Comparison of Airway Intubation Devices When Using a Biohazard Suit: A Feasibility Study

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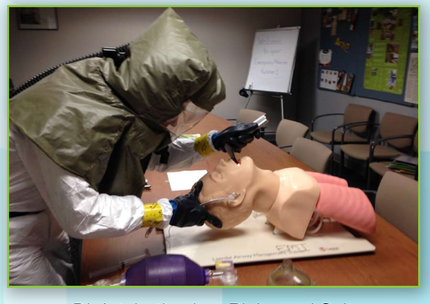
Study Objectives:

Biohazard events have the potential to require emergent airway management. Biohazard gear by its nature imposes restrictions on the airway manager. Many emergency physicians have limited experience managing airways in biohazard suits. With various commercial intubation products and techniques available, determining the most effective in a biohazard simulation could inform which airway device to prioritize in an actual event. This study sought to determine the success of airway management for three different devices by Emergency Medicine (EM) residents while wearing biohazard gear. Their intubation skills were compared to their success in airway management without the protective suits.

Residents in Biohazard Suits



DL Intubation in a Biohazard Suit

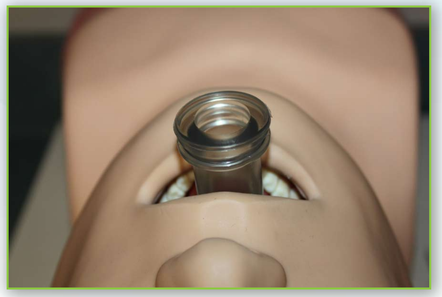
Another View of DL Insertion in Biohazard Gear

Methods:

After receiving IRB approval, we prospectively enrolled EM residents from a PGY 1-4 dually approved, community hospital training program. We measured the total time for intubation, first pass success rate and overall success rates for direct laryngoscopy (DL), GlideScope®-assisted (GS) intubation and the SALT® (SLT) airway, in both a normal simulation environment and while managing the airway in biohazard gear. All airways were simulated with Laerdal® intubating mannequin heads. Each EM resident passed through two sets of three testing stations in the following succession: DL, GS, SLT. Participants were randomized to start the stations either with or without biohazard gear. Stations were prepared for each resident with a schematic, so equipment layout consistency was maintained. Each station had a trained researcher timing participants until two ventilations were delivered successfully post-intubation. Demographics, including prior airway and biohazard experience, were gathered.

GS Intubation in Biohazard Gear

SALT Intubation Device Insertion



SALT Device Inserted

Results:

Thirty-seven residents participated, of which 27 were male (73%). Fourteen (37.8%) had prior experience intubating in biohazard suits. There was a statistically significant difference in those who had prior intubation experience between DL (37, 100%); GS (32, 86.5%) and SLT (12, 32.4%) ($p<.001$). Median time to intubation was DL, 43 seconds, DL+Suit, 58.7 seconds ($p=.001$), GS, 54 seconds, GS+Suit, 57 seconds, and SLT, 43.1 seconds and SLT+Suit, 49 seconds. Overall, the median time to intubation without suits was 48 seconds and with suits, 57 seconds ($p=.03$). There was no statistically significant difference between the overall times to intubate for the three devices. Prior experience with biohazard suits significantly lowered time to intubate for DL and GS ($p=.001$), but not for SLT. First pass success was highest for DL (91.2% no suit, 83.7% in suit), followed by GS (89% no suit, 78.3% in suit) and SLT (51% no suit, 67.6% in suit). Participant satisfaction with the devices fell significantly for DL ($p<.001$) and SLT ($p=.006$), but not for GS when used with a biohazard suit as compared to without.

Conclusion:

In a group of EM residents with limited experience, biohazard suits generally extended time to successful intubation in a statistically significant manner and decreased airway manager satisfaction. These effects are most prominent with DL, even with its having the highest overall first pass success rate. Interestingly, despite participants having significantly less experience with SLT, this device was associated with the shortest time to intubation in a biohazard suit and was the only device to have greater first pass success with EM residents in biohazard gear compared to no gear.

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