Digital cytology in cervical screening: from evidence to implementation

An IBMS position on the safe, evidence-led adoption of AI-assisted digital cytology within NHS cervical screening programmes

Date of preparation: July 2026

Executive summary

Cervical screening relies on timely and accurate cytology to triage samples in which high-risk HPV is detected and identify those requiring referral for colposcopy. This cytology workload depends on a specialist workforce facing vacancies, an ageing profile and sustained pressure on capacity.

What has changed

In 2024, the IBMS published *Digital Cytology: A transformative solution for cervical screening in the UK*. It described how digital cytology could support cervical screening and identified the workforce, evidence and implementation questions that remained unresolved.

Since then:

- a British Association for Cytopathology survey has reported 60 vacancies among 426 cytology-related posts across England, Scotland and Wales;
- *Improving laboratory workforce efficiency using AI-assisted digital cytology within an HPV-based cervical screening programme: A model-based evaluation for the NHS Cervical Screening Programmes* has quantified the potential effect on review and reporting time;
- the *Pathology Transformation Review 2026* has set out the wider service conditions needed for digital technologies to deliver value;
- the UK NSC has taken digital cytology forward through its open-call process and is undertaking further evidence synthesis, while its Research and Methodology Group has advised on the evidence required from proposed North Bristol evaluation work, including clinical non-inferiority, efficiency and implementation;
- in Scotland, digital cytology has been approved in principle for introduction, subject to successful validation demonstrating non-inferiority

Together, these developments move the policy question from whether digital cytology has potential to how it should be introduced safely, evaluated in NHS practice and, where agreed standards are met, adopted more widely.

What the new evidence shows

The model-based evaluation in *Improving laboratory workforce efficiency using AI-assisted digital cytology within an HPV-based cervical screening programme: A model-based evaluation for the NHS Cervical Screening Programmes* compared manual microscopy with the Hologic Genius AI-assisted digital cytology system.

For an annual English cohort of 479,125 slides, it estimated 71,309 fewer staff hours for slide review and reporting, equivalent to a modelled reduction of 69%. Average review and reporting time fell from 12.9 minutes per slide using manual microscopy to 4.0 minutes using Genius.

If reproduced in NHS practice, this could release specialist capacity for complex case review, training, quality assurance and service resilience. These are potential service benefits rather than measured outcomes of the study.

What the evidence does not yet show

The model examines staff time for slide review and reporting rather than the complete effect of implementation.

It does not capture the full requirements and costs of scanning, infrastructure, systems integration, data storage, workflow, training, validation, service transition or downstream activity. It also assumes equivalent diagnostic performance and does not establish the effect on abnormal reporting, colposcopy, histopathology or wider screening outcomes.

The findings should therefore be tested through controlled implementation across different NHS laboratories and should not be assumed to apply to every digital cytology system or service model.

The IBMS position

The evidence is sufficient to move AI-assisted digital cytology into controlled, independently evaluated implementation within NHS cervical screening services.

The IBMS is calling for the UK NSC's ongoing assessment of digital cytology to be connected to a clear and time-bound process for controlled NHS implementation and evaluation, funding, wider adoption and continuing audit.

Implementation should be:

- human-led and professionally accountable;
- provider-neutral;
- independently evaluated;
- quality-assured;
- supported by interoperable systems and secure infrastructure;
- aligned with workforce planning;
- assessed against full pathway costs and outcomes.

The *Pathology Transformation Review 2026* shows that digital technology cannot be considered separately from service design, infrastructure, governance and workforce readiness. AI should support these foundations, not substitute for them.

Any capacity released should be reinvested in service quality, workforce development and resilience.

Why the position has developed

The 2024 evidence review

As part of its longstanding leadership on digital cytology, the IBMS convened a roundtable with Hologic in 2024 to review the evidence and consider the requirements for adoption within UK cervical screening. The resulting paper, *Digital Cytology: A transformative solution for cervical screening in the UK*, identified several potential benefits:

- faster and more flexible slide review;
- easier access to second opinions;
- remote reporting;
- greater ability to share work between laboratories.

It also identified gaps that prevented a clear route towards adoption. UK workforce evidence was limited, the likely effect on laboratory capacity had not been quantified and the full costs of implementation were unknown. The route from national assessment to implementation was also unclear.

