Accelerating NHS Digital Pathology Adoption

A Strategic Roadmap

Problem Statement

Pathology services play a fundamental, yet often overlooked, role in healthcare, including in more than 80 per cent of all patient care pathways.[1] Yet, many departments across the NHS are under increasing pressure, facing rising demand for diagnostic services compounded by significant shortages in the medical workforce. This combination of challenges poses significant risks to timely patient care, especially for critical diseases like cancer, making it a pressing clinical concern that demands urgent reformation.

In particular, histopathology services (the diagnosis of disease in tissues)[2], is rising by 4.5 per cent year on year,[3] outpacing the NHS' capacity to manage caseloads effectively. To meet this rapid growth in histopathology case volumes, workflow digitisation presents a potentially transformative solution. Enabling the scanning, sharing, and reporting of whole-slide images, digital technology not only allows for faster and more accurate diagnoses, but eliminates logistical delays associated with physical slide transport, and promotes a streamlined workflow for significantly reduced turnaround times.

To help guide this need for change, a national Working Group for digital pathology was formed with the primary aim of shaping key recommendations for accelerating the transition to digital pathology, nationally. It also sought to highlight the imperative for continued ringfenced funding for histopathology departments, with a critical set of recommendations on how best to utilise this budget for large-scale success, and ultimately patient benefit.

The Working Group, chaired by Debra Padgett (IBMS Past President, NENC Pathology Operational Lead) comprises a Group of essential stakeholders in UK histopathology service delivery, including key NHS clinical and operational leaders, representatives from the Institute of Biomedical Science (IBMS) and the Royal College of Pathologists (RCPath) and related organisations, as a well as a partial-industry representative from Source LDPath, who have facilitated, but not led, the platform. This whitepaper is intended to sit alongside and further support the NHSE 6-point histopathology plan[4] and is designed as an advisory resource to address the challenges and harness the opportunities in implementing large-scale digital pathology across the NHS. With members of the Group actively engaged in on-the-ground operations, their insights offer a valuable bridge to national decision-makers, fostering a collaborative approach that maximises the potential for successful digital transformation from local to system level.

In this paper, histopathology is intentionally used to encompass both traditional and digital workflows, underscoring that digital pathology is fundamentally an evolution of histopathology, not a separate field. While we reference both traditional and digital histopathology, the aim is to show that digitising histopathology services marks a natural progression in the UK's service delivery. It represents the next generation of histopathology, not as a replacement or optional enhancement, but an essential advancement of the current operating model.

1 https://sourcebioscience.com/wp-content/uploads/Source-LDPath-Brochure-Pathology-In-Practice-2023.pdf

2 https://www.rcpath.org/discover-pathology/news/fact-sheets/histopathology.html

3 Keele University Independent Study, The National Pathology Benchmarking scheme. https://www.smvn.scot.nhs.uk/wp-content/uploads/2012/10/KUBS.pdf

4 Histopathology Transformation Meeting - Institute of Biomedical Science

Background - The Case for Digitisation

The case for digitising histopathology services has already been recognised by histopathology departments nationwide, but it must be reinforced throughout the wider healthcare system and among policymakers to overcome longstanding barriers and drive national adoption.

Digital histopathology represents a transformative shift, offering a more cost-effective, accurate, and efficient approach to disease diagnosis. It utilises digital imaging, image analysis and data management technology to provide quantitative data and detailed visual information about tissue and cell samples.[5] There is great potential for histopathology departments to embrace this development of diagnostic service delivery, with estimates suggesting a 15% improvement in workforce-related efficiencies.[6]

The NHS continues to face a significant and persistent backlog which is exacerbated by a post-pandemic escalation in the demands on essential healthcare services.[7] Findings within the recently published Secretary of State for Health and Social Care commissioned, Lord Darzi Investigation[8] highlights that the lack of speed and availability of diagnostics inhibits patients from flowing through emergency departments and other critical areas.[9] Lord Darzi's findings emphasise that inadequate diagnostic capacity is a central factor contributing to reduced productivity and inefficiencies in wider hospital operations.[10] Enhancing diagnostic workflow operations, therefore, is a key issue that is pivotal for improving patient flow and sustaining not just diagnostic workstreams, but the broader NHS system.

As the NHS struggles to manage this high volume of patients who are awaiting diagnosis and treatment, traditional methods of histopathology, which rely on glass images, manual slide examination and physical storage, are becoming increasingly inefficient, unsustainable, and inadequate in meeting the evolving needs of modern healthcare. A key conclusion within Lord Darzi's review, which has been emphasised by the Secretary of State for Health and Social Care in his priorities for the NHS, is a 'tilt towards technology'.[11] Lord Darzi emphasises the importance of digital systems in unlocking the necessary productivity advances, particularly within the provision of diagnostics.

