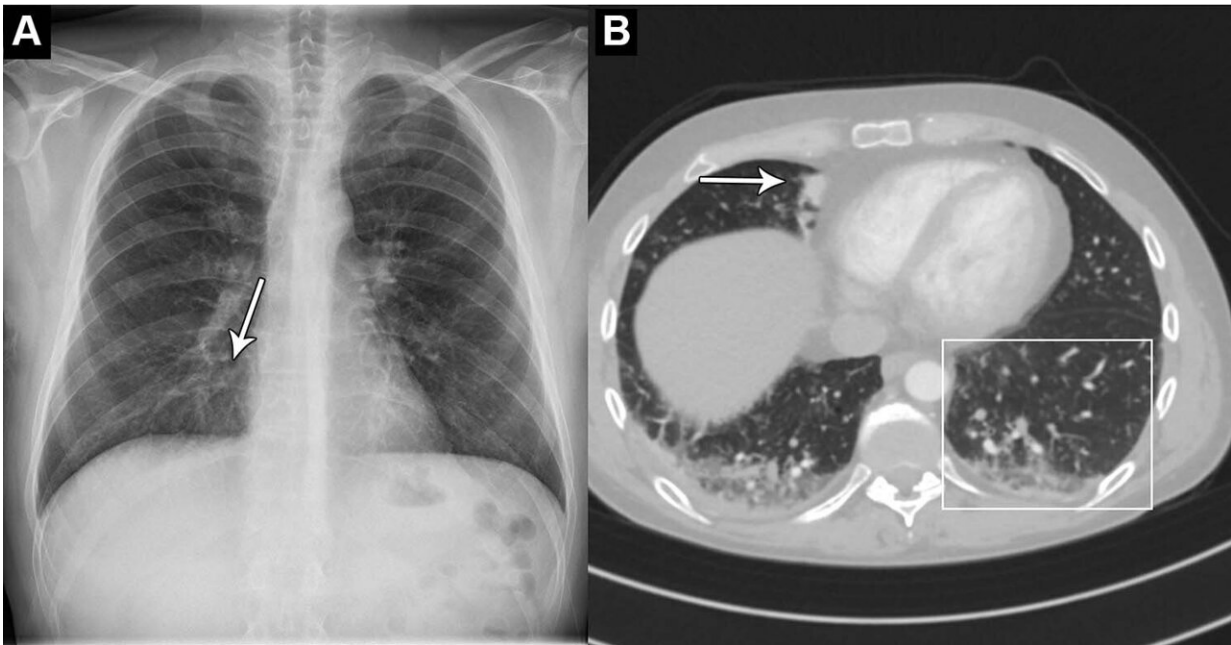


AI accurately identifies normal and abnormal chest X-rays

March 7 2023



A 44-year-old man who presented with chest pain and dyspnea. (A) Chest X-ray shows very subtle nodular opacities, primarily in lower lobes, representative of pneumonia and a discrete silhouette sign of the right cardiac border (arrow). The AI system interpreted this chest X-ray as normal. It was also interpreted as normal in the clinical radiology report. (B) CT scan shows the lower lobe airspace opacities with vague tree-in-bud morphology (box) and an area of consolidation (arrow). Pulmonary angiography was performed 5 hours after X-ray. This was the sole false-negative “critical” finding by the AI tool. Credit: Radiological Society of North America

An artificial intelligence (AI) tool can accurately identify normal and abnormal chest X-rays in a clinical setting, according to a study published in *Radiology*.