Pressure on the current service

All four UK cervical screening programmes now use high-risk human papillomavirus (HPV) testing as the primary test. Cytology is used mainly to assess HPV-positive samples and identify cellular changes that may require referral for colposcopy.

The study uses 2023-24 HPV testing volumes and positivity rates to model the English cytology workload. Its cohort should not be interpreted as a UK-wide activity total.

The English programme expects 98% of people to receive their screening result within 14 days of the sample being taken. Between April 2023 and March 2024, the national average was 89%. Cytology is identified as an important constraint within the pathway.

Workforce capacity adds to that pressure. The 2024 British Association for Cytopathology survey reported 60 vacancies among 426 cytology-related posts across England, Scotland and Wales, equivalent to 14.1% of the workforce. The study also reports that vacancies could reach 28% within five years as experienced staff retire.

Demand will continue to change. HPV vaccination and longer recall intervals following a negative result are expected to reduce cytology activity in some groups. Wider use of HPV self-sampling may bring more under-screened people into the programme and create additional follow-up activity after positive results.

Services must therefore plan for a changing workload while maintaining timely and consistent review with a constrained specialist workforce.

Digital cytology does not address the reasons people do not participate in screening. Its potential contribution begins after an HPV-positive sample enters the laboratory.

What the new study adds

Improving laboratory workforce efficiency using AI-assisted digital cytology within an HPV-based cervical screening programme: A model-based evaluation for the NHS Cervical Screening Programmes addresses one of the main evidence gaps identified in 2024.

It compares manual microscopy with the Hologic Genius AI-assisted digital cytology system using a decision-tree model of the English laboratory pathway. The model applied the same screening, checking and reporting stages to both approaches and assumed equivalent diagnostic performance and referral patterns. This allowed the researchers to focus on the difference in staff time.

The study draws on published evidence, NHS laboratory data, a Bristol service evaluation and expert input. The researchers also tested how changes to key assumptions affected the findings and modelled an alternative Scottish workflow.

For an annual cohort of 479,125 slides, the model estimated 103,151 staff hours using manual microscopy and 31,842 using Genius. This represents 71,309 fewer hours, or a modelled 69% reduction in the staff time required for slide review and reporting. The largest difference occurred during primary screening.

This provides a UK-specific estimate of the potential workforce benefit and moves the discussion beyond a general expectation that digital systems may improve efficiency. The estimate relates to reader and reviewer time within the model rather than the total workforce or cost of delivering the service.

The sensitivity analysis found that the assumed manual and digital review times had the greatest influence on the result. The benefit achieved in practice is therefore likely to vary according to workload, case mix, staffing arrangements and existing workflows.

The model also examines only part of the service. It does not include the full time and cost of scanning, infrastructure, training, validation, implementation or service transition. It assumes equivalent diagnostic performance and does not assess effects on abnormal reporting, colposcopy, histopathology or wider patient outcomes.

Some slides may remain unsuitable for digital review. The authors report local estimates suggesting that fewer than 1% to 4% may require manual review and cite one published unreadable rate of 2.3%. Manual diversion was not included as a separate pathway in the central model.

The evidence relates to the system evaluated and should not automatically be applied to every digital cytology product or laboratory model. It is sufficient to support controlled NHS implementation and evaluation, while wider adoption should depend on performance in routine services.

The wider policy context

In 2023, the UK NSC endorsed digital pathology as an optional approach for reporting histopathology within the bowel, breast and cervical screening programmes. That decision did not extend to cervical cytology, which is therefore not currently covered by a UK NSC recommendation for routine use. Since then, however, Scotland has approved its introduction in principle, subject to successful validation demonstrating non-inferiority.

National screening programmes appropriately apply a high evidential threshold to changes that may affect large populations. The UK NSC has emphasised that screening is a pathway, not simply a test. New technologies must show where they would sit within the existing pathway, how they compare with current practice and what evidence supports their analytic validity, clinical validity, clinical utility and performance in the defined NHS screening population.

This caution is necessary to protect screening participants and programme outcomes. It should now be matched by clear and timely progression from evidence assessment into controlled NHS implementation and evaluation.