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5 IBMS (2023) Digital Pathology and Integrated Care Systems. Available at: https://www.ibms.org/resources/news/digital-pathology-and-integrated-care-systems/#:~:text=Today,%20along%20with%20Microsoft,%20we%20are%20launching%20a (Accessed: 12 September 2024).

6 Ho et al. Can digital pathology result in cost savings? A financial projection for digital pathology implementation at a large integrated health care organization. J Path Inform, 2014. Available at: Can digital pathology result in cost savings? A financial projection for digital pathology implementation at a large integrated health care organization - PubMed (nih.gov)

7 Darzi, Lord (2024) Independent Investigation of the National Health Service in ..., Gov.UK. Available at: https://assets.publishing.service.gov.uk/media/66f42ae630536cb92748271f/Lord-Darzi-Independent-Investigation-of-the-National-Health-Service-in-England-Updated-25-September.pdf (Accessed: 08 October 2024).

8 Darzi, Lord (2024) Independent Investigation of the National Health Service in ..., Gov.UK. Available at: https://assets.publishing.service.gov.uk/media/66f42ae630536cb92748271f/Lord-Darzi-Independent-Investigation-of-the-National-Health-Service-in-England-Updated-25-September.pdf (Accessed: 08 October 2024).

9 GIRFT (2021). Emergency Medicine: GIRFT Programme National Specialty Report. https://www.gettingitrightfirsttime.co.uk/wp-content/uploads/2022/07/Emergency-Medicine-Apr22q FINAL.pdf. Accessed 25 August 2024.

10 Darzi, Lord (2024) Independent Investigation of the National Health Service in ..., Gov.UK. Available at: https://assets.publishing.service.gov.uk/media/66f42ae630536cb92748271f/Lord-Darzi-Independent-Investigation-of-the-National-Health-Service-in-England-Updated-25-September.pdf (Accessed: 08 October 2024).

11 Darzi, Lord (2024) Independent Investigation of the National Health Service in ..., Gov.UK. Available at: https://assets.publishing.service.gov.uk/media/66f42ae630536cb92748271f/Lord-Darzi-Independent-Investigation-of-the-National-Health-Service-in-England-Updated-25-September.pdf (Accessed: 08 October 2024).

Presenting a Pathway to a More Efficient Healthcare System

By reducing reliance on manual processes such as distribution and physical storage, digital transformation introduces automated scanning, secure digital storage, rapid case tracking, and streamlined archiving and retrieval of diagnostic images and data. These advancements optimise resource allocation, resulting in faster turnaround times and more efficient diagnostic pathways. Furthermore, the ability to share cases digitally facilitates effective workload distribution across histopathology departments and pathology networks, enabling histopathologists from various locations to collaborate seamlessly. This redistribution helps to alleviate bottlenecks in diagnostic processes, such as delayed tissue analysis or insufficient access to specialised consultant pathologists, enabling pathology networks to scale diagnostic capabilities.[12]

Better Patient Outcomes and Safety

The ability to share digital images instantly with relevant specialists for remote consultation, second opinion or for multi-disciplinary reviews can reduce the time needed for diagnosis.[13] Traditionally, images have required transportation across the country to be reviewed under the microscope by colleagues, resulting in delays in reporting times and extending the time before patients can begin treatment. By allowing specialists to access high-resolution images in real-time, diagnostic reports can be reviewed instantaneously, regardless of physical location, rapidly reduces the time it takes for patients to access downstream clinical services and treatment pathways.[14] This capability is particularly impactful for urgent cases or complex diagnoses.[15] Ultimately, digitisation in histopathology has the potential to drive significant improvements in patient outcomes, safety, and efficiency. For the NHS, embracing digital pathology across all pathology networks is not just a step forward for diagnostics and joined-up working; it is a critical enabler to meet the demands of 21st-century healthcare.

12 Treanor, D. and Williams, B. (no date) The Leeds Guide to Digital Pathology, Leica Biosystems. Available at: https://www.leicabiosystems.com/en-gb/knowledge-pathway/the-leeds-guide-to-digital-pathology/#:~:text=Leeds%20Teaching%20Hospitals%20NHS%20Trust%20are%20developing%20best (Accessed: 12 September 2024).

13 IBMS (2023) Digital Pathology and Integrated Care Systems. Available at: https://www.ibms.org/resources/news/digital-pathology-and-integrated-care-systems/#:~:text=Today,%20along%20with%20Microsoft,%20we%20are%20launching%20a (Accessed: 12 September 2024).

