Cervical screening in the United Kingdom

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It has been more than 10 years since the cervical screening system in the United Kingdom was completely overhauled and a computerised call and recall system was introduced. The current programme is very healthy and dramatic improvements have been made over the past decade. The coverage of the screening programme in England has improved, and incidence and mortality rates have been reduced. Further improvements in compliance, rigorous auditing, and new technologies will likely yield more accurate, efficient, and cost-effective screening programmes in the next decade.

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Since 1988, women in England and Wales who are aged between 20 and 64 years have been invited for cervical screening at least once every 5 years, while in Scotland, the frequency is once every 3 years for women who are aged between 20 and 60 years. In practice, invitations for screening are sent at intervals of either 3 or 5 years depending on local policy. Smears are taken not only in general practices, but also in community clinics by specially trained nurses or doctors, and the samples are analysed by local hospital-based cytopathology departments. General practitioners are paid for each smear that they take, at a rate dependent on their overall coverage, and with increments at 50% and 80%. In 1998, 176 laboratories in England reported on 4.4 million smears.[1] Samples that show borderline changes or mild dyskaryosis (approximately 6.0%) are repeated at 6 months; women with moderate or severe dyskaryosis (approximately 1.6%) are referred for colposcopy.[1]

Coverage—defined as the proportion of women (with a cervix) aged 25 to 64 years who have been screened in the previous 5 years—has improved from about 50% in the mid-1980s to approximately 85% by 1998 and has stabilised at that level. In 1998, 72 of the 100 health authorities in England had a coverage of more than 85% and only 13 had a coverage of less than 80%.[1] Nevertheless, in some inner-city areas and among certain ethnic minorities, coverage is still quite low and more needs to be done to improve the screening uptake for these groups.

The mortality rate of cervical cancer had been declining by approximately 1.6% per year from 1950 to 1990, but within 5 years of the reorganisation of the national screening programme, rates decreased more rapidly and are now falling by about 7% per year.[2] Overall mortality rates have dropped by 42% from 1987 to 1997.[3,4] The reduction was greatest (54%) in women whose age at death was between 55 and 64 years. The data on the annual incidence of cervical cancer is still woefully out of date, but provisional data are available for the period 1993 to 1995.[5] The incidence did not decline during the 1970s and 1980s but now appears to be substantially reduced. The age-standardised incidence fell by 35% between 1988 and 1995; 1991 was the first year to show a significant reduction. Although the interpretation of age-specific trends is complicated by strong birth-cohort effects, careful analysis (ie after appropriate adjustments have been made) suggests that age-standardised incidences have actually been falling since the late 1980s.[6]

Improvements in cervical screening have come about not only through improved coverage, however. The National Screening Office and its predecessor, the National Coordinating Network, have worked hard to improve the quality of screening by establishing a comprehensive screening programme that includes all aspects—from invitation procedures to ensuring adequate treatment when cervical neoplasia is detected.

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The approach was to provide not only a central coordination, but also local control of the programme. Particular aspects include the following[7,8]: (1) a devolved computerised call and recall system with central reporting; (2) education and training programmes for smear takers and cytologists; (3) the active monitoring of follow-up in cases of abnormal smears and the implementation of fail-safe procedures; and (4) the publication of regular guidelines to improve various aspects of clinical practice and programme management. Regional Quality Assurance Teams have been established as a response to some well-publicised cases in which poor management failed to detect inadequate cytology services. In some cases, invasive cervical cancer developed in women whose smears had been misclassified.

Since the effectiveness of cervical screening is highly dependent on the quality of the service provided, it is essential to regularly audit the programme to identify areas that require modification. Initial efforts concentrated on auditing process measures such as coverage and laboratory results. More recently, the need to audit the screening histories of all cases of invasive cancer—the 'failure' of the previous screening programme—has been appreciated. The audit should be multidisciplinary and comprehensive, and should cover call-recall, smear taking, cytology, follow-up, colposcopy services, and cancer registration. To facilitate such an audit, a new computer system that integrates information from all parts of the programme is required, thereby allowing routine monitoring and the rapid identification of any weaknesses. Such a computer system would also allow the testing of different screening policies and the estimation of the risk of cancer developing within, for examples, 5 years of any screening outcome.