Digital cytology is already being considered through the UK NSC open-call process, and the Research and Methodology Group has provided advice on the evidence required from proposed NHS evaluation work. Scotland's conditional approval provides a route towards controlled introduction in one UK nation. What remains unclear is how these parallel developments will be coordinated: how UK NSC assessment will inform nation-specific decisions, how evidence from Scottish validation and other NHS implementation will be shared, and how successful evaluation would lead to funded wider adoption and continuing audit.

Relevant processes also exist for device regulation, digital assurance, laboratory accreditation and local implementation. The remaining need is to align these requirements with UK NSC assessment and nation-specific implementation arrangements, and to clarify the responsibilities of the organisations involved at each stage.

The *Pathology Transformation Review 2026* explains why this matters. Digital technologies depend on connected laboratory systems, reliable data, traceable workflows, secure infrastructure and staff with the skills and capacity to use them. They also require clear governance and sustainable funding.

The policy challenge is therefore not to create an entry route, but to coordinate assessment, controlled implementation and evidence generation across the four programmes, with common standards, clear accountability and sustainable funding.

The IBMS position and recommendations

The IBMS supports the controlled, independently evaluated implementation of AI-assisted digital cytology within NHS cervical screening programmes.

Professional expertise must remain central. Appropriately trained staff should retain responsibility for interpreting findings, escalating cases and reporting results. AI should support professional judgement, not replace human oversight or accountability.

The current evidence relates to the Hologic Genius system. Implementation and wider adoption must remain provider-neutral, with all technologies judged against common clinical, operational and quality requirements. Methods and findings should be published so that they can be independently reviewed and reproduced.

1. Define the route from UK NSC assessment to implementation

Building on the UK NSC's ongoing assessment of digital cytology following an open-call submission, the organisations responsible for cervical screening should set out how the technology would move from evidence assessment into controlled NHS implementation and, where agreed standards are met, wider use.

The route should define:

- the evidence requirements for completing UK NSC assessment and progressing to controlled implementation;
- the criteria used to assess the technology's place within the screening pathway and its performance in the intended NHS population;
- responsibilities for policy, regulation, programme assurance, implementation and funding;
- how professional, scientific and technical advice will inform decisions;
- the criteria and timescales for progressing from assessment to controlled use and wider adoption;
- the requirements for monitoring, audit and communication of decisions.

Where evidence is sufficient to justify controlled implementation but evidence from routine NHS use remains incomplete, the route should specify the conditions for staged introduction, continuing audit and wider adoption once predetermined standards are met.

The assessment and implementation process should remain provider-neutral and apply consistently to any technology that meets the required evidential, regulatory and programme standards.

Each UK nation determines its own screening policy and implementation arrangements. Responsibilities should therefore be clear within each programme, while evidence requirements, minimum quality standards and outcome measures should be coordinated wherever possible.

Scotland's validation and any subsequent early implementation should be designed to generate evidence capable of informing decisions across all four programmes. Findings should be made available throughout the UK, and different implementation timescales should not lead to avoidable variation in standards, access to specialist review or screening outcomes.

The 2023 consultation provides a useful precedent: the UK NSC endorsed digital pathology as a permissive, rather than mandatory, modification for reporting histopathology within the bowel, breast and cervical screening programmes, with continuing audit considered important.

2. Move to coordinated NHS implementation and evaluation

The available evidence is sufficient to move AI-assisted digital cytology into controlled implementation within NHS cervical screening services.

The next step should not be another preliminary assessment of whether the technology can work. It should be a coordinated programme that establishes how it can be introduced safely, consistently and effectively across different NHS settings.

Scotland's conditional approval provides an immediate opportunity to begin this work. Its validation and any early implementation should use a protocol and dataset capable of informing decisions across the UK, alongside implementation in other representative NHS settings.

Participating laboratories should represent different:

- workloads and staffing profiles;
- laboratory configurations and workflows;
- levels of digital readiness;
- geographic settings and national programme contexts.

Implementation should cover the complete laboratory process, including slide preparation, scanning, review, reporting and exception handling.

A common protocol and dataset should be used to assess:

- staff time, turnaround and throughput;
- diagnostic concordance and established quality indicators;
- abnormal reporting and referral rates;
- unreadable, rescanned and manually diverted slides;
- staff training, competency and experience;
- systems integration and implementation requirements;
- effects on colposcopy, biopsy and histopathology activity;
- capital, recurrent and transitional costs;
- screening participant confidence in professional oversight;
- consistency of performance and access across different services and populations.