14 Treanor, D. and Williams, B. (no date) The Leeds Guide to Digital Pathology, Leica Biosystems. Available at: https://www.leicabiosystems.com/en-gb/knowledge-pathway/the-leeds-guide-to-digital-pathology/#:~:text=Leeds%20Teaching%20Hospitals%20NHS%20Trust%20are%20developing%20best (Accessed: 12 September 2024).

15 Treanor, D. and Williams, B. (no date) The Leeds Guide to Digital Pathology, Leica Biosystems. Available at: https://www.leicabiosystems.com/en-gb/knowledge-pathway/the-leeds-guide-to-digital-pathology/#:~:text=Leeds%20Teaching%20Hospitals%20NHS%20Trust%20are%20developing%20best (Accessed: 12 September 2024).

Barriers to Digitisation

Despite the clear case for digitisation of histopathology services, there remain significant barriers to large-scale implementation. The roadmap for adoption can seem overwhelming to histopathology departments across the country, however progress can be made with targeted strategic guidance and continued support from decision-makers in the Department of Health and Social Care, and NHS England.

Fragmented System and Implementation

One of the most significant challenges to digitisation is the current state of digital infrastructure, as highlighted in Lord Darzi's Review. The NHS operates with numerous legacy systems (including various LIMS, which differ significantly across regions) that are often incompatible with digital innovations. These regional disparities impact NHS bodies' readiness to accelerate interoperability and therefore the successful digitisation of histopathology services across the entire healthcare system. Successful implementation requires not only the procurement of scanners and associated equipment, but also robust IT systems that are capable of supporting high-resolution image transfer and secure data storage. To that end, interoperability between systems is essential for enabling the seamless transfer of digital images between departments and other clinical settings.

Furthermore, the National Cancer Registration and Analysis Service (NCRAS) run by UKHSA is responsible for cancer registration in England to support cancer epidemiology, public health, service monitoring and research. As part of NHS histopathology service delivery, SNOMED coding systems should be captured and reported to NCRAS to support the registry, however, ongoing system incompatibilities and interface challenges often prevent this, leading to a lack of full visibility of cancer demographics across England. Without full visibility, there are limitations on how accurately healthcare authorities can monitor the incidence, spread, and treatment outcomes of various cancers, which can impede the development of evidence-based strategies for resource allocation and public health planning. With cancer waiting lists and treatment outcomes being a key priority for health boards nationwide, it is critical that operational infrastructure across the entire country supports effective diagnosis and monitor of disease.

Cost

While the digitisation of histopathology promises long-term savings through improved efficiency, the upfront cost for scanners, software, IT infrastructure and staff training can be significant, especially during NHS budget constraints and natural competition with other, more acute, healthcare priorities. At the same time, underutilisation of equipment – for instance, digital scanners – exacerbates waste and reduces the potential return on investment. For many NHS histopathology departments, the initial investment into the scanners has already been made, and a secondary budget is required to keep the momentum for effective utilisation of the technology.

Significant investment has already been made in the digital transformation of histopathology, however in order to ensure budgets are being maximised, consolidated strategic direction is required for success, and continued investment and revenue funding is required. Tools like Source LDPath's Health Economic Model for Digital Pathology Implementation[16] help, not only help to demonstrate the potential financial savings to Trusts and ICBs, but also to predict its impact on patient life-years saved. Based on cost reduction, shortened waiting times, minimised backlogs and patient-life years saved due to faster diagnosis, this model enables histopathology departments to establish the impact of digital pathology in relation to their unique operational set-up. Still, there is often insufficient utilisation of systematic modelling tools to generate an impactful evidence base for decision-makers to justify the continuation of investment required to realise clinical benefits. National innovation priorities may differ from local innovation priorities, meaning the system must undergo a delicate balancing act to address where to focus budgets across the different pathology networks. Strengthening the adoption of these tools can empower stakeholders to make data-driven decisions that align with long-term goals and get the most out of their budgets for their local landscape.

Workforce Issues

Histopathologists, biomedical scientists, and laboratory staff have been trained primarily on manual systems, with minimal exposure to digital methods. Crucially, the transition to digital workflows will require a re-evaluation of current job roles, ensuring that more histopathologists can focus on diagnostic tasks, while more routine functions can be automated or assigned to less specialised staff. There is a clear need for integrated training programmes to accommodate the sustainable transition to a digital workforce.

