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Fentanyl-Induced Wooden Chest Syndrome Masquerading as Severe Respiratory Distress Syndrome in COVID-19

Grace Judd BS, Rachael Starcher MD, David Hotchkin MD

Case Presentation

History

- 47 yo M with no PMH presented with fever and respiratory distress
- Admitted for COVID-19 pneumonia

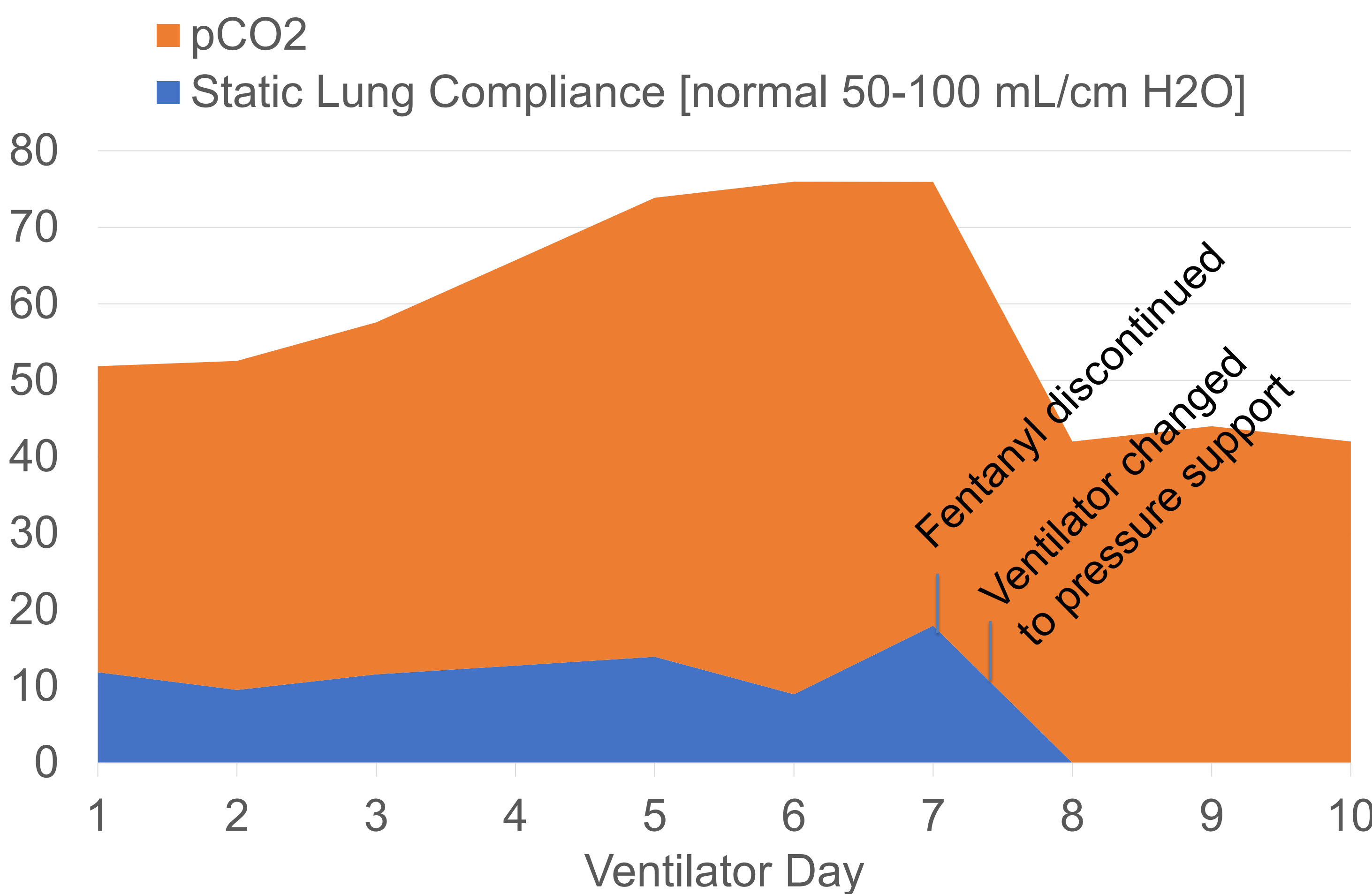
Hospital Course

- Intubated for moderate acute respiratory distress syndrome (ARDS) on hospital day 11
- Fentanyl infusion started
- Hypoxia improved within 36 hrs but plateau pressures consistently >30 cm H₂O despite minimizing dead space
- Trial of airway pressure release ventilation worsened hypercarbia
- Bronchoscopy w/o mucous plugging, airway collapse, or purulent secretions
- Lung compliance worsened (P_{plat}=50 on 4 cc/kg) w/o change in oxygenation
- Developed suspicion for wooden chest syndrome (WCS) and discontinued fentanyl

