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Conceptualization of Artificial Intelligence in Airway Management

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ABSTRACT

Background: Failed intubation is the single most important cause of patient morbidity and mortality during anesthesia for surgery. The incidence of difficult intubation could be as high as 12% while failed intubation is around 0.5%.¹ Disaster and mass casualty management may increase this risk multi-fold due to the paucity of airway-trained medical personnel.² Automation of the entire procedure could potentially save lives particularly in situations where mass casualties could happen without the immediate availability of skilled airway specialists. Thanks to the combination of existing technology involving 3-D image capture, artificial intelligence (AI), machine learning (ML) for image analysis, and robotics, airway management could be revolutionized. Work is already underway in this domain, but many challenges still need to be overcome to make the technology more practical and user-friendly.³

Methods: Experts in the above fields from Hamad Medical Corporation (Qatar), Qatar University (Qatar), and Teesside University (UK) were brought together to collaborate on this potentially game-changing technological solution. The team includes clinicians specialized in airway management, engineers with a very strong track record of accomplishments in artificial intelligence and computer algorithm-based software development. The team is regularly meeting online to discuss the integration of the various technologies to develop a prototype automated device.

Recommendations: A concept model based on Clinical-Technology-Research integration was arrived at as illustrated in [Figure 1](#). The team is presently seeking funding to start the development of a working prototype combining AI, ML, and robotics. The planned work packages are briefly presented in [Table 1](#).

Conclusion: This work has shown that an automated device to disrupt the practice in airway management is feasible and could save lives particularly in disaster management and in geographical areas with a lack of clinicians with expertise in airway management.

Keywords: Artificial intelligence, Tracheal Intubation, Airway management, Robotics, Machine learning

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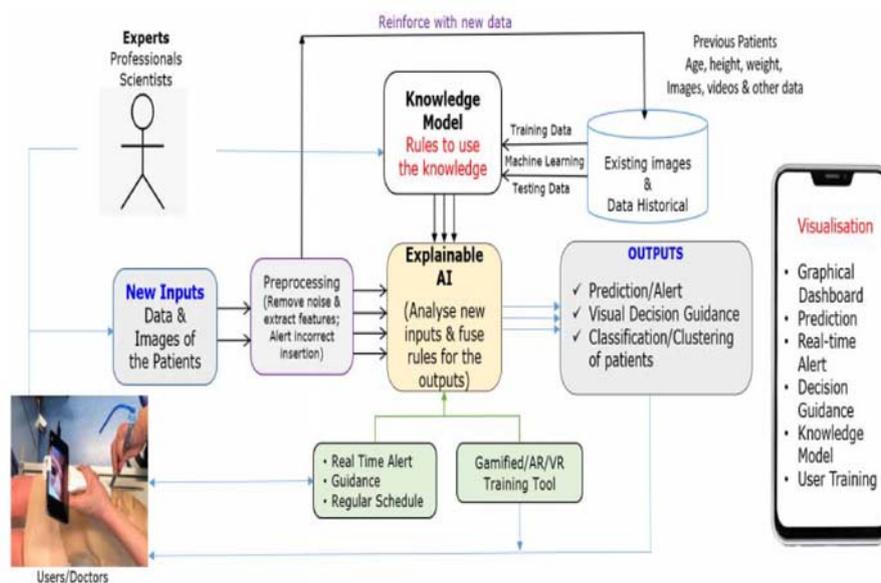


Figure 1. Concept model of the proposed Artificial Intelligence intubation device.

Table 1. Work packages (WP) for the development of an Artificial Intelligence intubation device.

Work Package (WP) number	WP title
1	Project Management and Coordination
2	Requirement Analysis and Data Collection
3	Cloud-Based Knowledge Sharing Model and Prototype App Development
4	Simulation, Data and Image manipulation and adaptation using Machine Learning and Artificial Intelligence
5	Clinical Study and Validation using a range of full-scale airway simulators
6	Cost effective and enhanced visualization
7	Standardization, Dissemination, and Capacity Building

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