One of the most insightful and beneficial high-level decisions taken so far has been to support and encourage the development of advanced and consultant-level practice for scientists working in the health services of all four UK nations. This is already accepted practice in nursing and many of the allied health professions but has been accepted at a slower pace within biomedical science. Increasing numbers of biomedical scientists are now undertaking professional qualifications that enable them to work alongside consultant pathologists as part of the histopathology dissection and reporting team.

Nationally there has been an increase in histopathology activity of 30% since 2018/19; however, the consultant workforce has grown by only 8% over the same period. Twenty years of safe and effective advanced and consultant scientist practice is evidence that the biomedical scientist workforce is key to expanding the delivery of advanced diagnostic services and the support of the four UK health departments to find innovative means of utilising workforce skills to better deliver patient services should be acknowledged.[17] There may be a need for a comprehensive service re-design to accommodate for the upcoming transition to digital on a national scale, with the NHS workforce being core to that change.

16 https://sourcebioscience.com/histopathology/digital-pathology/health-economic-model/#:~:text=Source%20LDPath's%20Health%20Economic%20Model,NHS%20and%20Private%20Healthcare%20Practices.

17 https://www.ibms.org/resources/documents/ibms-long-term-workforce-plan/

Cultural Resistance to Change

A significant barrier remains cultural resistance to adopting new technologies in healthcare. Across many NHS departments and clinical settings, histopathology has relied on traditional methods, with the use of digital tools frequently considered an imposition rather than an enhancement.[18] Despite the introduction of NHS England's frontline digitisation programme[19] and the recognised benefits of digital systems in healthcare to improve productivity, access and efficiency, NHS leaders have highlighted the tension between meeting key targets and delivering health services in a system that is not fully proficient in utilising digital innovation.[20] A significant part of the challenge lies in engaging staff in the process of digital transformation, largely as a result of other pressures on their time.[21] Frequently, too, previous efforts at digital transformation have been unsuccessful, in part because they did not sufficiently engage the workforce that would be using the technology and lacked the necessary structures needed to facilitate participation and co-design of digital technologies.[22]

The Path to Digitisation - Implementation Strategies

Digital pathology's success requires addressing cultural, infrastructural, and operational challenges within healthcare. Key strategies include embedding digital innovation as core to the NHS, establishing national standards, securing funding, and engaging frontline staff early in the process. Leveraging health economics, best practice examples, and real-world data insights from other successful implementations - both within and beyond the NHS - is essential to building a strong case for digitisation. These insights will be most impactful from a range of different geographical regions, incorporating both single-site and multi-site transformations. Ensuring patient engagement and tapping into private sector resources for capacity and specialisation are also critical components.

It is possible to look towards the developments within adjacent healthcare systems, such as radiology, who have had success in integrating digital imaging and AI into clinical practice, enabling improved performance, and reduced false positive rates for diagnostics.[23] The Royal College of Radiologists reported that 54% of NHS trusts are already utilising AI tools within radiology.[24] The Working Group reporting this paper looks at using lessons learnt in radiology as a benchmark for implementation strategies for histopathology.

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18 https://committees.parliament.uk/publications/40637/documents/198145/default/

19 https://digital.nhs.uk/services/frontline-digitisation

20 https://www.nhsconfed.org/publications/frontline-digitisation#:~:text=Yet%20over%20time%2C%20NHS%20leaders%20across%20trusts%20and%20ICBs%20have,capable%20of%20harnessing%20digital%20innovation.

21 https://committees.parliament.uk/publications/40637/documents/198145/default/ (p.24)

22 https://committees.parliament.uk/publications/40637/documents/198145/default/ pp.22-23

23 Adams, S.J., Henderson, R.D., Yi, X. and Babyn, P., 2021. Artificial intelligence solutions for analysis of X-ray images. Canadian Association of Radiologists Journal, 72(1), pp.60-72.enabling improved performance with reduced false positive rates compared with earlier human programmed machines

24 The Royal College of Radiologists (June 2024). Clinical Radiology Workforce Census 2023. https://www.rcr.ac.uk/news-policy/policy-reports-initiatives/clinical-radiology-census-reports/

Digital as Integral to Culture Change

As noted at the start of this paper, a large aspect of the culture change to be implemented is the way in which the system, and its workforce, views the digital transformation of histopathology. Histopathology cannot be siloed from the wider patient pathway, just like digital pathology cannot be siloed from traditional histopathology service delivery. For a nation-wide adoption of digital workflows to be successful, we must consider traditional histopathology and digital pathology as one and the same – and the nomenclature around this being a necessary evolution of service delivery must be embedded into routine practice.

