

Title- Effects of Fentanyl Exposure during Mechanical Ventilation: A Retrospective Study

Rachel Ko¹, Dan Wright¹, Jonathan Irvin¹, Anna Guo¹, Saira Khan¹, Zachary Holtzapple, MD², Andrew Abrahamian, MD², William Barnett, MS², Brian Kaminski, DO³, Ragheb Assaly, MD⁴

¹College of Medicine and Life Sciences, The University of Toledo, Toledo, OH 43614

²Division of Internal Medicine, Department of Medicine, The University of Toledo, Toledo, OH 43614

³Department of Emergency Medicine, ProMedica, Toledo, OH 43615

⁴Division of Pulmonary and Critical Care, Department of Medicine, The University of Toledo, Toledo, OH 43614

*Corresponding author: rachel.ko@rockets.utoledo.edu

Keywords: Internal Medicine, Critical Medicine, Quality Improvement

Published: 14 December 2023

Background: Analgesics and sedation are often administered to ensure the comfort and safety of patients receiving mechanical ventilation (1). Patients are commonly treated with fentanyl, an opioid, to provide both pain control and sedation while mechanically ventilated. As opposed to benzodiazepines or propofol, fentanyl results in better pain control but is associated with risks such as chest wall rigidity, that may negatively impact outcomes of patients placed on mechanical ventilation (1, 2).

Objective: To assess the impact of fentanyl exposure on the outcomes of patients who undergo mechanical ventilation.

Methods: This study was a retrospective cohort study of 1191 patients from a tertiary care center. Data was gathered for all mechanically ventilated patients that survived to discharge from 2019-2022. The cumulative dose of fentanyl was quantified throughout the patient's hospital stay. Outcomes including ICU and total length of stay were ascertained upon review of the patient's medical record.

Results: Greater fentanyl exposure was associated with a longer duration of ICU and total hospital length of stay. ICU length of stay increased by 1.09 days when exposed to low doses of fentanyl and 8.78 days with higher exposure. High-dose fentanyl exposure increased total hospital length of stay by 9.71 days.

Conclusions: Higher levels of fentanyl exposure while on ventilator support significantly increased ICU and total hospital length of stay. Longer length of stay is associated with negative health outcomes such as hospital-acquired infection and cardiac arrhythmias. High doses of fentanyl in critically ill patients predisposes them to serious and life-threatening medical complications.

References

1. Tedders, K.M., McNorton K.N., and Edwin S.B. Efficacy and safety of analgosedation with fentanyl compared with traditional sedation with propofol. *Pharmacotherapy*, 2014. **34**(6): p. 643-7.
2. McGreevy, J.L., Piraino, S.T., and Sandhu, G. Fentanyl-Associated Serotonin Syndrome and Chest Wall Rigidity in an Intensive Care Unit Patient. *Am J Ther*, 2019. **26**(5): p. e612-e614.