Evaluation of adequate sedation and analgesia with the use of continuous infusion neuromuscular blocking agents

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Background

- The "Clinical Practice Guidelines for Sustained Neuromuscular Blockade in the Adult Critically Ill Patient" recommend patients achieve deep sedation with an analgesic and sedative prior to receiving a continuous infusion neuromuscular blocking agent (NMBA)[1]
- Prior to NMBA initiation, level of sedation may be assessed using RASS (Richmond Agitation-Sedation Scale) with a goal of -4 or -5 (deep sedation to unarousable)[1]
- After NMBA initiation, a paralyzed patient's level of sedation may be assessed using Bispectral Index (BIS) with a goal 40-60 (BIS monitoring may reduce awareness in paralyzed patients)[2,3]
- Patients with inadequate sedation while receiving NMBA may experience awareness and fear of death[4]
- During COVID, there was an increase in NMBAs use and shifts in staffing who may be unfamiliar with using NMBAs

Objective

- Evaluate the adequate use of sedation and analgesia in patients receiving NMBAs

Methods

Study Design: Retrospective, multi-center, quality assurance project

Sample Size: Patient selection was random and based on proportion of patients at each delivery network

Inclusion Criteria: Patients receiving continuous intravenous infusion NMBA between March 24 and May 8, 2020

Exclusion Criteria: Patients receiving only bolus or continuous infusion NMBAs for less than 1 hour

Primary Outcome: Incidence of adequate sedation and analgesia prior to NMBA initiation

- Adequate sedation = receiving a continuous infusion of ketamine, lorazepam, midazolam, or propofol and achieved a RASS of -4 to -5
- Adequate analgesia = receiving a continuous infusion of ketamine, fentanyl, hydromorphone, or morphine

Secondary Outcome:

- RASS documentation within 2 hours prior to NMBA initiation
- BIS documentation within 2 hours after NMBA initiation
- Incidence of medication orders not updated with appropriate RASS or BIS goal

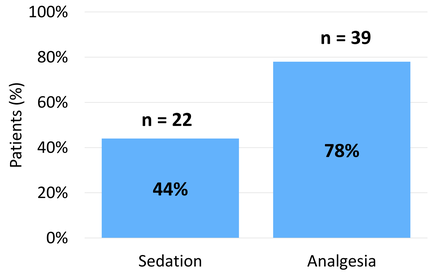
Results

Table 1. Baseline characteristics

Characteristics	n (%)
Age - years	62 ± 13
Gender - male	34 (68%)
BMI – kg/m^2	30.6 ± 6.5
Ethnicity	
Asian	2 (4%)
Black	7 (14%)
Caucasian	16 (32%)
Hispanic	25 (50%)
Positive COVID Status	46 (92%)
Serum Creatinine – mg/dL	1.6 ± 2.7
AST – units/L	82.5 ± 68.8
ALT – units/L	65.9 ± 56.4

Data presented as n (%) or mean ± SD
BMI, body mass index; AST, aspartate transaminase; ALT, alanine transaminase

Figure 1. Incidence of adequate sedation and analgesia



- Analgesia: 8 patients received as-needed intravenous push (IVP) analgesics (median 1mg [IQR 0-6.2mg] in first 24 hours), and 3 patients received no analgesics

Table 2. Documented sedation within or not within 2 hours

	Within 2 hours	Not within 2 hours
RASS documented	25/50 (50%)	25/50 (50%)
RASS at goal	17/25 (68%)	6/25 (24%)

	Within 2 hours	Not within 2 hours
BIS documented	18/50 (36%)	32/50 (64%)
BIS at goal	16/18 (89%)	2/32 (6%)

Figure 2. Median time of most recent RASS documentation prior to and BIS documentation after NMBA initiation

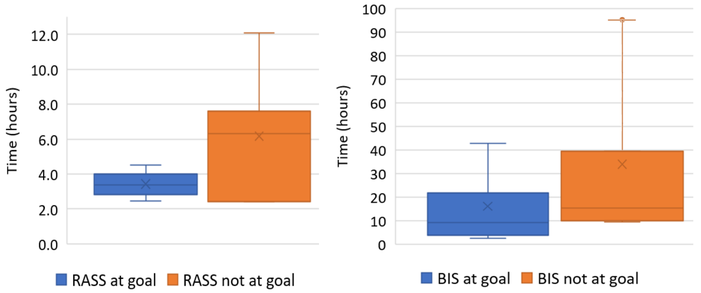
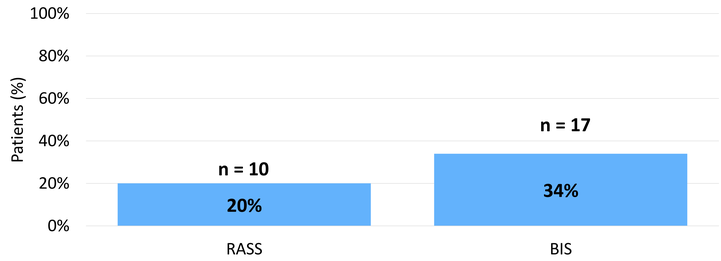


Figure 3. Medication orders updated with appropriate goal



Discussion

- Inadequate documentation of sedation or analgesia was possibly due to
  1) missing continuous infusion order for sedation/analgesia
  2) missing documentation of RASS/BIS at goal
  3) medication orders not updated with appropriate goal parameters
- Patients receiving as needed intravenous push analgesia may have received suboptimal analgesia – Pain assessment (HR >15% baseline, tearing, diaphoresis) may be unreliable in paralyzed patients[1]
- Patients with timely documentation were more likely to be at goal sedation[5]
- Limited availability of BIS monitors likely contributed to missing BIS documentation

Limitations

- Retrospective analysis
- Small study population
- Data was abstracted from nursing flowsheet. Nursing progress notes were not reviewed

Conclusions

- Sedation orders with inappropriate goals may have contributed to inadequate sedation
- Patients receiving NMBA should receive continuous infusion analgesia to ensure adequate pain control
- Electronic health record should be optimized to ensure:
  1) Continuous infusion sedation and analgesia are ordered when starting a continuous infusion NMBA
  2) Sedation and analgesia orders are updated with appropriate goals
  3) Timely documentation of RASS and BIS in flowsheets

References

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