Artificial Intelligence in Medical Imaging

Healthcare institutions perform imaging studies for a variety of reasons. While these imaging studies are helpful, very few have clinical therapeutic value. To avoid redundancy and ensure meaningful endpoints to imaging studies, Artificial Intelligence (AI) has now been introduced to the world of medical imaging.

AI involves the use of computerised algorithms which can help dissect complicated data and help clinicians reach more accurate diagnosis. Countless studies show that computer-aided diagnostics with AI have excellent accuracy for a wide range of disorders. Also, AI-based systems tend to have high sensitivity for the detection of small radiological defects, which eventually results in better patient care.

However, the outcome assessment in AI imaging studies is frequently determined by the location of the lesion, while often ignoring the biological aggressiveness and type of lesion. This can skew the overall performance of AI. In addition, when one uses non-patient focussed imaging and pathological endpoints, this can increase the estimated sensitivity of the technique at the expense of elevating the rate of false-positive and overdiagnosis as a result of identifying minute changes as major deficits. Thus, today radiologists agree that IA is useful in imaging but it is important to establish consistent and reliable clinical endpoints such as symptoms, survival, and the need for treatment.

At present, the role of AI in diagnostic medical imaging is undergoing a renaissance. While the technique has shown good accuracy and sensitivity in the identification of imaging defects and promises to enhance tissue-based characterisation, there is a concern that the technique may over-diagnose and lead to false positives, which in turn could lead to unnecessary procedures for the patient and increased cost. For example, analysis of screening mammograms has shown that AI is no more accurate at detecting cancer compared to manually read mammograms by radiologists. AI has consistently shown a much higher sensitivity for subtle lesions, but this does not always have clinical relevance.

The education of the medical community is vital; clinicians should be made aware that AI-assisted diagnostic medical imaging will result in some errors and one should anticipate potential unknowns. Also, when the use of AI becomes more widespread, the quality and interoperability may not always be easy to define.

At present, many AI imaging studies estimate the diagnostic accuracy by calculating the specificity and sensitivity while others are only assessing clinical outcomes. However, since AI is known to detect minor image defects, this will add more variable outcomes that may or may not impact survival.

As the use of AI spreads in clinical medicine, better algorithms will be needed to help differentiate between the detection of defects and clinically relevant meaningful lesions. While this may lower the rate of false positives, it is important not to make the system so rigid that we go overboard and increase the rate of false negatives. Clinicians who use AI should always take into account the clinical endpoints to enhance the applicability of AI if it is to be used in clinical practice.

Source: The Lancet

Image Credit: iStock

Published on : Fri, 18 Sep 2020