亞東紀念醫院

115 年度呼吸治療智慧醫療與醫學教育國際研討會

課程摘要:

主題一：AI and mechanical ventilation

演講者: Huang, Yuh-Chin 教授

課程摘要:

AI and Mechanical Ventilation

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Artificial intelligence (AI) is rapidly transforming the landscape of medicine. In mechanical ventilation, AI has been used to develop algorithms to 1) optimize ventilator setting, 2) predict weaning readiness, 3) detect patient-ventilator asynchrony, and 4) forecast clinical outcome. These algorithms have performed well in different clinical settings, but none have entered clinical arena. Currently there are ventilator modes with some closed loop control, a simple form of AI. These modes adjust the ventilator directly and provide decision support (i.e., telling the doctor what to do). A prime example is adaptive support ventilation (ASV). It uses the Otis minimum work of breathing principle to adjust respiratory rate and tidal volume with a given minute ventilation based on airway resistance and lung compliance. These closed loop ventilation modes are known to reduce the frequency of adjusting the ventilator settings by the respiratory therapists (RTs). This may help ventilator management in clinical settings when RTs are not as available. Eventually AI algorithms in mechanical ventilation will shift the ICU from "one size fits all" protocols to "precision respiratory medicine," where the ventilator adapts to the patient in real-time.

主題二: 智守呼吸：呼吸治療數位化與智慧化整合應用

演講者:張美瑩 呼吸治療師

課程摘要:

一、 課程簡介

本課程探討臨床呼吸治療（RT）從傳統紙本、多方繁瑣溝通，走向數位化與智慧醫療（AI）整合的歷程與實務應用。內容以醫學中心之實際導入經驗為基礎，分享如何透過資訊系統優化與生成式、預測式人工智慧之結合，達到提升照護品質、促進臨床工作效能及加強決策輔助之目標。

二、 核心內容與智慧化歷程

1. 數位化與系統整合發展：介紹呼吸治療由早期的儀器管理保養電子化、紀錄傳輸系統，逐步發展至每日交班系統、批價系統與智能排班之演進過程。
2. 臨床系統優化與即時溝通：
    - 呼吸治療會診與物資租借管理：以 VEST/拍痰背心等儀器為例，說明如何將傳統紙本同意書及繁瑣溝通，優化為資訊透明、與醫囑系統連接的電子化流程，並結合通訊軟體（Teams / LineBot）進行即時異動通知，解決醫囑漏開或資訊不同步之痛點。
    - 智慧醫囑與排班管理：流程全面線上化，確保醫療團隊能即時掌握病患醫囑動態與人員調度。
3. 臨床決策輔助系統（CDSS）之應用：
    - 整合呼吸登錄系統、醫囑、護理資訊系統（NIS）與檢驗數據等多源臨床資料。
    - 智慧化生成病歷進程紀錄（Progress Note），自動產出「呼吸器脫離評估」與「臨床狀態評估」之精準照護建議，大幅節省臨床人員的文書處理時間。
4. 人工智慧（AI）中央站與拔管脫離預測：
    - 建立「智守呼吸站」進行中央動態監測與即時警示。

- 整合多項呼吸參數與綜合數據，透過大數據訓練執行邏輯式回歸等模型測試，進行「AI 預測呼吸器脫離與成功拔管機率」，提供第一線醫師與治療師即時的臨床決策輔助。

三、品管監測與成效評估：分享導入智慧醫療模組後，在整體呼吸照護品質管理（如：呼吸器脫離率、重插管率）之趨勢改善與正面臨床成效。

主題三:IntelliVent-ASV：全自動智慧通氣模式在提升臨床效率與促進呼吸器脫離之應用

演講者: Bailey Wang， RRT,RCP

課程摘要:

This presentation introduces IntelliVent-ASV, a fully automated closed-loop ventilation mode designed to continuously adjust both ventilation and oxygenation based on real-time patient physiology. The system uses end-tidal CO_2 ($PetCO_2$) and oxygen saturation (SpO_2) as primary feedback signals, enabling separate yet integrated control of ventilation and oxygenation parameters. Key variables automatically adjusted include minute ventilation (%MinVol), respiratory rate (RR), tidal volume (VT), fraction of inspired oxygen (FiO_2), and positive end-expiratory pressure (PEEP)
to maintain clinician-defined target ranges.
For ventilation control, IntelliVent-ASV adapts %MinVol according to whether the patient is passively ventilated or breathing spontaneously,
targeting $PetCO_2$ or respiratory rate accordingly. The ASV algorithm continuously determines the optimal combination of RR and VT based on lung mechanics. For oxygenation, the system adjusts FiO_2 and PEEP in accordance with SpO_2 targets and established clinical guidelines such as ARDSnet, aiming to optimize oxygenation while minimizing potential harm. Built-in safety features ensure that automation is suspended and alarms are triggered when signal quality is inadequate.
The system allows clinicians to tailor settings based on patient conditions such as ARDS, brain injury, or chronic hypercapnia, including adjustable target ranges and “target shift” strategies for individualized care. IntelliVent-ASV also integrates a fully automated weaning process, including Quick Wean

and spontaneous breathing trials (SBT), supporting the patient from intubation through extubation.

Clinical evidence suggests that automated ventilation systems, including IntelliVent-ASV, can reduce the duration of mechanical ventilation, ICU and hospital length of stay, as well as the risk of reintubation and tracheostomy. In summary, IntelliVent-ASV combines real-time physiological feedback with evidence-based protocols to deliver comprehensive, automated ventilatory management, improving efficiency and patient safety throughout the course of care.