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# A computer-based training system for breast fine needle aspiration cytology

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## Abstract

Fine-needle aspiration (FNA) cytology is a rapid and inexpensive technique used extensively in the diagnosis of breast disease. To remove diagnostic subjectivity, a diagnostic decision support system (DDSS) called CytoInform© has been developed, based on a Bayesian belief network (BBN) for the diagnosis of breast FNAs. In addition to acting as a DDSS, the system implements a computer-based training (CBT) system, providing a novel approach to breast cytology training. The system guides the trainee cytopathologist through the diagnostic process, allowing the user to grade each diagnostic feature using a set of on-screen reference images as visual clues. The trainee positions a slider on a spectrum relative to these images, reflecting the similarity between the reference image and the microscope image. From this, an evidence vector is generated, allowing the current diagnostic probability to be updated by the BBN. As the trainee assesses each clue, the evidence entered is compared with that of the expert through the use of a defined teaching file. This file records the relative severity of each clue and a tolerance band within which the trainee must position the slider. When all clues in the teaching case have been completed, the system informs the user of inaccuracies and offers the ability to reassess problematic features. In trials with two pathologists of different experience and a series of ten cases, the system provided an effective tool in conveying diagnostic evidence and protocols to trainees. This is evident from the fact that each pathologist only misinterpreted one case and a total of 86%/88% (experienced/inexperienced) of all clues assessed were interpreted correctly. Significantly, in all cases that produced the correct final diagnostic probability, the route taken to that solution was consistent with the expert's solution.



Keywords: decision support; Bayesian networks; breast FNA; computer-based training; knowledge management