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Protection of front-line nurses from life-threatening infection by suctioning robots: a systematic review

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Nurses together: a force for global health

Introduction

On October 2021, the World Health Organization confirmed that up to 180,000 healthcare workers have died from COVID-19. Nurses have been exposed to the unknown virus especially when the patients require tracheal suctioning (Figure 1). The route of nosocomial infection can be avoided by its automation, which will decrease fatal risk of nurses.

Therefore, this study aims to describe previous knowledge on automation of tracheal suctioning and suctioning robots.

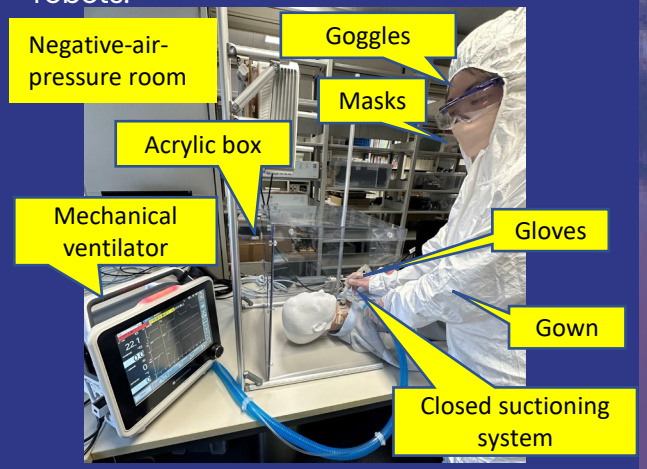

Figure 1. Image of current infection prevention skills

Methods

Systematic electronic searches for PubMed, CINAHL and Web of Science were carried out for scientific, peer-reviewed papers published in English language between 1998-2022. The data was selected on stages based on inclusion and exclusion criteria. We included interventions designed to develop automatic secretion clearance, automatic secretion drainage, and artificial cough maneuver. Studies about obstruction of a suctioning tube or design of catheters, were excluded. Ethical consideration was not required in this study.

Results

Altogether 1,773 titles were found, whereas 76 were selected based on titles, 29 based on abstract and finally 20 papers met eligibility criteria.

Majority of automated function of tracheal suctioning reported continuous suctioning for subglottic, endobronchial, endotracheal secretion (Figure 2). Two studies targeted continuous lateral rotational therapy. Automatic Secretion Clearance Function for a new ventilator (Figure 3) was reported in six articles. Artificial cough maneuver, changes of airflow, automatic identification of breath and cough were described in the rest of articles.

Figu.2 アモレＳＵ1
https://www.tokso.net/iryo1.htm

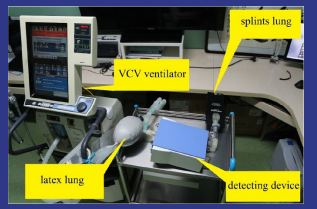

Fig. 3 Automatic Secretion Clearance Function
https://ieeexplore.ieee.org/document/7857783

Discussion and Conclusions

Automation of suctioning skills was the automation of aggregate of several tasks, e.g., detection of cough/breath and measuring the level of clearance. Even though the function of automated suctioning is added to mechanical ventilators, nurses are still required to provide suctioning when blackout.

Multidisciplinary communication in different fields might accelerate automation of suctioning. Further studies will be required to protect future generations from global pandemic.

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