Automated reading methods of uterine cervical cytology

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SUMMARY

Introduction: Uterine cervical cancer is the third most common cancer in women, where more than 80% occur in developing countries. Cervical cancer screening has proven effective in reducing the incidence and mortality from cervical cancer, especially when it is implemented within an organised population-based programmes. Initially, the screening test was Pap smear (conventional cytology). To improve the effectiveness of screening new sampling techniques, such as liquid-based cytology (LBC), and automation-assisted systems of reading cytological slides have been introduced.

Objective: To assess the efficacy and effectiveness of automated reading versus manual reading of cytologies (conventional or LBC) in cervical cancer screening. b) To evaluate the productivity of automated slide reading versus manual slide reading. c) To assess the cost-effectiveness ratio of automation-assisted slide reading.

Methods: Systematic review of the scientific literature. Critical appraisal of studies was conducted by two independent reviewers.

Results: A systematic review and three subsequent primary studies published on the effectiveness of automated slides reading were selected. The systematic review concluded that, with respect to manual reading, automated reading of LBC increased the number of lesions classified as LSIL+, detected the same number of CIN2+, reduced slide reading time and had an unfavorable cost-effectiveness ratio unfavorable in the Australian setting. In the primary trials, the results on effectiveness of automated slide reading were not consistent: one study showed higher effectiveness, another showed lower effectiveness and the third one found no differences between the automated and manual reading. All three studies showed verification bias. In the studies on productivity, automated slide reading showed better productivity than manual reading. The two cost-effectiveness studies included, conducted within the framework of cervical screening programmes in England and Australia, showed discrepant results that were not directly transferable to the Spanish setting.

Conclusions and recommendations:

- Automated reading of cytology has not shown higher sensitivity than manual reading to detect cervical intraepithelial neoplasia grade II (CIN2) or worse lesions, regardless of the automation-assisted device and the technique of cytology sampling (conventional or liquid-based cytology).
- Automated reading of cytology has not shown higher specificity than manual reading to detect cervical intraepithelial neoplasia grade II (CIN2) or worse lesions, regardless of the automation-assisted system and the type of cytology sample (conventional or liquid-based cytology).
- The productivity of automated reading of cytology was higher than manual reading, in terms of reading time and number of slides read per hour or per day.
- According to the results of studies conducted in the context of organised cervical cancer screening programmes, automated reading of liquid-based cytology was less cost-effective than manual reading for any type of cytology (liquid or conventional).
- According to the published results, the use of automated reading systems currently available can not be recommended for the detection of cervical precancerous lesions.
- In our setting, where a common organised screening programme is not available, it is recommendable that prior to the implementation of automated reading systems, studies should be conducted to determine its feasibility and organisational repercussions: choice of cytology sampling technique; assessment of the centralizing cytological reading in reference laboratories, professional training on automated reading, adequacy of screening protocol and quality control of cytology reading, monitoring the productivity of automated cytology reading; assessment of false positive results and its repercussion on referral to diagnostic tests, assessment of false negative results and its impact on diagnostic and therapeutic delay, etc.