



A retrospective analysis of the performance of an AI tool in the detection of unsuspected pulmonary embolism in a tertiary care centre in oncology patients

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Purpose or Learning Objective:

Incidental pulmonary embolism (iPE) is estimated around 3% of cancer patients. It can be overlooked by radiologists in asymptomatic patients performing CT scans for surveillance. Given the amount of exams and the difficulty of interpretation of oncologic ones, interpretation delay is almost inevitable. This can eventually lead to an impact on patient management and care.

The advent of AI in radiology could reduce the risk of diagnostic delay of iPE by an optimal triage at the time of acquisition. This study aimed to determine the accuracy rate of an AI algorithm (CIBA-iPE) in detecting iPE, the delay of the management of cancer patients and to highlight the characteristics of patients with a confirmed pulmonary embolism (PE).

Methods or Background:

This is a retrospective analysis of the role of Avicenna's CE-certified and FDA-cleared CINA-iPE algorithm in oncology patients treated at Gustave Roussy Cancer Campus who underwent regular CT scans.

The results of the AI algorithm were compared with the radiologist's report by a resident and a senior radiologists. In case of discrepancy, the reason for it was investigated. The duration between the time of the CT scan and analysis but also

between the result's reporting and the beginning of treatment were assessed.

Results or Findings:

Out of 3047 patients, 104 alerts were detected for iPE (prevalence of 1.3%) while 2942 had negative findings. 36 of the 104 patients had a confirmed PE while 68 alerts were FP. Only one patient reported as negative by the AI tool was deemed to have a PE by the radiologists.

The sensitivity and specificity of the AI model were 97.3% and 97.74% while the PPV and NPV were 34.62% and 99.97% respectively.

Most causes of FP were artifacts (22 cases, 32.3%) and lymph nodes (11 cases, 16.2%).

The detection of pulmonary embolism was particularly challenged by the fact that many studies were injected at a portal venous phase, suboptimal when it comes to PE analysis.

Seven patients experienced delayed diagnosis, requiring them to return to the ER for treatment after being sent home following their scan.

The mean delay time of treatment was 8.13 hours.

Conclusion:

In the oncology field, iPEs are common with an increased risk of morbidity when missed with a delayed diagnosis. With the assistance of a reliable AI tool, the radiologist can focus on the challenging analysis of oncology results while dealing with urgent diagnosis such as PE by sending the patient straight to the ER for prompt treatment.

Adding an AI tool for the detection of unsuspected PEs on chest CT in routine oncology care demonstrated a promising efficacy compared to human performance only. The results showed the potential synergy between AI and radiologists for an optimal diagnosis of iPE in routine clinical cancer surveillance.

References:

1. Konstantinides SV, Meyer G, Becattini C, et al. 2019 ESC Guidelines for the diagnosis and management of acute pulmonary embolism developed in collaboration with the European Respiratory Society (ERS). *European Heart Journal*. 2020;41(4):543-603. doi:10.1093/eurheartj/ehz405
2. Stevens SM, Woller SC, Kreuziger LB, et al. Antithrombotic Therapy for VTE Disease. *Chest*. 2021;160(6):e545-e608. doi:10.1016/j.chest.2021.07.055
3. Van Laar SA, Kapiteijn E, Gombert-Handoko KB, Guchelaar HJ, Zwaveling J. Application of Electronic Health Record Text Mining: Real-World Tolerability, Safety, and Efficacy of Adjuvant Melanoma Treatments. *Cancers*. 2022;14(21):5426. doi:10.3390/cancers14215426
4. Van Es N, Bleker SM, Di Nisio M. Cancer-associated unsuspected pulmonary embolism. *Thrombosis Research*. 2014;133:S172-S178. doi:10.1016/S0049-3848(14)50028-X
5. Spirk D, Sebastian T, Barco S, et al. Clinical Outcomes of Incidental Venous Thromboembolism in Cancer and Noncancer Patients: The SWISS Venous Thromboembolism Registry (SWIVTER). *Thromb Haemost*. 2021;121(05):641-649. doi:10.1055/s-0040-1720977
6. Aujesky D, Obrosky DS, Stone RA, et al. Derivation and Validation of a Prognostic Model for Pulmonary Embolism. *Am J Respir Crit Care Med*. 2005;172(8):1041-1046. doi:10.1164/rccm.200506-862OC
7. Guman NAM, Kaptein FHJ, Lohle SB, et al. Discharge from the emergency department and outpatient clinic in cancer patients with acute symptomatic and incidental pulmonary embolism: A multicenter retrospective cohort study. *Thrombosis Research*. 2024;233:181-188. doi:10.1016/j.thromres.2023.12.003
8. Siragusa S, Arcara C, Malato A, et al. Home therapy for deep vein thrombosis and pulmonary embolism in cancer patients. *Annals of Oncology*. 2005;16:iv136-iv139. doi:10.1093/annonc/mdi923
9. Hendriks SV, Huisman MV, Eikenboom JCJ, et al. Home treatment of patients with cancer-associated venous thromboembolism – An evaluation of daily practice. *Thrombosis Research*. 2019;184:122-128. doi:10.1016/j.thromres.2019.10.031