For this to materialise, the workforce must be given adequate headspace to adopt this new way of thinking. Digitising histopathology marks a pivotal shift in healthcare, offering significant precision and productivity advantages over traditional methods.[25] Its integration enhances collaboration, supports professional development, and promotes equity in service delivery. This shift to digital is particularly critical in cancer diagnostics, where digital pathology and AI technologies enable performance monitoring, transparency, and accountability, leading to improvements in service delivery and turnaround times.[26] The ability to share workloads, operate networks, and enable remote working further boosts productivity.[27] For these innovations to succeed, the health system's infrastructure must be prepared. This includes embedding a culture of research and innovation within the NHS, upgrading infrastructure and equipment, and providing healthcare professionals with the time and resources to conduct research. Engaging with patients, offering digital training, and educating healthcare professionals are also vital to this cultural shift.[28]

Interoperability and standardisation are crucial for the successful adoption of digital pathology. Seamless collaboration across systems depends on adherence to industry standards, which enables the integration of digital pathology into workflows.[29] Centralised systems like PACS and Vendor-Neutral Archives (VNA) provide a unified view of medical data, reduce duplication, and enhance diagnostic accuracy. Public education on digital pathology, AI, and cloud storage is essential to build trust and address concerns about data sharing. Additionally, educating Integrated Care Systems (ICSs) about current systems is key to fostering collaborative working.[30] This joint effort in education, infrastructure upgrades, and standardisation is essential for driving the cultural change required for digital pathology to thrive. With a clear focus on patient outcomes and operational efficiency, these changes are fundamental to meeting the rising demands of modern healthcare.

25 https://www.ibms.org/resources/news/digital-pathology-and-integrated-care-systems/

26 https://www.ibms.org/resources/news/time-to-test--six-key-challenges-facing-cancer-testing/

27 https://www.ibms.org/resources/news/digital-pathology-and-integrated-care-systems/

28 https://www.cancerresearchuk.org/about-us/we-develop-policy/our-policy-on-early-diagnosis

29 https://www.ibms.org/resources/news/digital-pathology-and-integrated-care-systems/

30 https://www.ibms.org/resources/news/digital-pathology-and-integrated-care-systems/

National Standards, Funding, and Clear Direction

Implementing digital histopathology requires robust national standards, sufficient funding, and a clear strategic direction. One major hurdle is the lack of skilled staff, compounded by insufficient financial investment in NHS infrastructure. A sustainable workforce model, bolstered by investment in NHS estates, logistics, and information systems, is critical to meet rising diagnostic demands. While there are well-defined frameworks for pharmaceutical pathways throughout the system, the same consolidated roadmap is not as apparent for diagnostics and the associated threads to medical technology innovations. The shape of national standards, funding frameworks, and strategic direction must be guided by government directives, which will provide a blueprint for digitising histopathology. This national framework will address inefficiencies and resource waste caused by multiple NHS sites independently trialling and erroring best practice in digital pathology. By reducing redundant work, it prevents hospitals from operating in silos – an approach we aim to eliminate – and accelerates the pace of national adoption. At the same time, a well-considered framework will provide flexibility, enabling departments to customise and drive implementation based on unique needs, while ensuring coordinated progress nationwide. Establishing national standards for data governance and access management is equally vital for consistency and security,[31] however, there must be substantial input from operational staff working in day-to-day practice to help guide national frameworks for optimal outcomes.

Early Frontline Engagement for Successful Implementation

Engaging frontline staff early is key to ensuring digital pathology is effectively implemented. Involving all professional roles in diagnostic testing, including histopathologists, biomedical scientists, and also administration staff, allows for more efficient, high-quality care delivery. Early engagement fosters a system where professionals operate at their highest capacity, improving service integration and patient care.[32] To achieve this, structured mechanisms for frontline feedback and co-design during the development and rollout phases of digital pathology systems should be integrated into all operational levels of the system to ensure that solutions are practical, user-friendly, and aligned with workload capacity.

Collaboration across the healthcare ecosystem is also critical. Senior leadership from Pathology Networks, Cancer Alliances, and other stakeholders must work together to transform histopathology services. This collaborative effort will help ease workforce pressures and enhance service delivery through a skilled, well-supported workforce.[33]

31 https://www.ibms.org/resources/news/digital-pathology-and-integrated-care-systems/

32 https://www.ibms.org/resources/news/time-to-test--six-key-challenges-facing-cancer-testing/

33 https://www.ibms.org/resources/news/histopathology-transformation-meeting/

Storage and Image Archiving

There are many discussions ongoing around the best practices for storing and archiving imaging data, and what this consequently means for the physical storage of traditional blocks and slides. The storage of histopathology slides and samples in the NHS currently poses significant logistical challenges. The retention periods, as mandated by the RCPath, require slides to be stored for a minimum of 10 years, with paraffin blocks retained for at least 30 years and autopsy records often need indefinite preservation. This results in a substantial demand for physical storage space, rigorous organisation, and robust systems to prevent quality degradation over time. While storing digital imaging data does not require the same physical space, the digital imaging data cannot provide original tissue sample of the patient and therefore cannot entirely replace physical storage due to potential need for retrieval later down the line for things like genetic testing. With that said, if the digital imaging power is to be securely stored and retained, it questions the need for such extended periods of physical storage.