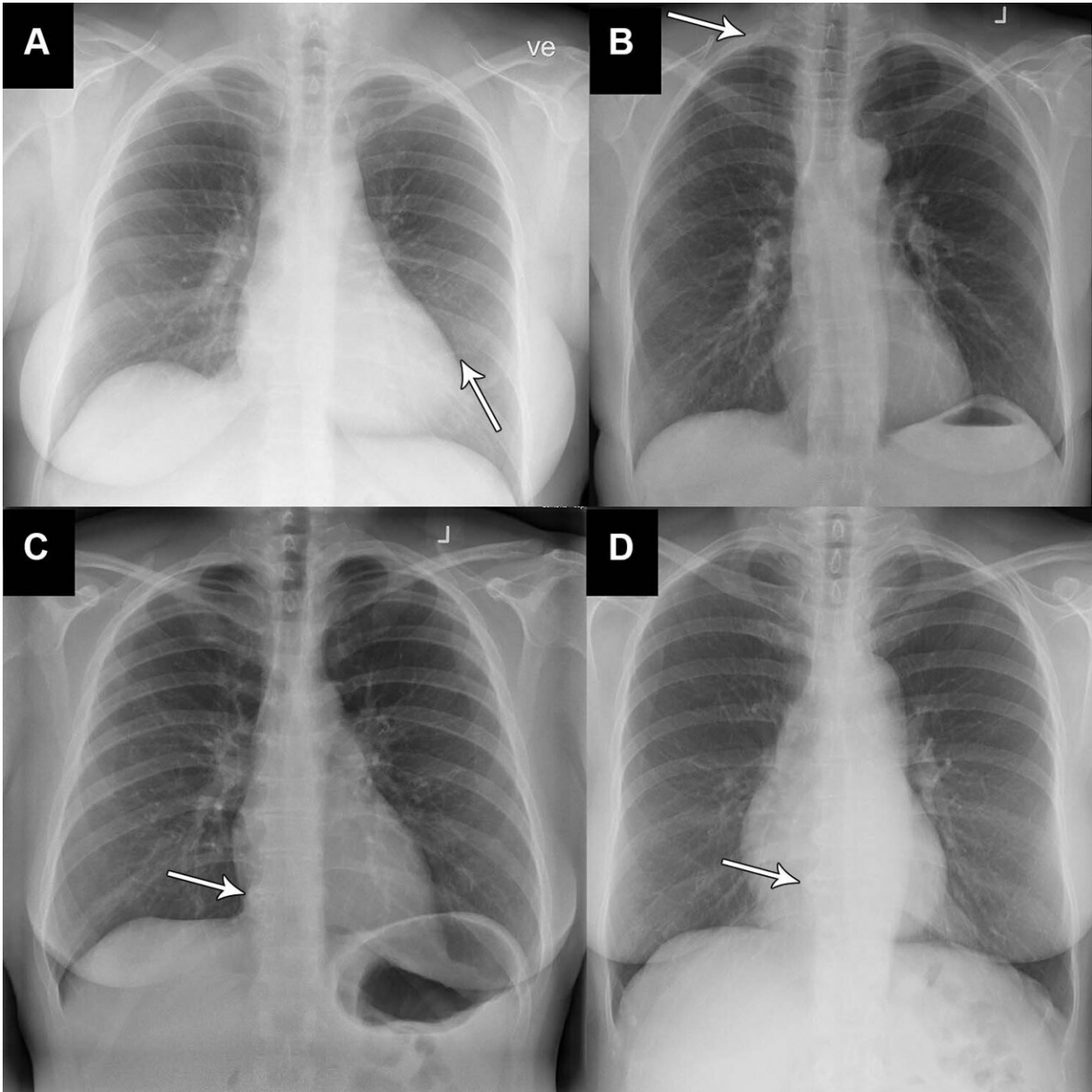
Chest X-rays are used to diagnose a wide variety of conditions to do with the heart and lungs. An abnormal chest X-ray can be an indication of a range of conditions, including cancer and chronic lung diseases.

An AI tool that can accurately differentiate between normal and abnormal chest X-rays would greatly alleviate the heavy workload experienced by [radiologists](#) globally.

"There is an exponentially growing demand for [medical imaging](#), especially cross-sectional such as CT and MRI," said study co-author Louis Lind Plesner, M.D., from the Department of Radiology at the Herlev and Gentofte Hospital in Copenhagen, Denmark. "Meanwhile, there is a global shortage of trained radiologists. Artificial intelligence has shown great promise but should always be thoroughly tested before any implementation."

For this retrospective, multi-center study, Dr. Plesner and colleagues wanted to determine the reliability of using an AI tool that can identify normal and abnormal chest X-rays.

Researchers used a commercially available AI tool to analyze the chest X-rays of 1,529 patients from four hospitals in the capital region of Denmark. Chest X-rays were included from emergency department patients, in-hospital patients and outpatients. The X-rays were classified by the AI tool as either "high-confidence normal" or "not high-confidence normal" as in normal and abnormal, respectively.



Four examples (out of a total of nine) of X-rays classified as “abnormal, unremarkable” by the reference standard (provided independently by two board-certified thoracic radiologists, with a third radiologist in cases of disagreement) but as normal by the AI tool. All X-rays show very subtle and unremarkable findings; these X-rays were all classified as normal by the clinical radiologic report as well. (A) X-ray in a 58-year-old woman with very discrete linear atelectasis in the lingula segment of the left upper lobe (arrow). (B) X-ray in a 61-year-old woman shows presence of a cervical rib on the right side (arrow). (C, D) Images in a 48-year-old woman (C) and 64-year-old woman (D) show

very subtle degeneration in the spine with osteophytes in lower thoracic segments (arrow). Credit: Radiological Society of North America

Two board-certified thoracic (chest) radiologists were used as the reference standard. A third [radiologist](#) was used in cases of disagreements, and all three physicians were blinded to the AI results.

Of the 429 chest X-rays that were classified as normal, 120, or 28%, were also classified by the AI tool as normal. These X-rays, or 7.8 % of all the X-rays, could be potentially safely automated by an AI tool. The AI tool identified abnormal chest X-rays with a 99.1% of sensitivity.

"The most surprising finding was just how sensitive this AI tool was for all kinds of chest disease," Dr. Plesner said. "In fact, we could not find a single chest X-ray in our database where the algorithm made a major mistake. Furthermore, the AI tool had a sensitivity overall better than the clinical board-certified radiologists."

According to the researchers, further studies could be directed toward larger prospective implementation of the AI tool where the autonomously reported chest X-rays are still reviewed by radiologists.

The AI tool performed especially well at identifying normal X-rays of the outpatient group at a rate of 11.6%. This suggests that the AI model would perform especially well in outpatient settings with a high prevalence of normal chest X-rays.

"Chest X-rays are one of the most common imaging examination performed worldwide," Dr. Plesner said. "Even a small percentage of automatization can lead to saved time for radiologists, which they can prioritize on more complex matters."

More information: Louis L. Plesner et al, Autonomous Chest Radiograph Reporting Using AI: Estimation of Clinical Impact, *Radiology* (2023). [DOI: 10.1148/radiol.222268](https://doi.org/10.1148/radiol.222268)

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