

Airway management in microgravity – a systematic review

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Introduction: In the near future, space programs will shift their focus towards long-duration interplanetary missions, in particular to the Moon and Mars. These exploration missions will unavoidably be associated with an increased risk of acute medical problems, which will need to be handled by an autonomous crew operating in extreme isolation. An important skill in emergency medicine is represented by airway management, which is a key component in the management of numerous medical conditions as well as for general anesthesia. Many airway devices are available and it is unclear which one would be the most suitable in the context of a space mission. The aim of this systematic review is to analyze the existing literature on airway management in the special situation of weightlessness during space missions.

Material and methods: We performed a standardized review of published literature on airway management in spaceflight and analogue environments using the database PubMed.

Results: We identified a total of 3,111 publications of which 3,039 were initially excluded after evaluation (**Fig. 1**). The literature screening identified three randomized comparative manikin studies (**Fig. 2**), two of them in parabolic flights (**Fig. 3**), one in a submerged setup. Under free-floating conditions, the insertion success rate of supraglottic airway devices (SGA) was excellent (91%-97%). The administration of artificial ventilation could be successfully achieved in weightlessness with supraglottic devices, without the need to restrain patient or operator. The success rate of conventional laryngoscopy under free-floating conditions fluctuated between 15-86%. No study has evaluated modern video laryngoscopes or intubation under partial gravity conditions.

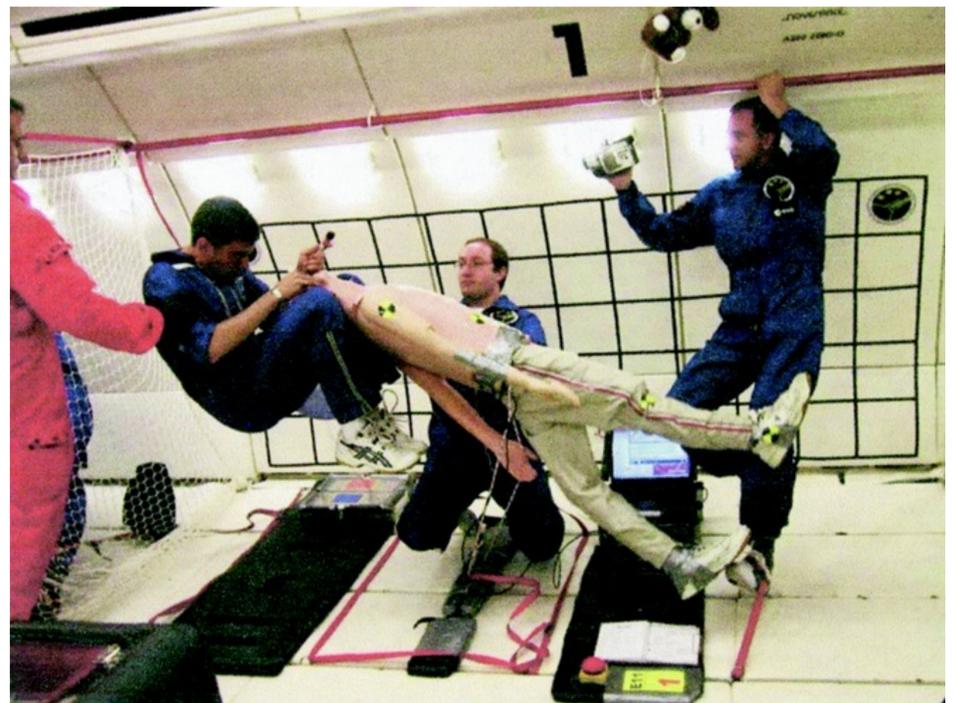
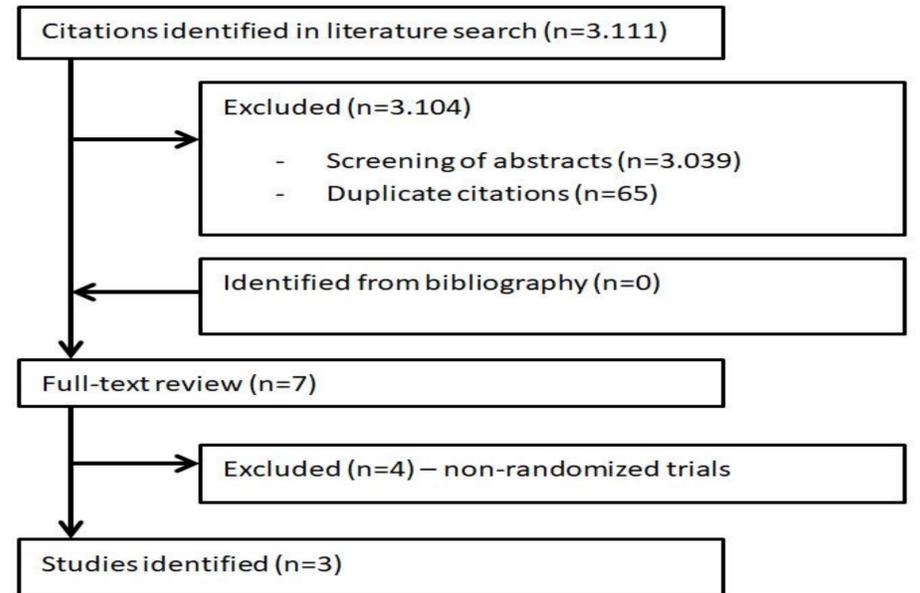
Conclusion: It appears possible to safely manage the airway in weightlessness, provided that certain conditions are ensured, such as restraining the patient and operator for conventional orotracheal intubation. If airway protection is required in microgravity with endotracheal intubation, both the operator and the patient should be restrained.

Literature:

Rabitsch W, et al. Airway management with endotracheal tube versus Combitube during parabolic flights. *Anesthesiology*. 2006;**105**:696-702.

Groemer et al. The feasibility of laryngoscope-guided tracheal intubation in microgravity during parabolic flight: a comparison of two techniques. *Anesthesia and analgesia*. 2005;**101**:1533-5.

Keller MDC, et al. Airway Management during Spaceflight A Comparison of Four Airway Devices in Simulated Microgravity. *Anesthesiology*. 2000;**92**:1237-41.



Authors	Year	Method	Model	Participants	Airway device	Setting
Keller et al. [24]	2000	Randomized comparative	Manikin	4	Four different	Submerged
Rabitsch et al. [26]	2006	Randomized comparative	Manikin	4	Endotracheal intubation VS Combitube®	Parabolic flight
Groemer et al. [37]	2005	Randomized comparative	Manikin	3	Endotracheal intubation	Parabolic flight