10. Zondag W, Mos ICM, Creemersâ€Schild D, et al. Outpatient treatment in patients with acute pulmonary embolism: the Hestia Study. *Journal of Thrombosis and Haemostasis*. 2011;9(8):1500-1507. doi:10.1111/j.1538-7836.2011.04388.x
11. Aujesky D, Roy PM, Verschuren F, et al. Outpatient versus inpatient treatment for patients with acute pulmonary embolism: an international, open-label, randomised, non-inferiority trial. *The Lancet*. 2011;378(9785):41-48. doi:10.1016/S0140-6736(11)60824-6
12. Den Exter PL, Hooijer J, Dekkers OM, Huisman MV. Risk of Recurrent Venous Thromboembolism and Mortality in Patients With Cancer Incidentally Diagnosed With Pulmonary Embolism: A Comparison With Symptomatic Patients. *JCO*. 2011;29(17):2405-2409. doi:10.1200/JCO.2010.34.0984
13. Carrier M, Righini M, Wells PS, et al. Subsegmental pulmonary embolism diagnosed by computed tomography: incidence and clinical implications. A systematic review and metaâ€analysis of the management outcome studies. *Journal of Thrombosis and Haemostasis*. 2010;8(8):1716-1722. doi:10.1111/j.1538-7836.2010.03938.x
14. Van Dijk WB, Fiolet ATL, Schuit E, et al. Text-mining in electronic healthcare records can be used as efficient tool for screening and data collection in cardiovascular trials: a multicenter validation study. *Journal of Clinical Epidemiology*. 2021;132:97-105. doi:10.1016/j.jclinepi.2020.11.014
15. Mahajan A, Brunson A, White R, Wun T. The Epidemiology of Cancer-Associated Venous Thromboembolism: An Update. *Semin Thromb Hemost*. 2019;45(04):321-325. doi:10.1055/s-0039-1688494
16. Roy PM, Penalzoza A, Hugli O, et al. Triaging acute pulmonary embolism for home treatment by Hestia or simplified PESI criteria: the HOME-PE randomized trial. *European Heart Journal*. 2021;42(33):3146-3157. doi:10.1093/eurheartj/ehab373
17. Mulder FI, Horváth-Puhó E, Van Es N, et al. Venous thromboembolism in cancer patients: a population-based cohort study. *Blood*. 2021;137(14):1959-1969. doi:10.1182/blood.2020007338

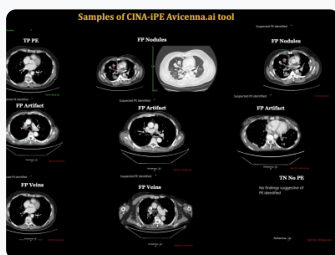


Fig 1: Binary tags provide an easy interpretation : an image containing the most relevant finding

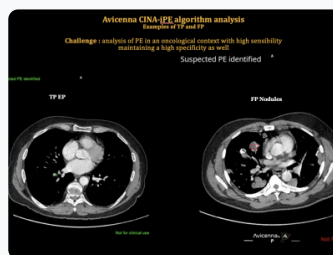


Fig 2: A particular challenge for AI tool : pulmonary metastatic nodules

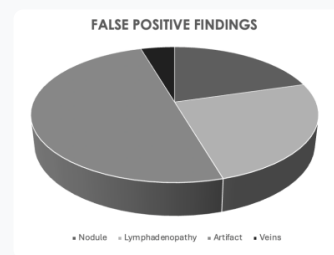


Fig 3: Majority of the false positives : artifacts

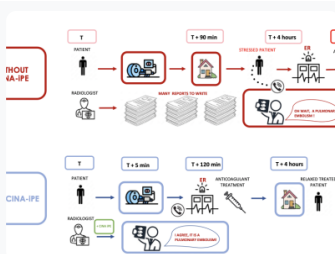


Fig 4: Time saved from the CT acquisition to patient treatment : management without and with AI tool