New technology offers a way of improving the efficiency of screening and reducing the reliance on the tedious and error-prone manual processing of smears. The most significant change that is likely to be introduced over the next decade is liquid-based cytology. Instead of smearing cells from a spatula onto a glass slide, spatulas or brushes containing the sample are immersed and rinsed in a preservative. In this way, a greater percentage of cells is collected. The sample is then sent to the laboratory to be plated out onto slides as a 'thin-layer' specimen. Although cytologists will require some retraining, there is good evidence that the resulting preparations will dramatically reduce the number of inadequate samples (currently accounting for more than 8% of all smears), reduce the average time required to screen each sample, and possibly improve the diagnostic accuracy.[9-11]

Preparing liquid-based samples also offers the possibility of performing additional assays such as testing for the presence of DNA from high-risk types of human papillomavirus. This group of viruses is known to cause virtually all cervical cancers and has a high prevalence in young women; fortunately, most infections regress spontaneously. Current results show that the test has a high sensitivity for detecting viral DNA in samples from patients with high-grade cervical intraepithelial neoplasia, but questions still remain about the test's specificity.[12,13]

Another approach to improving cytology is to use computer-assisted analysis of the slides. Two systems have been widely evaluated. In one, a proportion of slides (typically between 25% and 50%) are classified as not requiring human interpretation.[14] The other provides a video screen of selected fields that are judged to be 'most suspicious' by the computer algorithm and a link to the microscope, which positions the slide so that the field of interest can be viewed directly. Results of only conventionally collected smears—and hence shorter reading times and somewhat better detection rates—have been reported so far.[15-17] A major difficulty with automated reading, however, is the inaccurate interpretation of overlapping cell clumps, and one might hope that the automated reading of thin-layer preparations will give even better results. New technologies, however, are currently capital intensive and are most efficient when laboratories read in excess of 50 000 smears per year. This volume poses logistical questions for the cervical smear programme, as many laboratories process less than 25 000 per year.

The high coverage and quality assurance measures that are currently in place have led to a reduction in cervical cancer mortality—estimated to be approximately 60% in the target population.[5] Within the infrastructure that has now been established, there are opportunities for new technologies to improve accuracy and reduce human error. As testing becomes more sensitive, it may become safe and more cost-effective to begin screening at age 25 years, lengthen the interval between screens, and discontinue routine screening at age 50 years.

References

1. Department of Health. Cervical screening programme, England 1997-98, Bulletin 1992/2. London: Crown Copyright; 1999.
2. Sasieni P, Cuzick J, Farmery E. Accelerated decline in cervical cancer mortality in England and Wales [letter]. Lancet 1995,346:1566-7.

3. Office of Population Consensuses and Surveys. Mortality statistics: cause series DH2 No. 14. London: Her Majesty's Stationery Office; 1987.
4. Office of Population Consensuses and Surveys. Mortality statistics: cause series DH No. 24. London: Her Majesty's Stationery Office; 1997.
5. Office of National Statistics, United Kingdom. Monitor: population and health. Estimates of newly diagnosed cases of cancer, England and Wales 1993-1997. London: ONS; 1998.
6. Sasieni PD, Adams J. Effect of screening on cervical cancer mortality in England and Wales: analysis of trends with an age period cohort model. BMJ 1999;318:1244-5.
7. Imperial Cancer Research Fund Coordinating Committee on Cervical Screening. The management of a cervical screening programme: a statement (October 1985). Commun Med 1986; 3:179-84.
8. Farmery E, Grey JM. Report of the first five years of the NHS cervical screening programme. National Coordinating Network, NHS Cervical Programme. Oxford: Anglia and Oxford Regional Health Authority; 1994.
9. Hutchinson ML, Agarwal P, Denault T, Berger B, Cibas ES. A new look at cervical cytology. ThinPrep multicenter trial results. Acta Cytol 1992;36:499-504.
10. Hutchinson ML, Isenstein LM, Goodman A, et al. Homogeneous sampling accounts for the increased diagnostic accuracy using the ThinPrep Processor. Am J Clin Pathol 1994; 101: 215-9.
11. Wilbur DC, Dubeshter B, Angel C, Atkison KM. Use of thin-layer preparations for gynecologic smears with emphasis on the cytomorphology of high-grade intraepithelial lesions and carcinomas. Diagn Cytopathol 1996;14:201-11.
12. Cuzick J. HPV testing in cervical screening. Sex Transm Infect 1998;74:300-1.
13. Cuzick J, Sasieni P, Davies P, et al. A systematic review of the role of human papillomavirus testing within a cervical screening programme. Health Technol Assess 1999;3:14.
14. Richart RM, Patten SF, Lee JS. Automated screening using the AutoPap 300 device. In: Franco E, Monsonego J, editors. New developments in cervical cancer screening and prevention. Oxford: Blackwell Science; 1997.
15. Prismatic Project Management Team. Assessment of automated primary screening on PAPNET of cervical smears in the PRISMATIC trial. Lancet 1999;353:1381-5.
16. Kok MR, Boon ME. Consequences of neural network technology for cervical screening: increase in diagnostic consistency and positive scores. Cancer 1996;78:112-7.
17. Koss LG, Lin E, Schreiber K, Elgert P, Mango L. Evaluation of the PAPNET cytologic screening system for quality control of cervical smears. Am J Clin Pathol 1994;101**:** 220-9.