In the UK, a fully implemented digital pathology department can generate hundreds of terabytes of data annually. With an 8-year retention requirement, this translates to a need for storage solutions capable of supporting petabytes of data. In contrast, a typical radiology department generates tens of terabytes annually, and even over an 8-year retention period, the total storage requirements remain lower than the volume generated in a single year by digital pathology. This stark disparity arises from the significantly higher resolution of pathology images and the complexity of digital pathology systems. As a result, robust and scalable archiving solutions are crucial to meet the vastly greater storage demands of digital pathology compared to radiology.

Digital images in the UK are recommended to be retained for at least two UKAS accreditation cycles, as guided by the RCPath. When considering the cost-benefit analysis for digital image storage and archiving, cloud-based storage offers a promising avenue to optimise costs. Providers like AWS present a tiered approach, where images initially stored in high-cost, high-access storage can be transitioned to more economical long-term options like deep glacier storage. Deep glacier storage is significantly less expensive and suitable for images that do not require immediate retrieval but must be preserved for compliance.

It should be noted that third party orchestrators acting between NHS sites and cloud storage providers may not be providing the most cost-effective workstream for this currently. While there is a case for national investment, we must identify if there is also a case for national system storage. A more flexible, risk-based approach to digital image retention could reduce costs without compromising diagnostic or compliance standards.

Health Economics and Case Studies

The economic benefits of digital histopathology are clear. Studies show it can lead to a 15% improvement in workforce efficiency, making it a critical tool in cancer diagnostics, where timely and accurate diagnoses are essential.[34] Early investment in cancer testing not only improves outcomes but also reduces downstream costs by preventing ineffective treatments.

However, this work must go beyond outlining the benefits. It is essential to make a compelling case to policymakers, politicians, Integrated Care Systems (ICS), Trust leaders, and other stakeholders to ensure the adoption and subsequent embedding of digital pathology becomes a priority. Incorporating best practice examples from other sectors, such as radiology, can illustrate both the challenges and the strategies to overcome them. Investing in workforce training is also crucial for maximising the benefits of digital histopathology. Short-term training initiatives can boost long-term productivity, and supporting the workforce is vital for creating sustainable, efficient healthcare services. Prioritising digital workforce planning will enable the healthcare system to meet future demands more effectively.

[34] https://www.ibms.org/resources/news/digital-pathology-and-integrated-care-systems/

Case Study:

Lessons from Radiology for the Digital Transformation of Histopathology

Radiology has long been a benchmark for digital transformation in healthcare, successfully adopting digital imaging technologies and integrating them into clinical practice. Its journey offers valuable insights and best practices for histopathology as it embarks on a similar digital transition.

Key Lessons:

- **Remote Interpretation & Collaboration:** Radiology's adoption of digital imaging has enabled remote interpretation and seamless collaboration among multidisciplinary teams, significantly enhancing diagnostic capabilities. Histopathology can replicate these benefits, but with the added advantage of more advanced, cost-effective cloud storage solutions. This allows for greater flexibility, including the ability to work from anywhere in the world, avoiding the archiving pitfalls seen in radiology.
- **Integration with Electronic Health Records (EHR):** Radiology's success in integrating digital images with EHRs has streamlined workflows and improved patient care. Histopathology can build on this foundation, ensuring that digital images and data are seamlessly integrated into patient records for improved diagnostic accuracy and efficiency.
- **Marketing & Perception:** Radiology is widely recognised as a critical component of diagnosis within healthcare. However, digital histopathology lacks the same level of public and professional understanding. As a result, we must focus on better communicating the impact of digital pathology on patient care, making its value more visible to both stakeholders and the general population.
- **Investment Challenges:** Unlike radiology, histopathology faces unique challenges in competing for investment, partly due to differences in perceived patient impact. Learning from radiology's approach to securing investment and stakeholder buy-in will be critical in developing a sustainable digital transformation strategy. Part of this buy-in was achieved through the sheer fact that it was an essential next step for modernising healthcare.
- **National vs. Trust-Level Implementation:** Currently, most radiology services in the NHS are only available within the trust where the radiologist is based. Histopathology can avoid this limitation by leveraging cloud technologies and designing a system with nationwide interoperability from the start, ensuring that digital pathology is not restricted to individual trusts.

