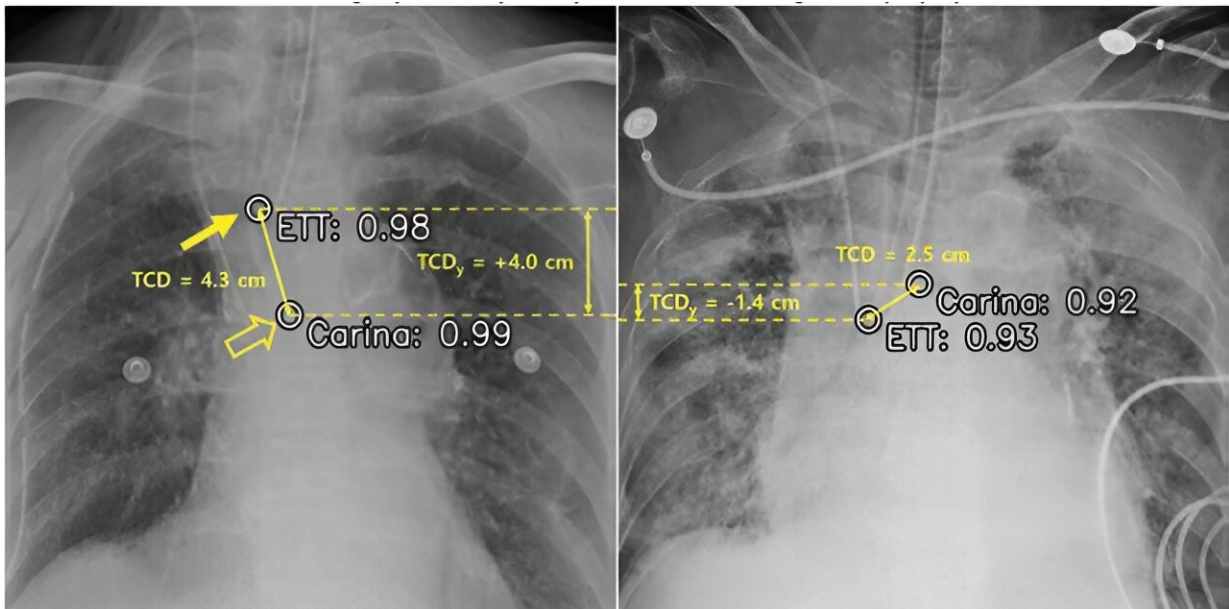# AI confirms tracheal tube position on chest radiography

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Left: Chest radiograph from 80-year-old patient in sample A. AI identified endotracheal tube (ETT) with probability score of 0.98, and properly localized tip of ETT (solid arrow). AI also identified tracheal carina with probability score of 0.99 and properly localized carina (open arrow). Based on pixel spacing information in DICOM data header, AI automatically measured absolute distance between ETT tip and tracheal carina (tip-to-carina distance, TCD) as 4.3 cm. AI also measured distance between ETT tip and carina along radiograph's vertical axis of (y-axis tip-to-carina difference, TCD_y) as 4.0 cm, indicating that ETT tip is located 4.0 cm above carina. ETT is in proper position based on TCD. Right: Chest radiograph from 77-year-old patient in sample A. ETT is in critical position, with tip located below tracheal carina. AI-derived TCD was 2.5 cm. AI-derived TCD_y was -1.4 cm, indicating that ETT tip is

[According to an accepted manuscript published in the *American Journal of Roentgenology*](#), an artificial intelligence (AI) system developed by Lunit (Seoul, Korea) identified improperly positioned endotracheal tube (ETTs) on chest radiographs obtained after ETT insertion, as well as on chest radiographs obtained from patients in the ICU at two institutions.

"Automated AI identification of improper ETT position on chest radiograph may allow earlier repositioning and thereby reduce complications," wrote corresponding author Eui Jin Hwang, MD, Ph.D., from the department of radiology at Korea's Seoul National University Hospital.

Hwang et al.'s retrospective study included 539 chest radiographs obtained immediately after ETT insertion from January 1, 2020 to March 31, 2020 in 505 patients (293 men, 212 women; mean age, 63 years) from institution A (sample A); 637 chest radiographs obtained from January 1, 2020 to January 3, 2020 in 304 patients (158 men, 147 women; mean age, 63 years) in the ICU (with or without an ETT) from institution A (sample B); and 546 chest radiographs obtained from January 1, 2020 to January 20, 2020 in 83 [patients](#) (54 men, 29 women; mean age, 70 years) in the ICU (with or without an ETT) from institution B (sample C).

Lunit's commercial DL-based AI system was used to identify ETT presence and measure ETT tip-to-carina distance (TCD). Reference standard for proper ETT position was TCD between 3 cm and 7 cm, determined by human readers. Critical ETT position was separately defined as ETT tip below the carina or TCD less than or equal to 1 cm.

Ultimately, in three patient samples from two different institutions, an AI system identified ETT presence with [sensitivity](#) of 99.2–100%; and specificity of 94.5–98.7%, improper ETT position with sensitivity of 72.5–83.7% and specificity of 92.0–100%, and critical ETT position with sensitivity of 100% in all samples and specificity of 96.7–100%.

More information: Ji Yeong An et al, Artificial Intelligence for Assessment of Endotracheal Tube Position on Chest Radiographs: Validation in Patients From Two Institutions, *American Journal of Roentgenology* (2023). [DOI: 10.2214/AJR.23.29769](#)

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