



# Innovations in breast ultrasound improve breast cancer management

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## **The problem of breast density**

Breast density is a very important problem of breast imaging because sensitivity of mammography decreases depending on breast density. We have a very high sensitivity in a fatty breast (98%) but in a extremely dense breast sensitivity decreases to 48%. Moreover, breast density is an independent risk factor for developing a breast cancer that increases risk from 4 to 6 times over lifetime.

Ultrasound increases the detection rate and a personalized screening with mammography and ultrasound (multimodal approach) would bring the detection rate from 4% with only mammography to 7 % with the addition of ultrasound. Ultrasound is accessible and widespread with high acceptance from patients and the possibility of real time cross sectional assessment, but there are some critical issues that prevent us from proposing it in the screening programs: the examination time, the reproducibility, the false positives results and the costs. Automatic breast ultrasound (ABUS) represents a solution because it's simple, reproducible, well appreciated by patients and with lower operating costs than hand held ultrasound. In our study published in Health Services Management Research we showed that the introduction of ABUS in screening programs could lead to an increase in the screening phase expenditure, but could stimulate a significant decrease in the patients' care and cancer treatment phase with a lower National Health Service resources absorption.

## **Artificial intelligence**

In recent years has increased exponentially the problem of operator dependence and false positives/ false negatives results (FPV and FNV). It is necessary to standardize the examination by implementing the confidence of sonographers by providing them with tools that allow reproducibility and homogenize inter-operator variability. Koios is a software that automatically provides an AI-based quantitative risk assessment that aligns to a BI-RADS® category. It provides decision support for the clinician, and helping to improve consistency across the department. We tested this system in more than 150 patients and we concluded that it has a positive impact in decision-making process, decreasing recall rates and unnecessary biopsies and increasing accuracy. It works like second opinion, closing skill gap between experienced breast radiologists and radiologists not performing breast imaging full time.

## **Conclusions**

Breast ultrasound has a fundamental role in the detection and characterisation of breast lesions, but its limitations mainly related to false positives and costs compromise its inclusion in diagnostic pathways. The increasingly innovative new technologies allow us to overcome these limitations and place ultrasound at the centre of breast diagnostics.

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