory Physiology and Neurobiology, 2011. **177**(2): p. 71-9.

Methodology

- Post-surgery Monitoring
  - Opioid consumption and timing
  - PACU to Postop Morning 1

RR, MV

P_{TCCO2}

Sleep (AHI)

  - PACU to discharge

SpO_2

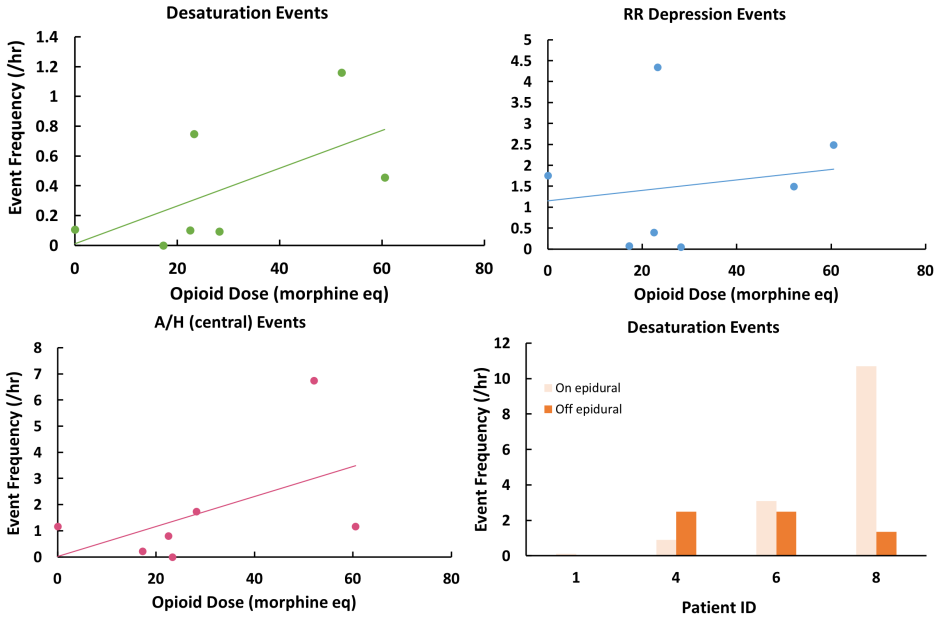
End points: "Respiratory Events"

1) **RR < 80% of baseline**
2) **MV < 80% of expected MV (based on BMI)**
3) **SpO_2 < 90% (room air) or 92% (+ O_2)**
4) **P_{TCCO2} > 50 mmHg**

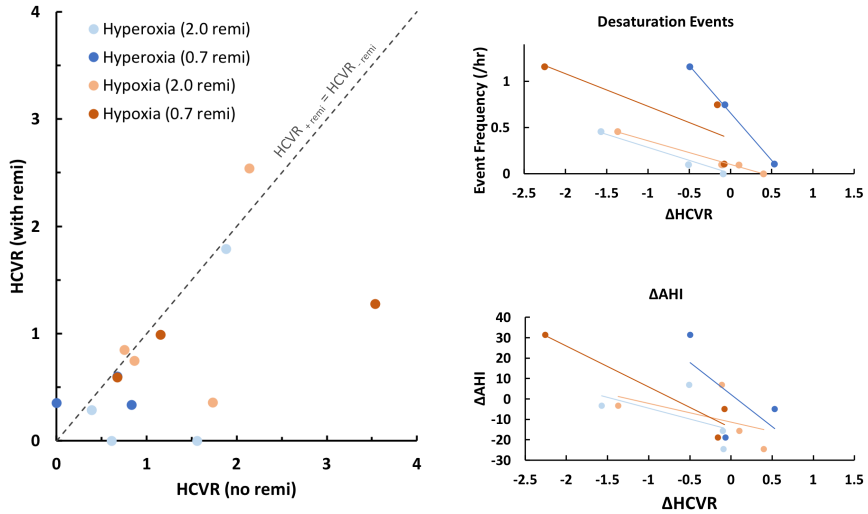
Preliminary Results

Age	Sex	Surgery	ΔAHI	Total opioid dose (MME)	Epidural opioid dose (MME)	Opioid intake frequency (MME/hr)
68	M	Colectomy	-24.6	177.9	52.9	3.9
58	M	Pancreatectomy	+6.9	22.5	-	1.1
63	M	Robotic prostatectomy	+4.9	240.5	-	2.8
80	M	Colectomy	+6.6	45.0	32.5	0.9
65	F	Colectomy	-18.9	52.7	35.2	1.2
68	M	Retropubic prostatectomy	+0.9	32.5	-	1.4
53	M	Pancreatectomy	+31.4	294.4	66.4	6.2

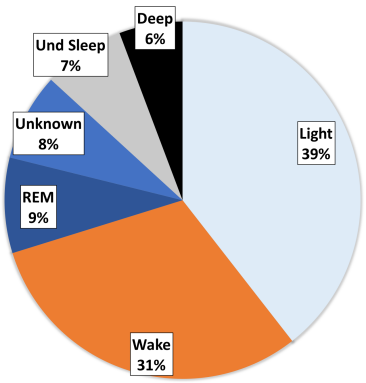
Preliminary Results

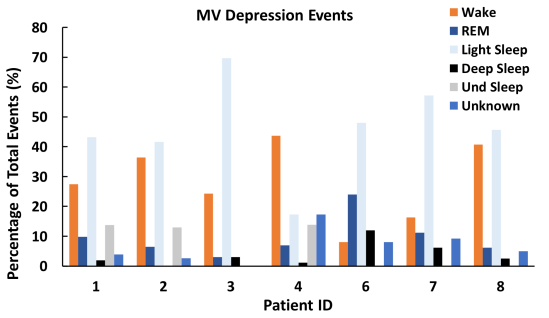


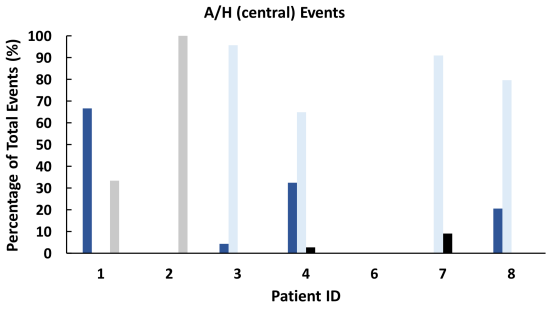
Preliminary Results



Preliminary Results







Conclusions and Moving Forward

- Establishment of methodology
  - Remifentanil site concentration of 0.7 ng/ml is adequate to measure opioid effect on respiratory chemosensitivity
- Preliminary findings:
  - Frequency of respiratory events generally have a positive correlation with total opioid dose and ΔHCVR
  - Respiratory events occur mostly during light sleep

Thank You

Questions?