

氣管內管位置異常警示系統

Endotracheal Tube Position Abnormality Alert System

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開發背景 Background

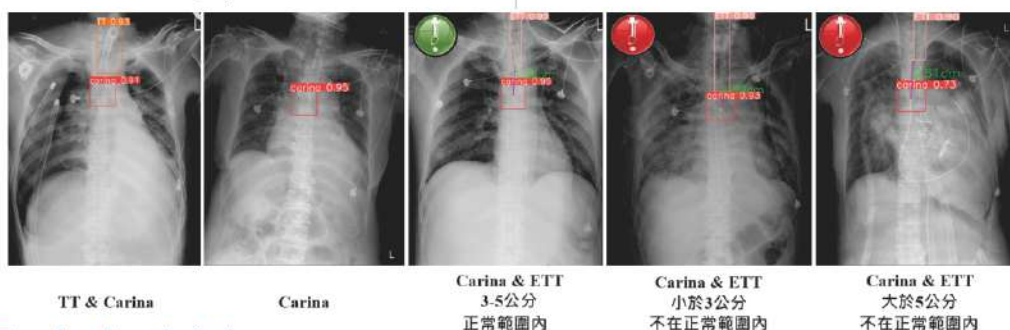
氣管內管放置是協助急重症呼吸衰竭病人的重要侵入性醫療處置。非計畫性氣管內管滑脫是在醫療照護過程中偶爾會發生的意外事件，而大部分非計畫性氣管內管滑脫的個案需緊急重新插管，處置過程中可能併發傷害，導致延長呼吸器使用及住院天數，甚至是死亡。這些意外事件增加了護理照護人力、耗時與醫療資源的耗費。因此為避免發生非計畫性氣管內管滑脫，需要定期確認氣管內管位置的適當性。為了提高患者的安全性和醫療照護品質，我們開發「氣管內管位置異常警示系統」，自動分析患者胸部X光的氣管內管位置，進行位置的判讀，並將結果即時呈現於警示系統。

Endotracheal tube (ETT) placement is an important invasive medical procedure to assist patients with acute respiratory failure. Unplanned extubation is an accident that occasionally occurs during medical care. Most cases of unplanned extubation require emergency reintubation. These accidents can lead to prolonged mechanical ventilation, prolonged hospitalization, and even death. These accidents not only increase the investment in nursing manpower and time, but also increase the consumption of medical resources. Therefore, in the intensive care unit (ICU), in order to avoid unplanned extubation, it is very important to sequentially and regularly confirm the proper position of the ETT. In order to improve patient safety and medical care quality, we developed "Endotracheal Tube Position Abnormality Alert System". In the existing workflow of clinical care (ICU patients usually receive chest X-rays every 2-3 days due to their own disease needs), the model automatically evaluates the position of the ETT in trachea on the chest X-ray and present the results to the warning system in real time.

技術摘要 Technical Introduction

「氣管內管位置異常警示系統」利用患者拍攝的胸部X光影像，透過人工智慧模型，即時自動評估患者胸部X光影像中氣管內管位置。其主要目的是協助臨床醫療人員快速且準確地確定氣管內管的位置是否適當，即早發現並處理位置不當的情況，減少併發症風險，從而降低氣管內管滑脫率，提高照護品質。透過預測胸部X光影像中的隆突（Carina）位置，並確認是否有氣管內管（Endotracheal tube, ETT）或氣切（Tracheal tube, TT）。如果偵測到Carina及ETT，則進一步計算Carina及ETT尖端的距離，同時評估ETT是否有置入過深，藉此判斷ETT的位置是否適當，進而預防非計畫性的滑脫率事件發生。

"Endotracheal Tube Position Abnormality Alert System" for assessing the appropriateness of ETT position is designed to use the chest X-ray images taken by the patient to automatically evaluate the position of the ETT in the patient's chest X-ray images in real time. Its main purpose is to assist clinical medical personnel to quickly and accurately determine whether the position of the endotracheal tube is proper, detect and deal with improper positioning earlier, and reduce the risk of complications, thereby reducing the unplanned extubation rate and improving the quality of care. By predicting the position of the carina in chest X-ray images, and confirming whether there is ETT or tracheal tube (TT). If carina and ETT are detected, the distance between carina and the tip of the ETT is further calculated, and at the same time, it is evaluated whether the ETT is inserted too deeply, to determine whether the position of the ETT is proper, thereby preventing unplanned extubation.



技術特色 Technical Advantages

1. 藉由胸部X光影像自動評估氣管內管位置，減少人為評估的主觀性，提高評估的客觀性。
2. 及早發現並採取適當的措施處理不適當的氣管內管位置，改善治療過程的效率和安全性，降低併發症風險，降低氣管內管滑脫的風險。
1. Automatically assessing the position of the endotracheal tube on chest X-ray images reduces the subjective nature of manual assessment and enhances objectivity in evaluation.
2. Early detection and appropriate measures to address inappropriate endotracheal tube position, to improve the efficiency and safety of the treatment process, and to reduce the risk of complications and unplanned extubation.

應用範圍 Application

適用於各類需要氣管內管治療且有拍攝胸部X光的患者，如加護病房患者、需插管全身麻醉患者、急診患者等，使用其胸部X光評估氣管內管位置的適當性。

相關專利 Patent

• 中華民國專利(TW)：113117248