Outcome

- P_{plat} nadired at 16 within one hour after stopping fentanyl
- Pt successfully extubated on VD 10

Low Lung Compliance with Worsening Ventilation



Compliance is Inverse to Transpulmonary Pressure

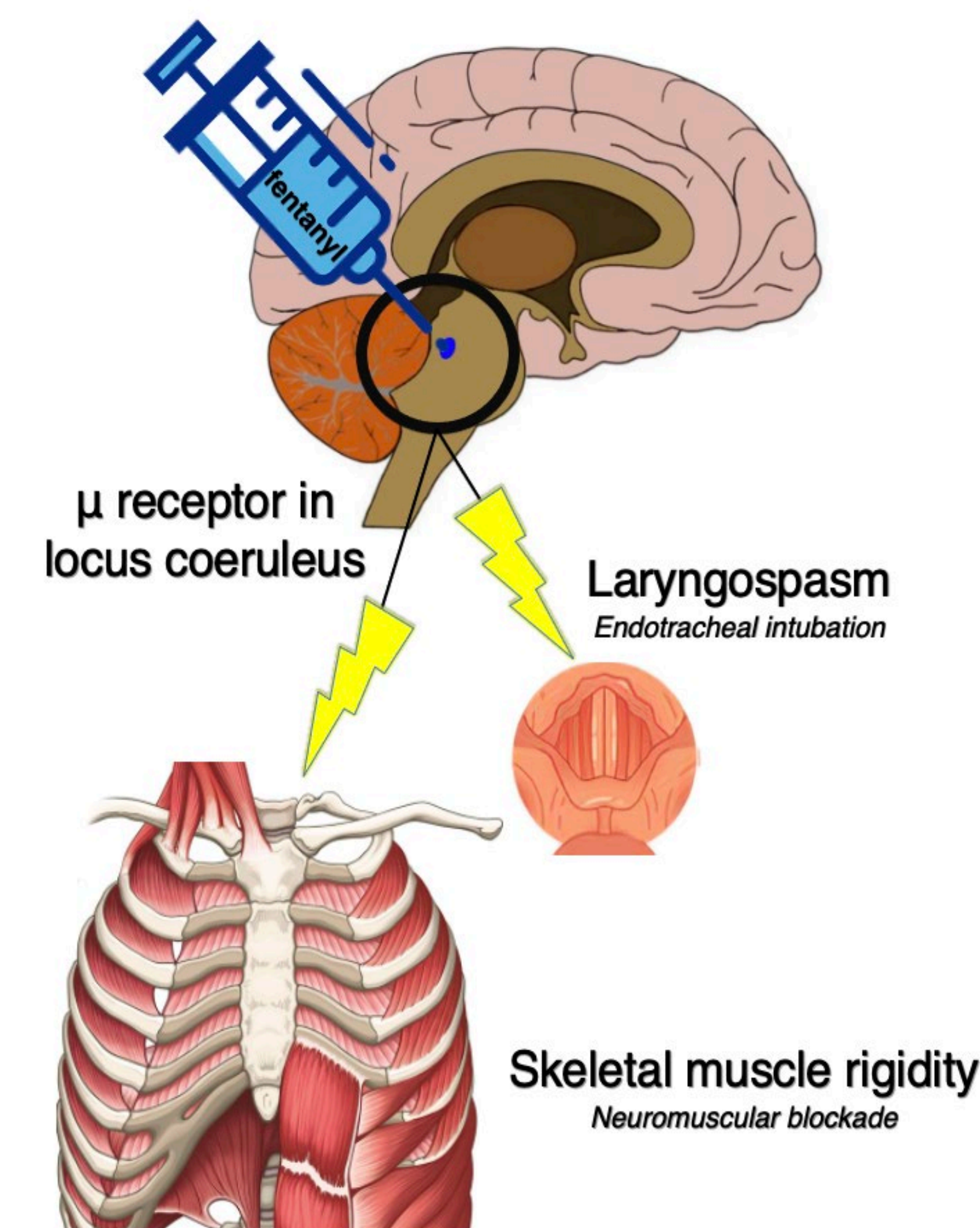
$$C = \frac{\Delta v}{\Delta p} = \frac{\Delta v}{p_{av} - p_{pl}}$$