By learning from radiology's digital journey and avoiding key pitfalls, histopathology has the potential to undergo a smoother, more efficient transformation, unlocking the full potential of digital technologies to improve diagnostic accuracy and workforce efficiency.

Leveraging the Private Sector for Capacity and Specialisation

Collaboration with the private sector can significantly enhance histopathology practices by addressing capacity limitations and improving precision. The private sector's advanced digital solutions offer opportunities to transform diagnostics, benefiting both patients and healthcare providers. Echoing the Health Secretary, Wes Streeting's belief on harnessing the private sector for outsourcing and technology adoption, integrating private sector innovations could provide the NHS with much-needed capacity and agility[35]. While the NHS faces constraints around capital and infrastructure, the private sector is not subject to the same limitations and is often more agile in adopting cutting-edge innovations.
To fully harness this potential, the healthcare system must implement practical strategies that promote the integration of private sector solutions in a way that is both effective and sustainable.

1. **Leverage private sector innovation and problem-solving capabilities,** especially in areas where NHS constraints limit progress. By tapping into the private sector's expertise and capital, the NHS can benchmark private sector success and use it to build a compelling case for digital transformation in pathology.
2. **Encourage collaboration within and between networks of private providers** rather than relying on a single organisation for nationwide adoption. Past efforts, such as NHS Track and Trace, have demonstrated that no single company can meet the full scale of national requirements. A networked approach will foster diverse expertise and prevent over-reliance on any one provider.
3. **Utilise private sector resources to create operational 'headspace' for NHS staff,** ensuring that while innovation is implemented, the day-to-day demands of pathology services are not neglected. This includes supporting NHS departments by taking on routine caseloads, allowing labs to focus on deploying and embedding digital technologies effectively. Additionally, private sector expertise can provide post-scanner acquisition support to streamline the integration of new technologies into NHS workflows.

By harnessing private sector resources and innovation, the healthcare system can achieve significant advancements in diagnostics, ensuring these innovations are effectively and equitably implemented across the NHS. To accelerate this process, the government and NHS England must direct Integrated Care Boards to foster these partnerships, enabling a future where digital pathology can flourish.

35 https://www.theguardian.com/politics/2024/apr/12/wes-streeting-defends-labour-plan-private-sector-cut-nhs-backlog

Recommendations

By focusing these recommendations on a clear, structured path to digitisation, the NHS can better navigate the challenges of integrating digital pathology into its existing healthcare system. The key to success lies in a coordinated national strategy, inclusive stakeholder engagement, and sustained investment in infrastructure, training, and innovation.

1. Foster a Cultural Shift Towards Digital Integration

A cultural shift is essential to fully realise the benefits of digital pathology. The NHS must create a shared understanding that digital histopathology is not just a technological upgrade, but a critical step in improving the quality and efficiency of services. This cultural change should be supported through targeted educational programs, continuous professional development, and the promotion of digital pathology as a key enabler of modern healthcare. Emphasising the role of digital pathology in enhancing patient care and reducing diagnostic errors will help pathologists and other stakeholders view it as an integral part of the wider pathology service, rather than a peripheral innovation. The nomenclature used to describe the digitisation of histopathology services will also be significant – we must view traditional histopathology and digital pathology as a natural modernisation of one another – they are critically one and the same.

2. Establish a National Digitisation Strategy and Framework

To achieve a successful, system-wide shift to digital pathology, the NHS needs a clear, national framework to guide digitisation efforts. This framework should include common technical standards, interoperable systems, and clear guidelines to enable seamless integration across NHS Trusts. A unified approach will address current fragmentation, where legacy systems often hinder the adoption of modern digital solutions. The framework should support local flexibility to accommodate for departmental needs, workforce capabilities, and existing infrastructure, while ensuring compatibility across regions and institutions, avoiding duplication of efforts, and enhancing efficiency. Measurable outcomes should be set, with clearly defined success indicators such as adoption rates, interoperability benchmarks, and reductions in processing times. This strategic approach will lay the foundation for a national, integrated digital pathology ecosystem.

3. Ensure Front-Line Stakeholder Engagement in the Digitisation Process

For digital pathology to be successfully integrated into clinical practice, it is crucial to actively engage front-line healthcare workers - particularly histopathologists, biomedical scientists, and laboratory staff - in the entire process of design, development, and procurement. These professionals possess deep insights into the challenges and opportunities within current histopathology workflows, making their involvement essential in shaping the systems that meet clinical needs. By involving them from the outset, the NHS can ensure that the technology aligns with real-world requirements, enhances clinical outcomes, and promotes smoother adoption by users.