Existing evidence on technical and clinical performance should inform the programme and should not be repeated unnecessarily. Additional validation should be required only where there are identified gaps, changes in intended use or differences between technologies.

Services meeting agreed regulatory, quality and workforce requirements should be able to introduce the technology on a controlled basis, with continuing audit and transparent reporting of outcomes.

This would establish how the modelled workforce benefit can be realised across NHS services and provide the evidence needed to support wider adoption.

3. Set common standards for safe implementation

National screening programmes, professional bodies and laboratory quality organisations should agree common requirements for the safe and continuing use of AI-assisted digital cytology.

These should build on existing regulation, screening standards and accredited laboratory quality systems rather than duplicate them.

The requirements should ensure that:

- technologies meet the relevant regulatory and screening programme requirements;
- systems connect reliably with laboratory and screening records;
- images and data can be accessed, transferred and retained securely;
- unnecessary dependence on proprietary platforms is avoided;
- local verification, validation and quality assurance are completed;
- software and algorithm changes are controlled, documented and auditable;
- professional responsibility for interpretation, escalation and reporting remains clear;
- staff receive protected training and competency assessment;
- manual microscopy remains available for unsuitable slides, system interruptions and quality assurance activity;
- continuing audit, incident reporting and review are built into routine use.

A common framework should apply consistently across technologies and screening programmes while preserving provider-neutrality and appropriate local choice. It would give services clear conditions for controlled implementation and provide assurance that quality and professional accountability are maintained as adoption expands.

4. Fund the full service change and reinvest capacity

The model estimates staff time for slide review and reporting. It is not a cost-effectiveness analysis or a complete business case.

Funding decisions should therefore consider the full cost of implementation, including capital investment, software and licensing, systems integration, storage, training, staff backfill, maintenance and service transition.

Funding must cover the complete service change, not only scanners and software.

The value case should recognise benefits realised through increased capacity, quality and resilience, rather than relying only on immediate cash-releasing savings. Modelled efficiency should be used to strengthen services, not treated automatically as justification for reducing posts.

Where implementation releases capacity, services should agree in advance how it will be reinvested. Priorities may include:

- protecting turnaround performance;
- reducing backlogs;
- supporting complex and abnormal case review;
- strengthening training and supervision;
- increasing time for audit and quality improvement;
- improving resilience during vacancies and absence.

The *Pathology Transformation Review 2026* argues that productivity gains should be retained and reinvested in workforce, digital infrastructure, quality and resilience. The same principle should guide decisions on digital cytology.

Conclusion

The IBMS has long led professional discussion and evidence review on digital cytology. The new model-based evaluation advances that work by quantifying a substantial potential workforce benefit within a UK screening context.

The evidence is now sufficient to move into controlled NHS implementation and evaluation. The task is to translate that potential into safe and consistent practice by coordinating UK NSC assessment with implementation across the four programmes, supported by common standards, continuing audit and full-service funding.

Used effectively, AI-assisted digital cytology could strengthen professional practice by releasing specialist capacity for complex work, quality improvement, training and service resilience. Wider adoption should follow where these benefits are demonstrated and sustained.

References:

1. Institute of Biomedical Science and Hologic. Digital Cytology: A transformative solution for cervical screening in the UK. Institute of Biomedical Science; 2024. Available at: https://www.ibms.org/resource/digital-cytology-a-transformative-solution-for-cervical-screening-in-the-uk.html

2. British Association for Cytopathology. Cervical Cytology Workforce Survey 2024. 2025. Unpublished survey report. Available at: https://www.britishcytology.org.uk/news/cervical-cytology-workforce-survey-results-2024

3. Wilson A, Cropper A, Ma Y, Adams EJ, Mehew S, Morgan M, Villeneuve N, Mitchell C. Improving laboratory workforce efficiency using AI-assisted digital cytology within an HPV-based cervical screening programme: A model-based evaluation for the NHS Cervical Screening Programmes. BMJ Open. 2026. Available at: https://bmjopen.bmj.com/content/16/7/e113298

4. Carter P. Pathology Transformation Review 2026: The short form review. Version 1.0. Institute of Biomedical Science; June 2026. Available at: https://pathologytransformation.org/

