Multifaceted and Pragmatic Extubation Protocol Reduces Reintubation Rate in the NMH SICU: One Year in Review

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Background
- Reintubation is associated with increased morbidity and mortality; with mortality rates ranging from 20% to 50%
- National ICU reintubation rate is ~10%
- The reintubation rate within the NMH SICU was not previously measured but anecdotally was high.

Quality Improvement Project Objectives
- Determine the baseline reintubation rate within the NMH SICU and the patient characteristics associated with an increased risk for reintubation
- Develop and implement an intervention strategy to decrease the reintubation rate

Methods

Patient inclusion criteria:
- Intubated SICU patients and transplant patients in the CTICU

Patient exclusion criteria:
- Self-extubation, tracheostomies, palliative extubation, and being reintubated in the OR for a planned procedure

Defining baseline reintubation rate:
- Enterprise Data Warehouse query from March 2018 through March 2019 – “Pre-Intervention”
- Includes all SICU and transplant CTICU patients with an extubation order followed by a subsequent intubation order

Determining reintubation risk factors:
- Literature search and review
- Retrospective data collection from the 70 patients identified in the above pre-intervention group

Methods: Intervention Strategy

Standardized extubation criteria for all SICU patients:
- Low secretion burden, need for airway protection evaluated via head lift and ability to follow commands, lack of airway obstruction, and need for positive pressure ventilation evaluated via RSBI and NIF

High risk criteria for reintubation:
- Age ≥ 65, cumulative fluid balance of ≥ 5 L, intubation for ≥ 4 days, chronic pulmonary disease, and emergency indication for original intubation
- Patient considered at high risk for reintubation if they met one or more of these criteria

Post-extubation pathway for high-risk patients:
- High-flow nasal cannula (HFNC) upon extubation
- Respiratory therapy-based treatment algorithm

Results

Pre-intervention:
- 17.0% reintubation rate (70 reintubations/411 extubations)

Intervention group (April 2019 through March 2020):
- 9.0% reintubation rate (p < 0.001; 36 reintubations/402 extubations)

In-hospital mortality:
- Reintubated = 33%; Successful extubation = 3%
- 75.9% of patients met criteria for “high risk for reintubation”
- 34 of the 36 reintubated patients were “high risk”
- High-risk screening tool had a sensitivity of 94.4%, specificity of 26.0%, and negative predictive value of 97.9%

Figure 1: Characteristics associated with reintubation identified through literature review and retrospective review of pre-intervention patients. These characteristics were then used to create the high-risk criteria.

Figure 2: Control diagram showing the reintubation rate averaged over two-month intervals before and after the implementation of this QI project’s multifaceted intervention strategy

Conclusions
- The baseline reintubation rate in the NMH SICU was higher than the national average: 17% vs 10%
- This QI project successfully reduced the SICU reintubation rate from 17% to 9% through the use of standardized extubation criteria, the use of a high-risk screening tool, and the implementation of a post-extubation pathway for patients at high risk for reintubation
- This pragmatic and multifaceted solution can easily be used in other SICUs to reduce reintubations without much new investment
- Future work will include refining the high-risk criteria

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