Daily and Cumulative Opioid Use in Mechanically Ventilated Intensive Care Unit Patients Receiving Propofol Versus Dexmedetomidine: A Retrospective Cohort Study

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BACKGROUND

- Mechanically ventilated ICU patients require both analgesia and sedation to support comfort, safety, and ventilator synchrony.
- The 2018 and updated 2025 PADIS guidelines recommend [1,2]:
  - An analgesia-first approach to sedation.
  - Use of non-benzodiazepine sedatives (propofol or dexmedetomidine).
  - Targeting light, goal directed sedation of RASS score –2 to 0.

Updated recommendation
Dexmedetomidine is now conditionally preferred over propofol, reflecting newer evidence of reduced delirium.

Pain
Routine assessment is essential; treat with opioids before considering sedatives.

Agitation / sedation Updated
Dexmedetomidine recommended over propofol for sedation quality and delirium reduction.

Delirium
Nonpharmacologic steps such as reorientation and sleep optimization are recommended.

Immobility
Enhanced mobilization and rehabilitation are favored over usual care for better functional outcomes.

Sleep disruption
Interventions to optimize sleep, like minimizing nighttime disturbances, are suggested.

- Evidence evaluating the impact of sedative choice on opioid requirements is limited and inconsistent, with major trials and meta-analyses, including the SPICE III, demonstrating no consistent difference in opioid use between propofol and dexmedetomidine in mechanically ventilated ICU patients[3,4].
- Understanding differences in daily and cumulative opioid exposure between propofol and dexmedetomidine is clinically important due to the potential to reduce opioid-related complications.

Propofol	Dexmedetomidine
GABA-agonist	α_2-agonist
Sedation: Deep, profound sedation	Sedation: Lighter, cooperative sedation
Analgesic profile: No intrinsic analgesic effect	Analgesic profile: Opioid-sparing potential

OBJECTIVE

- To quantify and compare daily and cumulative opioid use (MME) among mechanically ventilated ICU patients receiving propofol versus dexmedetomidine, versus both propofol and dexmedetomidine.

STUDY DESIGN/METHODS

- **Study Design**
  - Retrospective cohort study which evaluated mechanically ventilated ICU patients receiving propofol, dexmedetomidine, or both agents for sedation at a 235-bed teaching hospital from January 2022–January 2025.
- **Data Collection**
  - Demographics, clinical characteristics, sedative regimen details, daily and cumulative opioid exposure (MME), adjunctive analgesics, and clinical outcome were obtained from the WRMC EMR and pharmacy medication administration records.
- **IRB Approval:** Palm Beach Atlantic University Institutional Review Board.

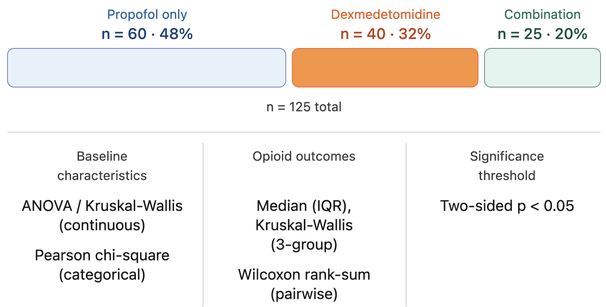
Inclusion Criteria	Exclusion Criteria
• Age >18 years old • Mechanically ventilated • Critically ill in the intensive care unit • Received propofol or dexmedetomidine	• Deep sedation requirements • Pregnancy • Substance use disorder • Propofol administration for seizures/alcohol withdrawal • Cancer • Palliative care • Documented opioid use prior to admission

OUTCOMES

Primary
- To evaluate the association between sedative regimen (propofol only, dexmedetomidine only, or both) and opioid use during ICU stay, quantified as total and average daily fentanyl MME in mechanically ventilated patients.

Secondary
- Incidence of bradycardia and delirium across sedation groups.
- Opioid prescribing patterns at hospital discharge.
- ICU length of stay and duration of mechanical ventilation.

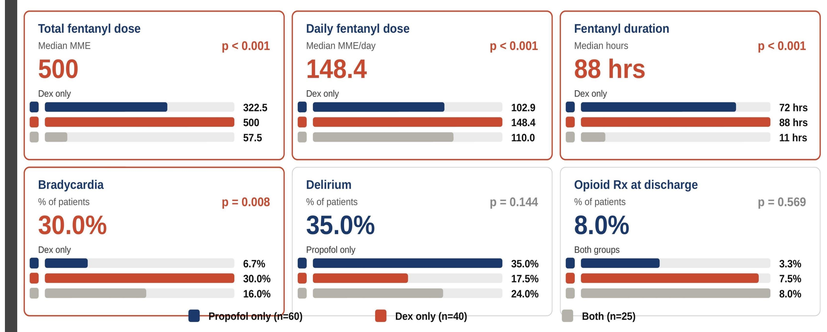
ANALYSIS



RESULTS

- Dexmedetomidine-only sedation was associated with significantly greater fentanyl exposure compared to propofol-only (p<0.001). Bradycardia was also more frequent with dexmedetomidine (30.0% vs. 6.7%, p=0.002).

Indication for MV: Respiratory failure (Propofol 55.0% | Dex 52.5% | Both 64.0%) vs. Sepsis (Propofol 45.0% | Dex 47.5% | Both 36.0%) — p=0.646



DISCUSSION/CONCLUSION

- **Discussion**
  - Dexmedetomidine produces a more cooperative, arousable level of sedation, which may allow patients to express pain or discomfort more readily, potentially leading to increased fentanyl administration.
  - The higher fentanyl use observed in the dexmedetomidine group may reflect differences in sedation characteristics rather than differences in pain burden.
- **Limitations**
  - Single-center, retrospective design.
  - RASS scores, sedation intent (pain vs. analgosedation), and unmeasured confounders not captured.
- **Conclusion**
  - Dexmedetomidine-only sedation was associated with significantly greater daily and cumulative fentanyl exposure compared with propofol-only sedation (p<0.001), despite its proposed opioid-sparing effects. This finding is consistent with results from SPICE III [4] and the A2B trial [5] .
  - Sedative choice may influence opioid administration patterns in mechanically ventilated ICU patients and should be considered when evaluating analgesic exposure.
  - Further prospective studies are needed to determine whether observed differences are related to sedation depth, pain assessment practices, or the intrinsic analgesic properties of the sedative agent.

DISCLOSURES

- The authors have nothing to disclose.

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