

Artificial Intelligence Role and Clinical Decision Support System Extubation Readiness Trail and Etiometry Scoring System

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ABSTRACT

Abbreviations: AI: Artificial Intelligence; DSS: Decision Support Systems; ERT: Extubation Readiness Trials; AB: Adequate Breathing

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Mini Review

Artificial Intelligence (AI) has the promising ability to improve healthcare delivery [1]. AI machine learning algorithms and data mining can offer many advantages; however, these advantages are always associated with many challenges and practical implications. One of these challenges is missing and inconsistent data; other challenges can be the disconnect between biomedical informatics and bedside providers [2-4]. For the AI-driven tool to outperform humans in specific analytical tasks, the tool explain ability should be understood clearly by the multidisciplinary team involved in creating and implementing such a tool. Explain ability has to be cleared in terms of how the tool will be achieved and what is the benefits of adopting it [5,6]. Clinical decision support systems (DSS) are being used increasingly in healthcare for providing guidance on safe medication prescribing, guidelines adherence, and risk assessment and prognosis [7]. These systems utilize guidelines that were formed based on data mining and articulation. The DSS could outperform the human ability only if it is used for what it is intended for [8].

Failed Extubation in Pediatric Patients

Infants and children born with congenital heart defects require surgical repair at some point in their lives. These patients stay in the hospital for a substantial period, depending on their surgery's complexity and the perioperative care they receive. Mechanical ventilation is required for these patients around the surgery time. Longer mechanical ventilation has been associated with more extended hospital stays and worse outcomes [9-11]. Patient needs to meet specific clinical and ventilatory criteria before separation from the ventilator. However, these criteria are not always clear, and patients also may fail the extubation despite meeting these criteria [12]. Failed extubation is associated with the bad outcome too.

Current Practice

Many heart centers currently depend on extubation readiness trials (ERT) for the prediction of extubation success in pediatric patients following heart surgery [13,14]. The extubation readiness trails are composed of a specific period when the patients are placed

on spontaneous ventilatory mode, providing them with minimal support. ERT is considered successful if the patient maintains good ventilation and oxygenation through the trail.

Etiometry

Etiometry is a new platform currently used by many physicians to track patients' vitals and critical clinical data over their hospitalization. When it is available at the bedside, it can give the bedside nurses a very good idea about the general trend of patients' vital signs. Etiometry data was extracted recently, and a score was developed to predict cardiac arrest for patients following cardiac surgery [15,16].

The Proposed New Method to Predicts Successful Extubation

We propose utilizing the Etiometry data combined with the ERT outcome to delineate and predict which patient will be successfully extubated. However, to develop a score that can predict the successful extubation, we need a retrospective review of our patients' clinical data and their mechanical ventilation course. Based on this review, we can establish a scoring method that considers the critical data point that Etiometry collects. Following the review phase, we can validate our scoring system prospectively for a certain number of patients. This step is necessary and helpful for us as we may add or subtract some data points that we find essential. Our vision that the Etiometry will provide a score for each ERT that is done, the specific threshold will be adopted for successful extubation. We will call such score the Adequate Breathing (AB) score.

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