

How can AI assist sonographers in performing fetal cardiac screening examination?

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Objective

The detection rate of congenital heart disease (CHD) in the antenatal period is about 60% in developed countries. Four main causes have been well identified for this failure: lack of knowledge of and adherence to national and international guidelines, failure to obtain views of interest and of quality, failure to recognize unusual images, and the existence of malformations not accessible to screening.

Methods

We have developed Diagnoly® software using algorithms based on Deep Learning technology to address the three first sources of error related to human practice by identifying the presence or absence of the five views of interest recommended by the guidelines (abdominal situs, 4 chambers view, left outflow tract, right outflow tract, 3-vessel and 3-vessel and trachea views) and by studying the quality of those same views of interest via the analysis of 54 anatomical landmarks defining an anatomical quality score. We used our software retrospectively (by conducting an audit of practice at a national scale via a collaboration with Monecho® leader in France in editing online pregnancy ultrasound reports) and prospectively (in real time) to assess quality of fetal cardiac screening examination.

Results

From a retrospective point of view, it was possible to carry out an audit of practices on a national scale by analyzing 10,000 files (5,000 from the 2nd trimester and 5,000 from the 3rd trimester) corresponding to the screening examinations of 879 practitioners (393 doctors and 486 midwives). 401,909 images present in the reports were analyzed. Those screening examinations included the 5 views of interest in only 50.5% of cases and had an average anatomical quality score of 58.5%. From a prospective point of view, the use of our software in real time makes it possible to secure screening practices by informing the practitioner of the non-completeness of his examination in 1 to 17% of cases, depending on whether we are looking at an expert or a screener respectively.

Conclusion

The use of AI tools makes it possible to improve the quality of fetal screening ultrasonographic examinations by assisting the operator through retrospective analysis or real-time auditing.