C = lung compliance
 V = volume
 p_{av} = alveolar pressure
 p_{pl} = pleural pressure

Poor Compliance in both ARDS and WCS

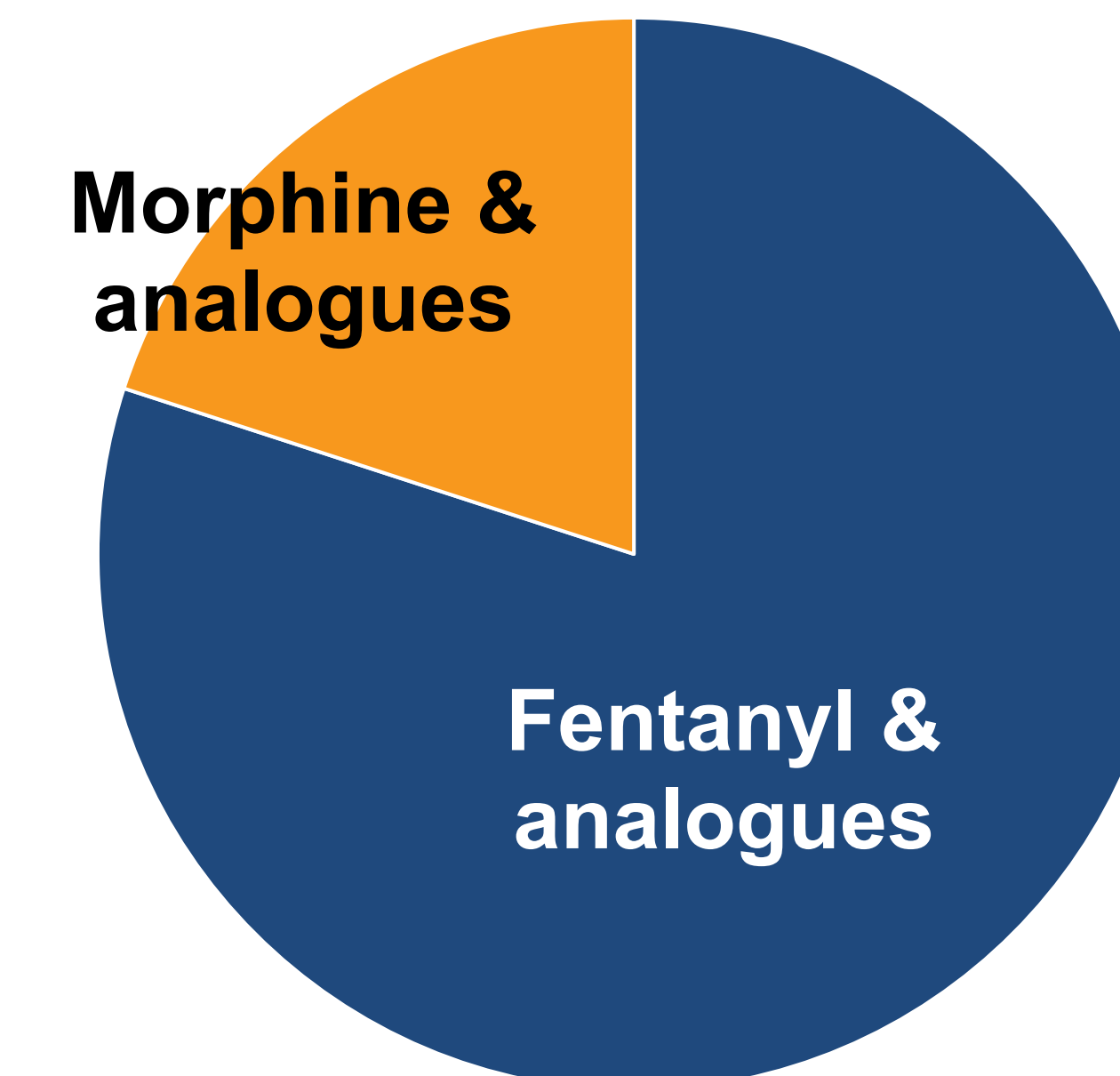
	COVID-19 ARDS	Wooden Chest Syndrome
Plateau pressure	High	High
Lung compliance	Low	Low
Alveolar pressure	High	Low
Pleural pressure	Low	High