4. A Dual Approach to Avoid Automating a Bad Process

We must avoid "automating a bad process", and therefore a complete service re-design may be required to see the full benefit of innovative digital solutions. A co-ordinated, dual bottom-up and top-down approach promotes a balanced pathway for the adoption of digital pathology. This strategy combines on-the-ground expertise to encourage practical, user-driven solutions (bottom-up) and leadership, standardisation, funding, and policy frameworks from a unified national force (top-down). By integrating both approaches, the NHS can foster an environment where digital pathology initiatives are innovative, scalable, and responsive to local and national needs. The formation of a working group within each pathology network with well-rounded expertise and knowledge-sharing power could be beneficial to project manage each territory.

5. Leverage Insights from Previous Digitisation Initiatives

The NHS can draw valuable lessons from the successful digitisation efforts in other medical disciplines, such as radiology. The digitisation of radiology has demonstrated the potential of digital imaging to support remote interpretations, improve multidisciplinary collaboration, and integrate with Electronic Health Records (EHRs). The NHS should apply these lessons to histopathology, particularly by focusing on the importance of robust IT infrastructure, data security, and clear communication channels between departments. Additionally, radiology showcased tangible clinical improvements to sustain momentum for change. We must report more closely on digital histopathology workflow outcomes and use this for a clear case for investment. The digital transformation seen in radiology was widely recognised as an essential evolution of the field, leading to dedicated funding and nationwide collaboration to support its development. Histopathology should be approached with the same level of importance and investment.

6. Utilisation of the Private Sector for Creating Headspace

Collaboration with the private sector can provide the expertise, resources, and innovation needed to accelerate the digital transformation of histopathology services. Engaging private companies in the development and provision of digital pathology solutions can relieve pressure on NHS resources and allow for faster deployment and scaling. The private sector can add value to NHS histopathology service delivery via two core channels – bringing innovative solutions for service optimisation and acting as an extension of the NHS laboratory for increasing capacity, creating headspace for the NHS workforce to act on the digital transformation. It will be important to spread the utilisation of private expertise throughout the system for both initial implementation and ongoing support, also creating a safety net that avoids over-reliance on a single provider. There must be easier opportunities for engagement to foster this approach to collaboration.

7. Secure Dedicated Funding and Support for Nationwide Digitisation

A successful nationwide rollout of digital pathology will require significant sustained financial investment, not only for initial equipment and software acquisition but also for ongoing costs such as training, system maintenance, and IT infrastructure. Policymakers must commit to long-term funding and ensure that resources are allocated effectively to support both national coordination and local implementation.
The funding strategy should be comprehensive, covering everything from equipment (e.g. digital scanners, storage solutions) to workforce development. Crucially, this funding must also account for the costs of supporting NHS Trusts in managing the transition, ensuring that institutions have the necessary resources to integrate digital pathology systems while maintaining high standards of patient care.

8. Adopt an Optimal Storage Strategy Nationwide

The debate surrounding whether the NHS should opt for long-term rental of cloud storage or consider alternative models often misses the critical the most substantial costs are incurred during the short-term, high-access phase. The strategic use of cloud storage, with a planned shift from short-term to long-term solutions could substantially reduce costs. Addressing this cost dynamic is critical for NHS departments to best utilise budgets, with lowered storage costs nationally, budgets can be optimised and re-invested into continued service development.

Appendix

This platform was facilitated, but not led, by Source LDPath. Grateful acknowledgment goes to the attendees listed below for sharing their expertise during the roundtable discussions. This summary reflects an accurate account of the Groups conversation but may not be representative of the organisational views of the participants.

Attendee	Organisation
Debra Padgett (Chair)	IBMS Past President, NENC Pathology Operational Lead
Dr Branko Perunovic	Chief Medical Officer, Black Country Pathology Service
Bruce Daniel	Head of Pathology NHS England – South West
Dr Muhammed Aslam	Clinical Director North Wales Diagnostic and Specialist Clinical Services, Consultant Pathologist
Dr Tim Bracey	Service Line Clinical Director Peninsula Pathology Network, Consultant Pathologist
Dr David Hughes	Pathology Clinical Lead, NHS England, North East and Yorkshire, Consultant Histopathologist
Professor Fiona J Gilbert	Director of Research, Department of Radiology, University of Cambridge, Honorary Consultant radiologist, Addenbrookes Hospital, Cambridge

The platform for this collaboration
was facilitated by Source LDPath.