UC Irvine

UC Irvine Previously Published Works

Title

Real-World Validation of a Deep Learning Al-Based Detection Algorithm for Suspected Aortic Dissection

Permalink

https://escholarship.org/uc/item/6tm3x7zj

Authors

Salehi, Shirin Schlossman, Jacob Chowdhry, Saba et al.

Publication Date

2022-11-22

Copyright Information

This work is made available under the terms of a Creative Commons Attribution License, available at https://creativecommons.org/licenses/by/4.0/

Peer reviewed



Real-world validation of a deep learning Al-based detection algorithm for suspected aortic dissection

Peter D. Chang, MD Shirin Salehi, MS2



Clinical significance

- Aortic dissection is associated with high rates of morbidity and mortality
 - Mortality rate of 1-2% per hour during first 48 hours
- Early diagnosis and prompt intervention greatly improve patient outcomes
- FDA 510k-approved software application expedites detection, triage,
 and ultimately treatment of patients with suspected aortic dissection
 - Viz Aortic Dissection algorithm, in collaboration with Avicenna.ai
- Objective to evaluate performance of AI algorithm across diverse clinical settings



department

Workflow incorporating Al-based detection algorithm

providers of findings, thereby

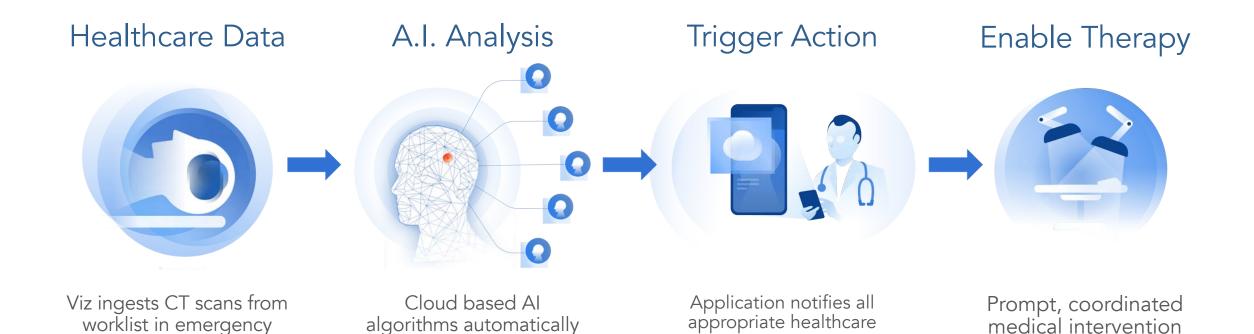
expediting clinical care

coordination and mobilizing

healthcare providers

and improved patient

health outcomes



detect, measure and

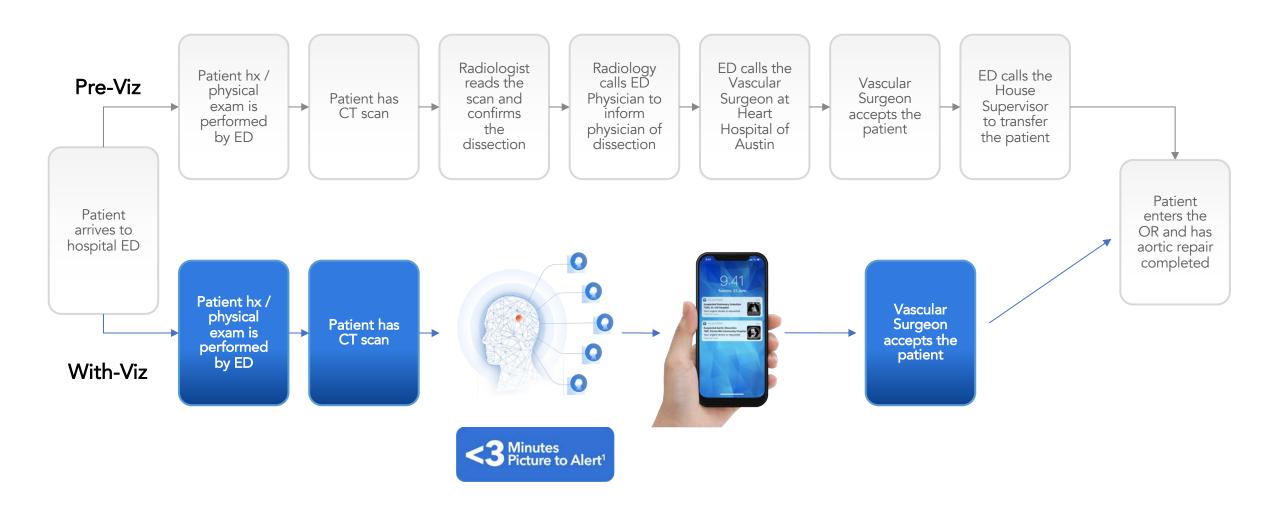
predict disease,

highlighting positive

findings



Al-based detection algorithm can expedite patient care





Study methods

- Large-scale, blinded algorithm validation study
- 1303 retrospectively collected chest and thoraco-abdominal CT angiography images
- Diverse representation of hospitals in 200+ U.S. cities
- Ground-truth consensus diagnosis determined by three boardcertified radiologists



Sample images of in-app Al-based findings

AAA



Al-Powered
Type B Dissection



Al-Powered
Type A Dissection



TAA



Rupture





Study results

- 1166 (89.5%) dissection-negative exams, 137 (10.5%) dissection-positive exams
- Sensitivity: 94.2%
 - [95% CI: 88.8% 97.5%]
- Specificity: 97.3%
 - [95% CI: 96.2% 98.1%]
- PPV of 80.1%, NPV of 99.3%
- 8 false negatives, largely complex cases
- 32 false positives, largely result of imaging quality

Clinical takeaways

- Real-world validation of a deep learning Albased detection algorithm for suspected aortic dissection
- Allows for rapid patient triage → earlier diagnoses → accelerated care coordination → timely initiation of life-saving interventions → better patient outcomes





Citations

- Gawinecka J, Schönrath F, von Eckardstein A. Acute aortic dissection: pathogenesis, risk factors and diagnosis. Swiss Med Wkly. 2017 Aug 25;147:w14489. doi: 10.4414/smw.2017.14489. PMID: 28871571.
- Gudbjartsson T, Ahlsson A, Geirsson A, Gunn J, Hjortdal V, Jeppsson A, Mennander A, Zindovic I, Olsson C. Acute type A aortic dissection - a review. Scand Cardiovasc J. 2020 Feb;54(1):1-13. doi: 10.1080/14017431.2019.1660401. Epub 2019 Sep 23. PMID: 31542960.
- Harris KM, Nienaber CA, Peterson MD, et al. Early Mortality in Type A Acute Aortic Dissection: Insights From the International Registry of Acute Aortic Dissection. JAMA Cardiol. 2022;7(10):1009–1015. doi:10.1001/jamacardio.2022.2718