The Growing Role of Artificial Intelligence in Expanding Interventional Treatment for Acute Pulmonary Embolism

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BACKGROUND

- Pulmonary embolism (PE) remains a critical condition with high morbidity and mortality requiring timely detection and intervention to improve patient outcomes.
- Optimizing the management of acute PE, especially severe cases, hinges on the Pulmonary Embolism Response Team (PERT) model.
- However, a critical gap still exists: despite the emergence of novel catheter endovascular technologies that have improved outcomes for many intermediate-high and high-risk PE patients, a considerable number of cases are still treated via traditional workflows, even when a PERT is accessible. This frequently contributes to inferior outcomes for this specific patient population.
- The AI algorithms based on a pattern recognition can improve a detection of pulmonary embolism (PE) cases with a sensitivity of 92.7% in identifying positive exams for PE and a specificity of 95.5% in identifying negative PE exams [1].

AIM of the STUDY

- Our objective was to evaluate how integrating artificial intelligence into the Pulmonary Embolism Response Team (PERT) workflow impacted the number of PE patients referred for catheter-directed therapies over a three-year period.

CONFLICTS of INTEREST

- No authors report conflict of interest pertinent to the context of the abstract.

METHODS

- The artificial intelligence workflow, Aidoc, became operational in July 2022.
- We compared the number of PE patients referred by the PERT for catheter-directed therapies in six-month intervals over the three years after Aidoc's integration, against comparable six-month periods from the two years before its implementation.

RESULTS

- The introduction of the Aidoc system dramatically increased referrals for endovascular interventions in intermediate-high and high-risk PE patients.
- From July 2020 to June 2022, prior to Aidoc, 52 patients were referred for endovascular interventions: 11-14 per six-month interval.
- However, between July 2022 and June 2025, after Aidoc's implementation, this number increased to 135 patients: which is 18-31 per six-month interval; with $p<0.001$.
- This sustained increase, averaging 73% in every six-month period over three years, was driven exclusively by the integration of artificial intelligence.

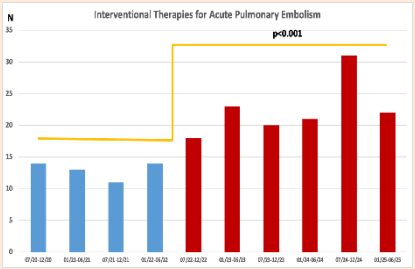

Image 1. PERT mobile workflow

Image 2. PERT at our hospital.

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DISCUSSION

- High hospital admission rates and number of CT pulmonary angiograms (CTPA) performed create a diagnostic challenge to read and communicate significant findings to referring team.
- The AI PE recognition assists cardiologists and radiologists by highlighting exams with a high suspicion of pulmonary embolism, thus, prioritizing reading of these cases and expediting the appropriate interventions. As well as it helps to avoid false-negative reports.
- Two primary AI-driven models that are currently being explored are deep convolutional neural networks (DCNNs) for enhanced image-based detection and natural language processing (NLP) for improved risk stratification using electronic health records [2].
- AI algorithms excel at detecting subtle patterns and abnormalities that might be difficult for the human eye to perceive; reduce the impact of human factors like fatigue, leading to more reliable interpretations; reduce the need of repeat scans and interpretation time and, thus, are more cost-effective.
- AI-analysis of CTPA images expedites the diagnostic and therapeutic work-up for patients with PE leading to decreased time from diagnosis to appropriate intervention and increased rate of advanced interventions for intermediate-high and high-risk PE patients.

CONCLUSIONS

- The AI-based algorithm showed a high degree of diagnostic accuracy for the detection of pulmonary embolism on CTPA.
- Integrating artificial intelligence into the workflow has significantly increased and sustained the number of PE patients managed by PERT.
- This ultimately improved the appropriateness of care for intermediate-high and high-risk PE patients undergoing catheter-directed interventional therapies (73 % increased access in JHMC).
- Subsequently, AI based diagnostic approach improves prognosis of intermediate-high to high acuity PE patients reducing the hospital stay and mortality rates [3].

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