5. UK National Screening Committee. UK NSC digital pathology consultation responses and recommendation. November 2023. Available at: https://www.gov.uk/government/consultations/use-of-digital-pathology-in-analysis-of-cancer-screening-samples

6. UK National Screening Committee. UK NSC open call: submitting a screening proposal. GOV.UK; 2022, updated 14 May 2026. Available at: https://www.gov.uk/government/publications/uk-nsc-open-call-submitting-a-screening-proposal

7. UK National Screening Committee. Screening programmes across the UK. GOV.UK; 2021. Available at: https://www.gov.uk/guidance/screening-programmes-across-the-uk

8. NHS England. Cervical screening: laboratories providing HPV testing and cytology services in the NHS Cervical Screening Programme. Updated 9 July 2025. Available at: https://www.gov.uk/government/publications/cervical-screening-laboratory-hpv-testing-and-cytology-services/cervical-screening-guidance-for-laboratories-providing-hpv-testing-and-cytology-services-in-the-nhs-cervical-screening-programme

9. NHS England Digital. Cervical Screening Programme, England, 2023–2024 [NS]. 28 November 2024. Available at: https://digital.nhs.uk/data-and-information/publications/statistical/cervical-screening-annual/england-2023-24

10. NHS England. Cervical screening standards valid for data collected from 1 April 2020. Updated 10 October 2024. Available at: https://www.gov.uk/government/publications/cervical-screening-programme-standards/cervical-screening-programme-standards-valid-for-data-collected-from-1-april-2018

11. Checchi M, Mesher D, Panwar K, Anderson A, Beddows S, Soldan K. The impact of over ten years of HPV vaccination in England: surveillance of type-specific HPV in young sexually active females. Vaccine. 2023;41(45):6734–6744. doi:10.1016/j.vaccine.2023.10.002.

12. NHS England. NHS rolls out more personalised cervical screening for millions. 10 June 2025. Available at: https://www.england.nhs.uk/2025/06/nhs-rolls-out-more-personalised-cervical-screening-for-millions/

13. Martinelli C. UK NSC recommends HPV self-sampling option for under-screened women in cervical screening programme. UK National Screening Committee Blog; 24 June 2025. Available at: https://nationalscreening.blog.gov.uk/2025/06/24/uk-nsc-recommends-hpv-self-sampling-option-for-under-screened-women-in-cervical-screening-programme/

14. Town K. Researchers and suppliers give UK NSC insights into novel cervical screening technologies. UK National Screening Committee Blog; 2 March 2026. Available at: https://nationalscreening.blog.gov.uk/2026/03/02/researchers-and-suppliers-give-uk-nsc-insights-into-novel-cervical-screening-technologies/

15. Harinath L, Harrington S, Matsko J, Colaizzi A, Elishaev E, Khader S, et al. Technical considerations during validation of the Genius Digital Diagnostic System. Journal of Pathology Informatics. 2026;20:100532. doi:10.1016/j.jpi.2025.100532.

16. Medicines and Healthcare products Regulatory Agency. Regulating medical devices in the UK. GOV.UK; 2020, updated 20 February 2026. Available at: https://www.gov.uk/guidance/regulating-medical-devices-in-the-uk

17. NHS England Digital. Digital Technology Assessment Criteria (DTAC): guidance for buyers and suppliers. Updated 20 May 2026. Available at: https://digital.nhs.uk/services/digital-technology-assessment-criteria-dtac

18. National Institute for Health and Care Excellence. Evidence standards framework for digital health technologies. Updated August 2022. Available at: https://www.nice.org.uk/what-nice-does/digital-health/evidence-standards-framework-esf-for-digital-health-technologies

19. International Organization for Standardization. ISO 15189:2022: Medical laboratories — Requirements for quality and competence. Geneva: ISO; 2022. Available at: https://www.iso.org/standard/76677.html

Transparency and independence:

The 2024 IBMS roundtable was convened in partnership with Hologic. The model-based evaluation was funded by Hologic, with Aquarius Population Health funded to undertake the research and prepare the manuscript. Hologic also provided technical and scientific input, as disclosed by the study authors.

This position paper has been developed independently by the IBMS. Its recommendations are provider-neutral and apply to any technology meeting the required evidential, regulatory and screening programme standards.