Reduction of Complicated Emergency Department Airways Using a Bundled Intervention Approach

Aim of project

Our overall aim is to decrease the percentage of patients who have “complicated airways” during emergency department intubations at the University of New Mexico. The specific short-term goal of the project is to decrease the rate of desaturations below 80% from the current rate of 30% to a rate at or below 25% by April 20th, 2013.

Background of project

Airway management of emergency department patients is a high-risk procedure. It can be a challenging procedure in a busy department, especially when the patient has an unknown diagnosis, medical co-morbidities and difficult airway anatomy. There is mounting evidence that standardizing high-risk procedures results in improved outcomes for patients. There is also evidence that apneic oxygenation during the peri-intubation period prevents desaturations during airway management. We used these two evidence-based findings to create an airway quality improvement bundle that would standardize the airway equipment, standardize the airway management process and encourage the increased use of apneic oxygenation.

We then searched the literature and created the best physiologic and missed airway measures that can increase morbidity and mortality in airway management. These characteristics are listed below and if any one of these are present in ED airway management we are calling it a “complicated airway”.

1. Physiologic Measures
2. Hypoxia (O2 saturation below 80%)
3. Bradycardia (heart rate below 60 bpm)
4. Aspiration
5. Death during intubation attempt
6. Missed Airway Measures
   - More than two attempts with direct or video guided laryngoscopy
   - Use of rescue airway after missed attempt with direct or video guided laryngoscopy
   - Esophageal Intubation
   - Leads to hypoxia
   - Increased regurgitation and risk of aspiration

We used a primary binary outcome measure (complicated or uncomplicated) in order to simply the process for improvement, but we will track each of the characteristics above as secondary outcome measures.

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Planned interventions tested

The Airway Quality Improvement Bundle
- Standardize Airway Equipment
- Standardize Airway Management by Using Checklist
- Increase Use of Apneic Oxygenation

Primary Outcome
Decrease Complicated Intubations

Increase use of apneic oxygenation

Standardization of ED Intubation Process by Use of Checklist

Standardization of Equipment

Education
- Respiratory Therapy
- Resident & Attending

Teamwork
- Extra Oxygen Port or Bottle
- ED Techs
- ED Techs Central Supply

Preliminary Results

Percentage of ED Airways with Oxygen Saturation Below 80%

Pre-Intervention | Post-Intervention
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25 | 30
26 | 29
27 | 28
28 | 29
29 | 30
Summary of results
Since the initiation of the airway quality improvement bundle at the end of February, 2013 we have seen a decrease in ED airway oxygenation saturations below 80% from the pre-intervention rate of 30% to early post-intervention rate of 27%. Our pre-intervention data did not have enough data to determine the rate of pre-intervention “complicated airways” so we are unable to compare this with our early post-intervention data.

Discussion
We have encountered some difficulty with the timing of our intervention and the equipment used to monitor vital signs during intubation attempts. Our intervention bundle exactly coincided with the start of the emergency department resuscitation shift that is staffed by an attending and an emergency medicine intern. First year residents are the least experienced airway managers and intubators and this is a cofounder for our data. Fortunately, the preliminary data shows an improvement after the airway intervention bundle was implemented despite having more inexperienced residents managing the airways. Secondly, the software program that records the patient’s vital signs that was used in the pre-intervention data collection was not working due to downtime and technical difficulties for three of the weeks of data collection in March. We have had to use the reported lowest oxygen saturation from out QI data collection form instead of the actual vital sign recordings for the majority of the cases. The software program is back online now and we are now able to collect the vital sign data.

Conclusions
The airway quality improvement bundle has increased the awareness of the high-risk nature of airway management and has highlighted that as a department we can do better at minimizing the complications in order to improve patient outcomes. It has clearly standardized our airway equipment through a forced function. The standardization of the airway process through the checklist and the rate of increased use of apneic oxygenation is still a work in progress. Our project has been a team-based effort and we would like to thank the respiratory therapists, nursing, ED technicians and medical equipment personal that have made this project possible. We hope to continue to improve our airway quality improvement process by adding to the airway bundle after we have completed the implementation and feedback from the first round of interventions.

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