Reducing Radiologists' Variability in the Interpretation of Mammograms with Computer-Aided Diagnosis (CAD)

Studies have shown that considerable variability can occur among the interpretation of and recommendation for the same mammogram when the diagnoses are made independently by different radiologists. Our purpose is to show that computer-aided diagnosis (CAD) can potentially reduce this variability. We analyzed results from an observer performance study designed to compare radiologists' interpretation of mammograms with and without a computer aid. The diagnostic task was to differentiate malignant from benign clustered microcalcifications in mammograms and to make a clinical-management recommendation of biopsy versus follow-up. The computer aid provided to the observers was an estimate of the likelihood of malignancy which was obtained from a computer analysis using an artificial neural network. Ten radiologists participated as observers and read 104 near-consecutive biopsy-proven cases of microcalcifications. When the computer aid was used, the agreements by all observers increased from 13% to 32% of total cases. Kappa increased statistically significantly from 0.19 to 0.41. In addition, two third of extreme disagreements where biopsy and routine screening were recommended for the same patient by different radiologists were eliminated. Furthermore, the standard deviation in A_Z was reduced by 47%, which was in agreement with an analysis of several other observer-performance studies. We conclude that computer-aided diagnosis can reduce the variability in radiologists' interpretation of mammograms while being able to improve radiologists' diagnostic accuracy.

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