

Redesigning Video Laryngoscope Equipment to Improve Preparedness for 1st Pass Intubation Attempts

Marika Kachman, M.D., Nathan Olson, M.D.

Problem

- Intubation is a common and critical procedure practiced by EM providers¹.
- Current ED airway carts do not fit comfortably at the head of the bed and are difficult to restock between back-to-back intubations.
- VL towers were being used as the principle intubating solution, but there was a large variety and disorganization of tools available on these towers (Figure A).
- Multiple studies have examined how human factors affect clinician performance in airway emergencies and how thoughtful organization of airway carts can mitigate such factors²⁻⁵.
- However, most focused on intubations performed by anesthesiologists in ORs²⁻⁴, which differ significantly from the emergent, unplanned nature of intubations occurring in an ER setting¹.

Goal

- Develop a novel point-of-care organizational tool that integrates onto existing Video Laryngoscopy (VL) towers used in the ER and improves resident readiness for first-pass intubation attempts.

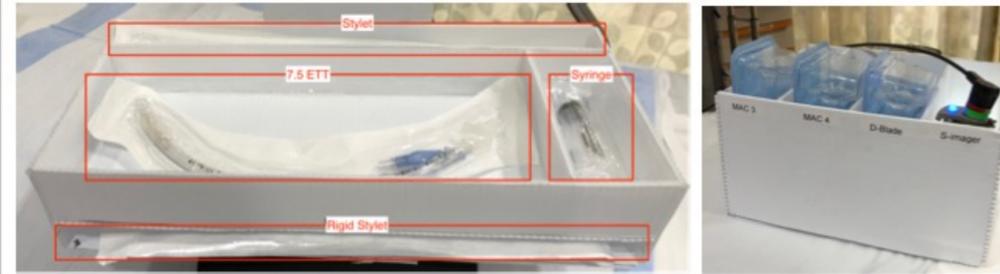
Intervention Design

- Our design (Figure 2) used choice architecture⁶ to include the following aspects:
 - Compact (fits comfortably at the head of the bed)
 - Portable/lightweight (easily moved from room-to-room as intubation needs arise)
 - Cleanable (for compliance with infection control)
 - Flexible (to adapt to multiple intubation use-cases)
- Used 2 forms of feedback: direct observation of use (Figure C) and surveys of EM residents
- Via this feedback we performed iterative revisions so that the solution would meet the needs of multiple situations and user preferences (Figure D).
- We surveyed residents on their pre- and post-intervention feeling of preparedness for first pass intubation attempts.

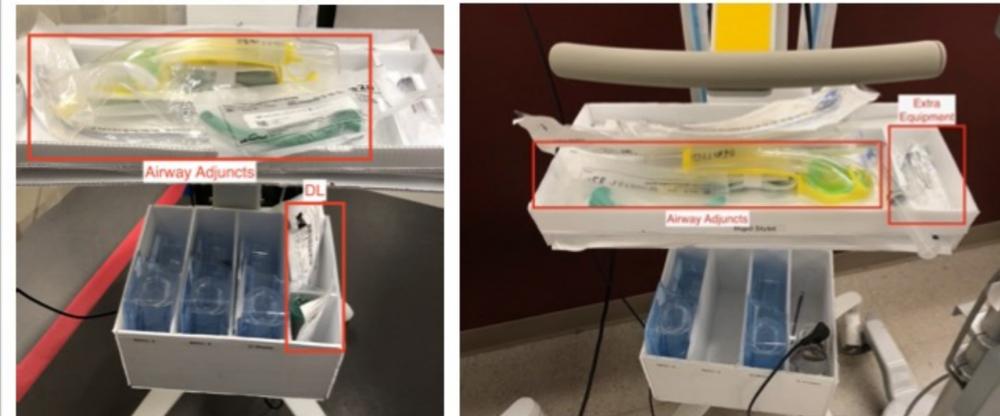
A - Pre-intervention: VL tower drawers contained used and unused materials for intubation, airway management, ultrasound, IV access. Design did not allow easy visualization of present equipment.



B - 1st Design: Organizational boxes (made from lightweight, cleanable materials) with labeled sections were attached to VL towers. Sections contained materials commonly used for 1st pass intubation attempts.



C - 2nd Design: Provider surveys and use of boxes demonstrated that residents wanted to keep airway adjuncts (e.g. NPAs) and alternatives (e.g. DL, iGel) closer at hand during intubations. Multiple sets of equipment were stored on the boxes to allow for easier restocking.



D - 3rd Design: An organizer for was attached to the VL tower for convenient (but organized) access to airway adjuncts, alternatives, and bougies. A restocking shelf for high-use intubation items was placed in the main treatment area for ease/speed of restocking.



Impact

- Residents reported an increased feeling of preparedness for first pass intubation attempts (Likert 1-5, mean +/- STD):
 - Pre = 2.94 +/- 1.43
 - Post = 4.33 +/- 0.97
 - p = 0.0024 (Mann-U-Whitney)

Conclusions and Next Steps

- Our VL airway tower solution combines established best practices for airway equipment design with the needs and preferences of EM providers in a high-intubation volume ER.
- For further work should formalize pre- and post- data collection methods and attempt to increase survey sample size.
- Next steps will involve re-surveying residents and stratifying data by PGY year.
- Further work is needed to determine if a similar solution is generalizable to other settings.

Acknowledgements

Thank you to Drs. McCartin, Staudt, Spiegel, Kitrina McDonald, and all of the ED residents!

Works Cited

1. Stevenson AGM, Graham CA, Hall R, Korsah P, McGuffie AC. Tracheal intubation in the emergency department: the Scottish district hospital perspective. *Emerg Med J.* 2007;24(6):394-397. doi:10.1136/emj.2006.041988
2. Chrimes N, Bradley WPL, Gatward JJ, Weatherall AD. Human factors and the 'next generation' airway trolley. *Anaesthesia.* Published online December 14, 2018;anae.14543. doi:10.1111/anae.14543
3. Jones CPL, Fawker-Corbett J, Groom P, Morton B, Lister C, Mercer SJ. Human factors in preventing complications in anaesthesia: a systematic review. *Anaesthesia.* 2018;73:12-24. doi:10.1111/anae.14136
4. Schnittker R, Marshall S, Horberry T, Young KL. Human factors enablers and barriers for successful airway management – an in-depth interview study. *Anaesthesia.* 2018;73(8):980-989. doi:10.1111/anae.14302
5. Bjurström MF, Bodelsson M, Stureson LW. The Difficult Airway Trolley: A Narrative Review and Practical Guide. *Anesthesiol Res Pract.* 2019;2019:1-12. doi:10.1155/2019/6780254
6. Redelmeier DA, Kao MM. Harnessing choice architecture to improve medical care. *BMJ Qual Saf.* 2021;30(5):353-355. doi:10.1136/bmjqs-2020-012598