

Name of research institute or organization:

**Inselspital Bern, Department of Anesthesiology and Pain Medicine**

Title of project:

Intubation success rate of different intubation aids under extreme daylight conditions in high altitude

Project leader and team:

Dr. med. Lorenz Theiler, project leader

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Project description:

Video-based intubation aids are on the rise; they become technically better and promise better view on the glottis, especially in difficult intubation situations. In prehospital emergency situations an intubation is always considered difficult to some extent. There are no studies available testing such intubation devices outdoors. Therefore, we tested the hypothesis that it would be possible to intubate quicker and more effectively, even in difficult environmental conditions with bright sunlight in high altitude and a reflecting background (snow). These are the conditions that the emergency physicians of the Swiss air emergency (helicopter rescue services, REGA) face on a regular basis. The answer to this research question is crucial and a direct prerequisite for in-vivo studies in prehospital emergency medicine.

We tested the 6 video-devices (GlideScope™, C-MAC™, A.P. Advance™, McGrath™, Kingvision™ and Airtraq™) and compared them with the Macintosh™ standard laryngoscope and the Bonfils™ rigid fiberscope. An intubation manikin (HAL® Gaumard) was equipped with an extrication collar (simulation of an emergency, reduction of maximal mouth opening to 3,5 centimeters). Then, 22 experienced anesthesiologists intubated those manikins with the 8 devices in a randomized order in 5 randomized, different environmental conditions (indoors at 380-540 and at 3450 meters above sea level (m.a.s.l.); outdoors in bright sunlight, with sunglasses and covered with a blanket all at 3450 m.a.s.l.).

The study was planned as a prospective randomized comparative manikin study. The primary outcome was defined as first attempt 60 seconds intubation success rate. Secondary outcome parameters included heart rate and peripheral oxygen saturation of the performing anesthesiologists (to show a possible effect of height on the performance of the physicians), time to successful intubation, visibility on a scale from 1 (clear) to 5 (no sight), the POGO-Score (percent of glottic opening), the Cormack-Lehane Score (I, IIa, IIb, III, IV) and the subjective rating of the devices on a scale from 1 to 4 (excellent, good, fair, poor). Physicians were asked to name their first and second preferences in this specific setting after completion of the study. In addition we documented weather, wind and temperature conditions at the study site.

Each anesthesiologist had to perform 40 intubations throughout the study. For each device only one intubation attempt was allowed. Each attempt was limited to a maximum of 120 seconds.

Data was analyzed using the IBM® SPSS version 21.0. Frequencies, like differences in success rates between the devices and the conditions were analyzed using the Cochran Q test and interval data, like the time to successful intubation, were analyzed using the Friedmann test. A p-value < 0.05 was considered statistically significant. Post-hoc analyses were performed using the Mc Nemar test and the Wilcoxon rank sum test as applicable. The Bonferroni correction for multiple comparisons was applied. As there were 28 possible combinations between the devices and 10 between the conditions, a p-value of < 0.002 and

< 0.005 respectively was considered statistically significant. The data is going to be published in an international peer-reviewed journal and after publication we will make the data available.

Key words:

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Laryngoscopy, intubation, anesthesiology, difficult airway management

Collaborating partners/networks:

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University of Bern  
Difficult Airway Society Collaboration  
BeSiC – Berner Simulations- und CPR Zentrum

Scientific publications and public outreach 2013

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**Conference papers**

Greif R., S. Nabecker, M. Kotarlic, C. Riggerbach, M. Kleine-Brüggeney, P. Schoettker, L. Theiler, Performance of videolaryngoscopes under extreme daylight condition outdoors: a manikin study on a Swiss glacier, DAS Annual Meeting, Ascot, United Kingdom, November, 2013.

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