EVALUATION OF EARLY VERSUS LATE NEUROMUSCULAR BLOCKADE IN ACUTE RESPIRATORY FAILURE

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Background

- Acute respiratory distress syndrome (ARDS) is characterized by hypoxemic respiratory failure

The Berlin Definition of ARDS		
Timing		Within 1 week of known insult or worsening symptoms
Chest imaging		Bilateral opacities
Origin of edema		Not explained by cardiac failure or fluid overload
Oxygenation	Mild	PaO_2/FIO_2 300 to 201 mm Hg with PEEP or CPAP ≥ 5 cm H_2O
	Moderate	PaO_2/FIO_2 200 to 101 mm Hg with PEEP ≥ 5 cm H_2O
	Severe	PaO_2/FIO_2 ≤ 100 mm Hg with PEEP ≥ 5 cm H_2O

- ARDS has mortality rate 40-60%
- Often requires mechanical ventilation
- Patient-ventilator dyssynchrony can create suboptimal oxygen exchange
- Role of neuromuscular blocking agent (NMBA)
  - Facilitate lung-protective mechanical ventilation
  - Potential decrease in lung or systemic inflammation directly by NMBA

Purpose

- To determine if there is a difference in 28-day ventilator-free days in patients with acute respiratory failure (ARF) receiving early vs. late administration of NMBAs
  - Early administration: ≤ 48 hours
  - Late administration: > 48 hours
  - ARF definition: SpO_2/FIO_2 ratio <315
- To determine if ARF patients receiving early NMBAs have
  - Lower ICU and hospital length of stay
  - Lower rate of 28-day mortality
  - Lower incidence of barotrauma, pneumonia, and ICU aquired paresis
  - Greater days without organ failure
- Compare median dose and duration of NMBAs
- Compare prescribed versus delivered tidal volume

Methods

Study Design

- Single health system, retrospective cohort study

Setting

- UR Medicine
  - Strong Memorial Hospital (850-bed Hospital in Rochester, NY)
  - Highland Hospital (260-bed Hospital in Rochester, NY)

Methods (cont.)

Selection of Participants

- March 2011to July 2015
- Inclusion
  - Adult patients (≥ 18 yo), admitted to adult ICU, requiring endotracheal mechanical ventilation for acute hypoxemic respiratory failure, on a continuous infusion NMBA for management of ARF
- Exclusion
  - Duration of mechanical ventilation < 48 hours, continuous infusion NMBA for an indication other than respiratory failure, and use of a NMBA for a duration < 24 hours

Study Procedures

- Utilized pre-existing data in the electronic medical record (EMR)
- Captured all patients with medication administration report (MAR) with a documentation of a continuous infusion of a NMBA
- Charts were reviewed to establish time of ARF diagnosis
- Eligible patients were then arranged into the two groups for comparison
- Data collection was then performed
- The study was approved by the institutional IRB

Statistical Analysis

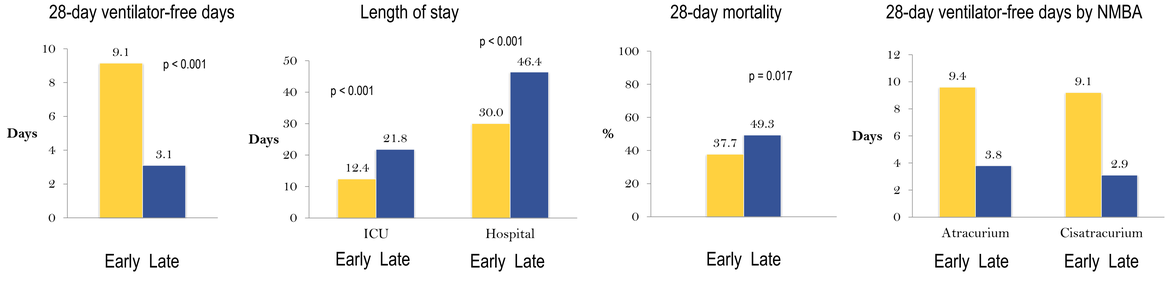
- Assuming 80% power and Type I error of 0.05, a sample size of 322 patients per group is required to detect a 2 day increase in ventilator-free days in the early NMBA group
- Descriptive statistics were used for the demographics
- Chi-square and Mann-Whitney Rank Sum analysis, as appropriate

Results

Baseline Characteristics	Early	Late	p value
Age, mean ± SD years	54.3 ± 15.7	55.4 ± 15.3	0.58
Sex, no. males (%)	229 (64)	90 (61.6)	0.70
Weight, mean ± SD kg	89.9 ± 27.1	90.5 ± 35	0.44
IBW, mean ± SD kg	65.8 ± 11	64.1 ± 11.7	0.51
NMBA used			
Atracurium, no. (%)	240 (67)	112 (76.7)	0.041
Cisatracurium, no. (%)	112 (31.3)	34 (23.3)	0.092
Rocuronium, no (%)	2 (0.6)	0 (0)	0.9
Vecuronium, no (%)	3 (0.8)	0 (0)	0.64

Disclosure: Authors of this presentation have nothing to disclose

Results (cont.)



Future analysis

- Ventilator settings and mechanics
- Dose and duration of NMBA
- Corticosteroids, epoprostenol, and nictric oxide use
- APACHE II scores
- SOFA scores
- Incidence of pneumonia, ICU paresis, and barotrauma
- Discharge disposition

Limitations

- Retrospective study design
- ARF defined with SpO2/FIO2
- Severity of illness scores
  - APACHE II
  - SOFA
- Unknown quality of neuromuscular blockade
- Did not meet statistical power for Late group

Conclusions

- Early onset of NMBA in ARDS is suggestive of higher 28-day ventilator-free days, shorter ICU and hospital stays, and reduced mortality
- Future studies should investigate early administration of continuous NMBA in ARF with a prospective, randomized controlled trial to assess the long-term outcomes to validate these results

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