

AI improves doctors' ability to correctly interpret tests and diagnose lung disease

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Artificial intelligence (AI) can be an invaluable aid to help lung doctors interpret respiratory symptoms accurately and make a correct diagnosis, according to new research presented today (Wednesday) at the European Respiratory Society International Congress.

Dr. Marko Topalovic (Ph.D.), a postdoctoral researcher at the Laboratory for Respiratory Diseases, Catholic University of Leuven (KU Leuven), Belgium, told the meeting that after training an AI computer algorithm using good quality data, it proved to be more consistent and accurate in interpreting respiratory test results and suggesting diagnoses than lung specialists.

"Pulmonary function tests provide an extensive series of numerical outputs and their patterns can be hard for the human eye to perceive and recognise; however, it is easy for computers to manage large quantities of data like these and so we thought AI could be useful for pulmonologists. We explored if this was true with 120 pulmonologists from 16 hospitals. We found that diagnosis by AI was more accurate in twice as many cases as diagnosis by pulmonologists. These results show how AI can serve as a second opinion for pulmonologists when they are assessing and diagnosing their patients," he said.

Pulmonary function tests (PFT) include: spirometry, which involves the patient breathing through a mouthpiece to measure the amount of air inhaled and exhaled; a body box or plethysmography test, which enables doctors to assess lung volume by measuring the pressure in a booth in

which the patient is sitting and breathing through a mouthpiece; and a diffusion capacity test, which tests how well a patient's lungs are able to transfer oxygen and carbon dioxide to and from the bloodstream by testing the efficiency of the alveoli (small air sacks in the lungs). Results from these tests give doctors important information about the functioning of the lungs, but do not tell them what is wrong with the patient. This requires interpretation of the results in order to reach a diagnosis.

In this study, the researchers used historical data from 1430 patients from 33 Belgian hospitals. The data were assessed by an [expert panel](#) of pulmonologists and interpretations were measured against gold standard guidelines from the European Respiratory Society and the American Thoracic Society. The expert panel considered patients' medical histories, results of all PFTs and any additional tests, before agreeing on the correct interpretation and diagnosis for each patient.

"When training the AI algorithm, the use of good quality data is of utmost importance," explained Dr. Topalovic. "An expert panel examined all the results from the pulmonary function tests, and the other tests and medical information as well. They used these to reach agreement on final diagnoses that the experts were confident were correct. These were then used to develop an algorithm to train the AI, before validating it by incorporating it into real clinical practice at the University Hospital Leuven. The challenging part was making sure the algorithm recognised patterns of up to nine different diseases."

Then, 120 pulmonologists from 16 European hospitals (from Belgium, France, The Netherlands, Germany and Luxembourg) made 6000 interpretations of PFT data from 50 randomly selected patients. The AI also examined the same data. The results from both were measured against the gold standard guidelines in the same way as during development of the algorithm.

The researchers found that the interpretation of the PFTs by the pulmonologists matched the guidelines in 74% of cases (with a range of 56-88%), but the AI-based software interpretations perfectly matched the guidelines (100%). The doctors were able to correctly diagnose the primary disease in 45% of cases (with a range of 24-62%), while the AI gave a correct diagnosis in 82% of cases.

Dr. Topalovic said: "We found that the interpretation of pulmonary function tests and the diagnosis of respiratory disease by pulmonologists is not an easy task. It takes more information and further tests to reach a satisfactory level of accuracy. On the other hand, the AI-based software has superior performance and therefore can provide a powerful decision support tool to improve current clinical practice. Feedback from doctors is very positive, particularly as it helps them to identify difficult patterns of rare diseases."

Two large Belgian hospitals are already using the AI-based software to improve interpretations and diagnoses. "We firmly believe that we can empower doctors to make their interpretations and diagnoses easier, faster and better. AI will not replace doctors, that is certain, because doctors are able to see a broader perspective than that presented by [pulmonary function tests](#) alone. This enables them to make decisions based on a combination of many different factors. However, it is evident that AI will augment our abilities to accomplish more and decrease chances for errors and redundant work. The AI-based software has superior performance and therefore may provide a powerful decision support tool to improve current clinical practice.

"Nowadays, we trust computers to fly our planes, to drive our cars and to survey our security. We can also have confidence in computers to label medical conditions based on specific data. The beauty is that, independent of location or medical coverage, AI can provide the highest standards of PFT [interpretation](#) and patients can have the best and

affordable diagnostic experience. Whether it will be widely used in future clinical applications is just a matter of time, but will be driven by the acceptance of the medical community," said Dr. Topalovic.

He said the next step would be to get more hospitals to use this technology and investigate transferring the AI technology to primary care, where the data would be captured by general practitioners (GPs) to help them make correct diagnoses and referrals.

Professor Mina Gaga is President of the European Respiratory Society, and Medical Director and Head of the Respiratory Department of Athens Chest Hospital, Greece, and was not involved in the study. She said: "This work shows the exciting possibilities that artificial intelligence offers to doctors to help them provide a better, quicker service to their patients. Over the past 20 to 30 years, the evolution in technology has led to better diagnosis and treatments: a revolution in imaging techniques, in molecular testing and in targeted treatments have make medicine easier and more effective. AI is the new addition! I think it will be invaluable in helping [doctors](#) and [patients](#) and will be an important aid to their decision-making."

More information: Abstract no: PA5290, "Artificial intelligence improves experts in reading pulmonary function tests", by M. Topalovic et al; Poster Discussion "The importance of the pulmonary function test in different clinical settings", 08.30-10.30 hrs CEST, Wednesday 19 September, Room 7.2D.

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