

## Dexmedetomidine use in pediatric intensive care settings

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## Acknowledgments

### Co-investigators

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## Background

- Dexmedetomidine (Precedex®)
  - Intravenous  $\alpha_2$ -agonist
  - Sedative & analgesic properties
- FDA approved for use in adults
  - Continuous sedation up to 24 hours
  - Procedural sedation in non-ventilated patients
- Currently no standards to guide practice in pediatrics
  - Used for continuous sedation at Children's National in the PICU & CICU

## Dexmedetomidine

- Potential advantages
  - Fewer side effects than benzodiazepines
  - Absence of respiratory depression
  - Faster awakening time, decreased delirium
  - Faster wean of concomitant sedatives
  - Expedited extubation
  - Predictable & stable response

## Objective & Hypothesis

- To analyze the use of dexmedetomidine in a convenience sample of intubated children in the PICU and CICU at Children's National
- Use of dexmedetomidine in a continuous sedation protocol will result in reduced need for concomitant sedatives/analgesics, resulting in a shorter duration of mechanical ventilation

## Methods

- Retrospective MUE of 50 patients
- Inclusion criteria
  - Patients admitted to Children's National between July 2008 and January 2010 who received dexmedetomidine while mechanically ventilated in the PICU or CICU
- Exclusion criteria
  - Surgical critical airway / laryngotracheal reconstruction (LTR) patients

## Study Endpoints

- Primary Endpoint:
  - Average percentage reduction in concomitant benzodiazepines and opioids associated with dexmedetomidine
- Secondary Endpoint:
  - Mean times of initiation of dexmedetomidine compared to time of intubation & extubation
  - Average initial infusion rates & titration
  - Incidence of hypotension & bradycardia

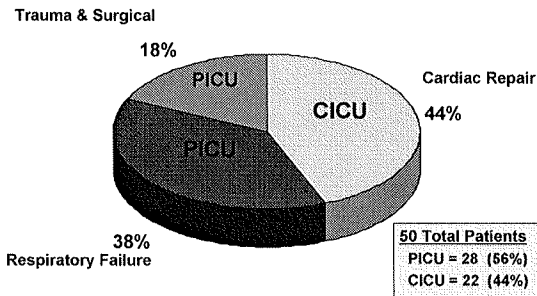
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## Data Elements

- Patient demographics
- Primary patient diagnosis & co-morbidities
- Reason for ICU admission & initiating dexmedetomidine
- Total LOS, ICU LOS, & duration of intubation
- Total daily doses of all sedatives & analgesics
- Dexmedetomidine dosing
  - Total infusion rate & total bolus doses each day
- Daily blood pressure & heart rate ranges
  - 24 hours before & during dexmedetomidine infusion
- Daily pain and sedation scores

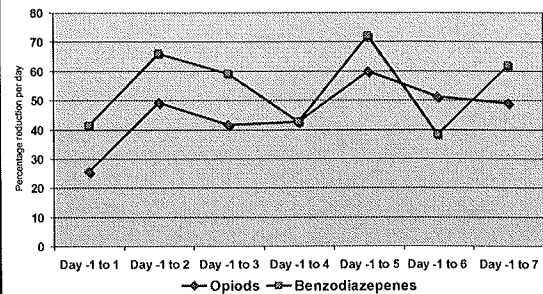
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## Reason for ICU admission



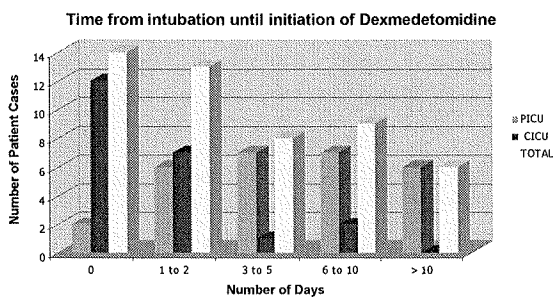
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## Change in Concomitant Meds



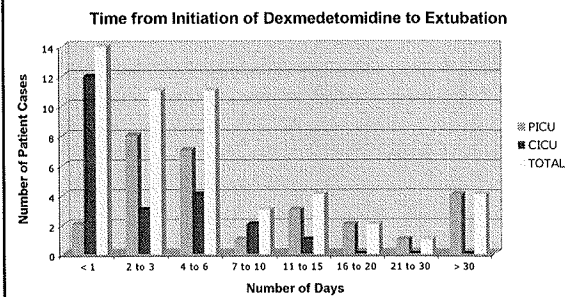
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## Results



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## Results



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## Results

PICU & CICU Averages

	Age	Initial rate mcg/kg/hr	Dosing Range mcg/kg/hr	Treatment days**	Intubation to Initiation (Days)	Initiation to Extubation (Days)	Avg % Titration Up	Avg % Titration Down
CICU (22)	1.8	0.36	0.1-2	1.3	1.5	2.9	43.5%	24.5%
PICU (28)	5.2	0.7	0.05-3	6.2	7.1	12.8	47.5%	31.6%

\*\*Dexmedetomidine days

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## Patients with Adverse Events

5 patients out of 50 (10%) experienced adverse effects during prece dex infusion (18% of patients in CICU, 3.6% of patients in PICU)

Pt # & UNIT	Age	Rate initiated (range)	Time on prece dex until event	Event	% Change from baseline
1 CICU	3 mos	0.5 (0.25-0.5)	4 hours	↓ BP	BP ↓ 32% (MAP = 34)
2 CICU	6 mos	0.3 (0.15-0.3)	6 hours	↓ HR	HR ↓ 46% (HR = 88)
3 PICU	15 years	0.5	22.5 hours	↓ BP ↓ HR	BP ↓ 37% HR ↓ 35%
4 CICU	2 mos	0.2 (0.2-0.4)	11 hours	↓ BP	BP ↓ 34% (MAP = 38)
5 CICU	9 mos	0.5 (0.1-1.2)	50.5 hours	↓ BP ↓ HR	BP ↓ 28% HR ↓ 43%

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## Limitations

- Study not powered (convenient sample size)
- No control group for comparison
- Not all patients had defined indications for dexmedetomidine
- Uncontrolled variables may have influenced titrations of opioids and benzodiazepines
  - Changes in patient clinical status
  - Ongoing procedures

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## Discussion

- CICU patients received lower doses, earlier initiation, faster extubation, & shorter infusion times, compared to PICU patients
- Our institution is using higher than standard infusion rates which have been reported in the literature
- The results show a trend towards decreasing usage of benzodiazepines and opiates with initiation of dexmedetomidine therapy
- Hypotension +/- bradycardia occurred in 5 patients, however 4 out of the 5 patients had congenital cardiac defects

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## Conclusion

- CICU patients and PICU patients may need separate sedation protocols due to variations in dexmedetomidine use
- Initiation of dexmedetomidine allows for a reduction in benzodiazepines and opioids
- Minimal adverse events occurred in both populations, with no correlation with dose
- Dexmedetomidine can be safe in pediatric patients despite the use of higher drip rates and extended infusions, compared to those reported in the literature

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## Future plans with data

- Analysis was ended early due to limited time
  - Evaluate concomitant medications
  - Evaluate use of dexmedetomidine boluses
  - Compare pain and sedation scores to drip rates of dexmedetomidine to evaluate clinical effectiveness
  - Evaluate overall economic impact of dexmedetomidine
- Plan to update current PICU and CICU sedation guidelines to include dexmedetomidine

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## References

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## Question

- What are the benefits of dexmedetomidine as a continuous sedative over midazolam?

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