Levels of Sedation Associated with Dexmedetomidine Versus Midazolam in Critically-Ill Pediatric Patients

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Background

- Inappropriate levels of sedation in adults and pediatrics associated with worse outcomes (duration of mechanical ventilation, ICU delirium)
- Rate of over and under-sedation in pediatrics found to be 32% and 10%, respectively
- Traditionally used benzodiazepine-based regimen
- Dexmedetomidine increasingly used in pediatrics, associated with under-sedation in several studies
- No formal head-to-head comparison in clinical practice
- State Behavior Scale (SBS) one of several scoring tools in mechanically-ventilated, non-paralyzed pediatric patients 6 weeks to 6 years old

Score	Description	Characteristics
(-3)	Unresponsive	No respiratory effort or cough Non-responsive to stimuli No movement
(-2)	Responsive to noxious stimuli	Spontaneous supported breathing Cough with suction Response to noxious stimuli Occasional movement
(-1)	Responsive to gentle touch or voice	Ineffective non-supported breathing Response to voice/touch Distractible, able to be calmed
0	Awake and able to calm	Effective breathing, cough Response to voice
+1	Restless, difficult to calm	Ventilator dyssyncrhony Responds to voice Inattention Not consolable, agitated
+2	Agitated	Spontaneous cough Biting ETT, pulling lines Inconsolable Increased movement

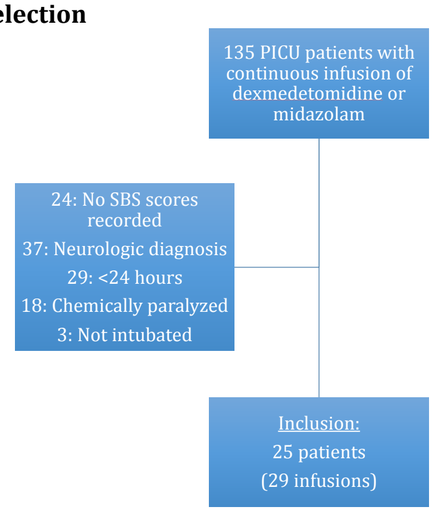
Objectives

- To determine if sedative agents were associated with varying levels of sedation in PICU patients
- Primary outcome: average SBS values
- Secondary outcomes: # prn sedatives/day, incidence of adverse effects attributed to sedation, cost per patient
- Goal: provide data for developing sedation guidelines

Study Design

- Single-center, retrospective chart review (6mo period)
- Assessed for PICU patients with MAR actions for midazolam or dexmedetomidine who had SBS values recorded
- Statistical analysis of levels of sedation and # prn doses/day using One-Way ANOVA
- Descriptive assessment of adverse effects

Patient Selection



Patient Characteristics

Characteristic	D (n=6)	M (n=10)	D+M (n=9)	P value
Male gender	2 (33%)	4 (40%)	6 (66%)	0.7
Average age (months)	102 ± 35	26 ± 8	54 ± 20	0.06
Average weight (kg)	30.4 ± 9.1	11.1 ± 1.9	21.2 ± 7.4	0.11
Indication: Respiratory Failure Postoperative	 5 1	 7 3	 4 5	0.28
Duration of intubation (hours)	119 ± 22	146 ± 29	90 ± 28	0.36
Baseline PRISM	12.8 ± 3.4	4.4 ± 1.2	3.4 ± 1.8	**0.02** D vs M, p<0.05 D vs C: p<0.05
Concomitant opioid	6 (100%)	9 (90%)	9 (100%)	0.44

D=Dexmedetomidine, M=Midazolam, C=Combination

Results

	D (n=8)	M (n=10)	D+M (n=11)	P value
Mean of Average SBS	-0.78 ± 0.23	-0.81 ± 0.13	-0.78 ± 0.25	0.99
Mean of intermittent sedatives/day	7.6 ± 1.5	7.5 ± 0.9	8.4 ± 1.0	0.87

Adverse Effects

- Four cases of ICU/emergence delirium describe (1 with dexmedetomidine, 1 with midazolam, 2 with combination therapy)
- One unplanned extubation (dexmedetomidine) requiring re-intubation and higher doses

Cost

	D	M
AWP / vial	$66.66 (200mcg/50mL)	$8.28 (50mg/10mL)
Cost/day for 10kg patient using starting dose	$20 (0.25mcg/kg/hr)	$2 (0.05mg/kg/hr)

Limitations

- Small sample size
- Confounding variables
- Heterogeneous population (baseline PRISM)
- Doses not assessed (discrepancy with orders and MAR)
- Opioid infusions/prn doses
- Excluded neuro diagnosis
- Did not separately evaluate patients with deeper goal sedation (e.g. critical airway)
- Intra-user variability of SBS
- Screening and documentation of adverse effects, including delirium not standardized

Conclusions

- SBS levels of ~(-1) may be achieved with dexmedetomidine or midazolam
- Combination therapy not demonstrated to achieve deeper level of sedation
- Preferred agent should depend on desired medication effects (hemodynamics, respiratory status), patient-specific factors (past history of difficulty weaning), potential complications of long-term use and medication/administration cost

References

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