Fentanyl Activates Muscles



Likely Prevalence

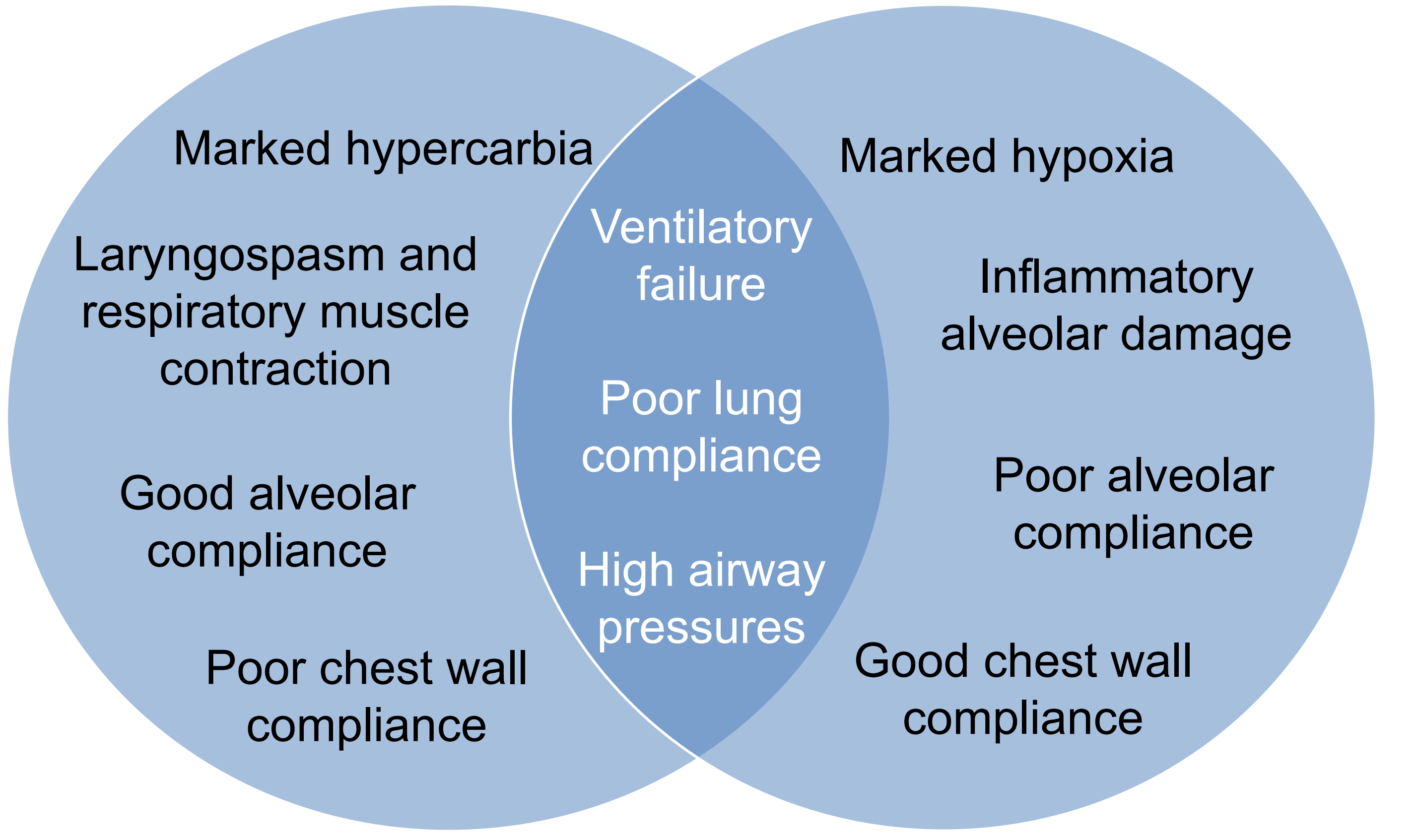
Frequency of Opiates Used in ICU†



Fentanyl is the most used analgesia in ICU patients on mechanical ventilation

99%♦ of people develop at least mild muscle rigidity when given fentanyl

Wooden Chest Syndrome v. COVID-19 ARDS



Takeaway Points

- Fentanyl uniquely activates laryngeal and respiratory muscle potentially leading to a fatal syndrome known as Wooden Chest Syndrome (WCS) manifested by poor ventilation
- *It is likely more common than clinicians realize*

Implications in practice:

- Maintain a high index of suspicion for alternate or overlying physiologies when treating persistent ventilatory failure in ARDS in COVID-19

Recommendation:

- Discontinue fentanyl if lung compliance and ventilatory failure seem out of proportion to hypoxia

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