Establishment of the efficacy of a power maintenance prototype for use with the Bedside Safe Airway Application (SAA)

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Background

Bedside signage in the setting of pediatric tracheostomy is used to communicate necessary information in an emergency setting. The overall program is focused on understanding trials utilizing an electronic bedside signage system: SAA. It is designed for use with patients having one of the following conditions:

- New Tracheostomy,
- Established Tracheostomy,
- Difficult Airways, and
- Airway Reconstruction (or Laryngotracheal Reconstruction).

The Safe Trach Bedside Signage addresses the patient's specific airway type, provider-selected details for airway rescue, and three basic rescue pathways:

- "Maskable,"
- "Intubation from Above,"
- "Intubation through Stoma."

During the routine events of patient care, the SAA would lose its connection to the power source preventing the device from providing information during an airway emergency.

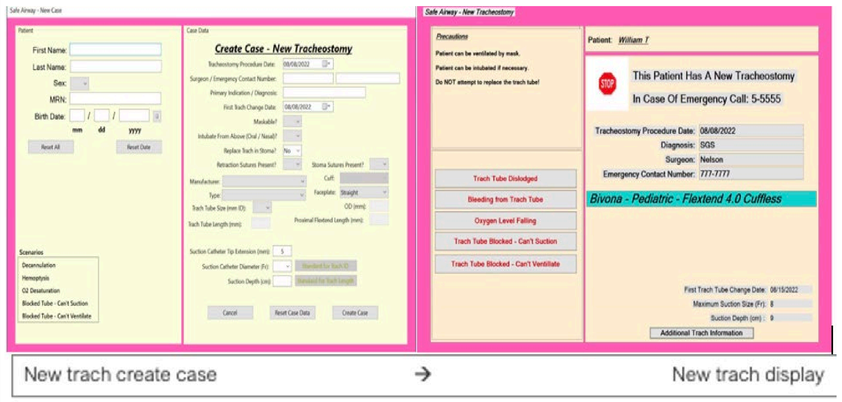
The goal of this study is to establish the efficacy of a prototype, designed to remain attached to the SAA and prevent the SAA device from losing power.

Methods

- The prototype was designed, and 3D printed to fully encapsulate the charger. The charger dimensions were 0.6 cm x 0.6 cm x 4.2 cm, along with 0.3 cm slack for the wire. The prototype was designed to be 10.4 cm x 3.4 cm and is open on one free edge to allow it to clip onto the SAA.
- A set of different magnitude force springs (1N, 5N, 10N) were used to determine the point at which the force exceeded the wire alone contrasted with the wire attached with the proposed prototype.
- There was 10 trials conducted for the wire alone and another 10 trials for the wire + prototype. From this data, the mean force was calculated along with SD, CI, and a two-sample t-test for P-value.

Results

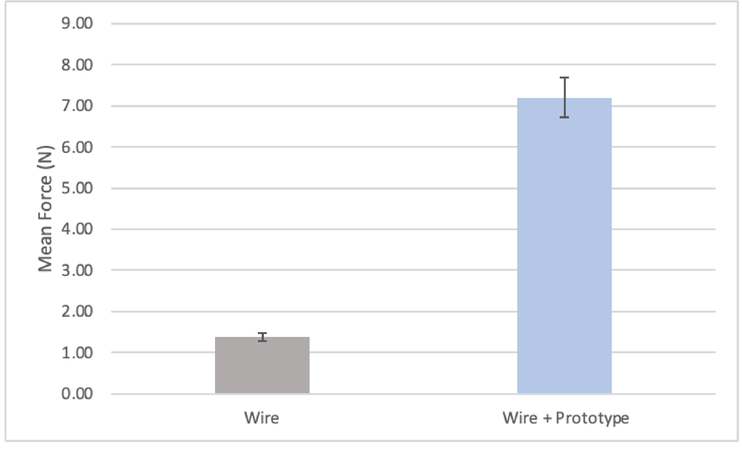
Figure 1. Safe Airway Application interface (Left: Create a new trach. Right: New trach display.)



New trach create case → New trach display

Figure 2. 3D printed retention device prototype.

Figure 3. Mean force required to displace wire alone vs. with the prototype attached.



Results

- The mean force required to displace the wire alone was 1.38 N (SD = 0.15, 95% CI = 1.37-1.39), while the force required to displace the wire with the attached prototype was 7.20 N (SD = 0.76, 95% CI = 7.15-7.25).
- Using a two-sample t-test, there was a statistically significant improvement in the required detachment force from the use of the prototype device ($p < 0.05$).

Conclusion & Applications

- The digital application combined with the retention device prototype appears to resolve the power connection issue. However, further testing in a clinical setting will be done to determine the usability and effectiveness in a day-to-day patient care setting.
- The SAA displays smart algorithms consistently, rapidly, and accurately for patient-specific situations, and includes more on-demand information regarding the patient compared to current methods of problem-solving tracheostomy emergencies.

References

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