aws

Applying technology to improve NHS workforce productivity

This is an introduction for National Health Service (NHS) organisations preparing to adopt AI and automation to enable their workforce

AWS in healthcare

The Amazon Web Services (AWS) healthcare mission is to enable access and delivery of person-centred care to improve outcomes and lower costs by accelerating the digitization and utilization of healthcare data. Our aim is to help the NHS and its partners develop cloud strategies to achieve more with less, modernize technology, and digitally transform back office and clinical services.

NHS workforce productivity

The UK NHS is at a pivotal moment in its digital transformation journey. The NHS faces acute challenges around workforce shortages, care backlogs, and providing quality patient experience. The NHS Long Term Workforce Plan 2023 lays out strategies to address these issues through expanding education and training, improving retention, and reforming how the workforce is trained and works.

Emerging technologies like cloud computing, robotic process automation and artificial intelligence (AI) are enabling healthcare organisations around the world to address their workforce productivity challenges. Cloud technology provides secure data storage and sharing to improve workflow efficiency. Robotic process automation (RPA) automates repetitive administrative tasks to free up clinicians' time. AI solutions can assist with complex clinical decision-making, data analysis, and diagnostic support. The NHS AI Lab roadmap predicts that healthcare workers will be one of the groups most impacted by the AI revolution, harnessing new tools to automate and improve clinical and administrative tasks.
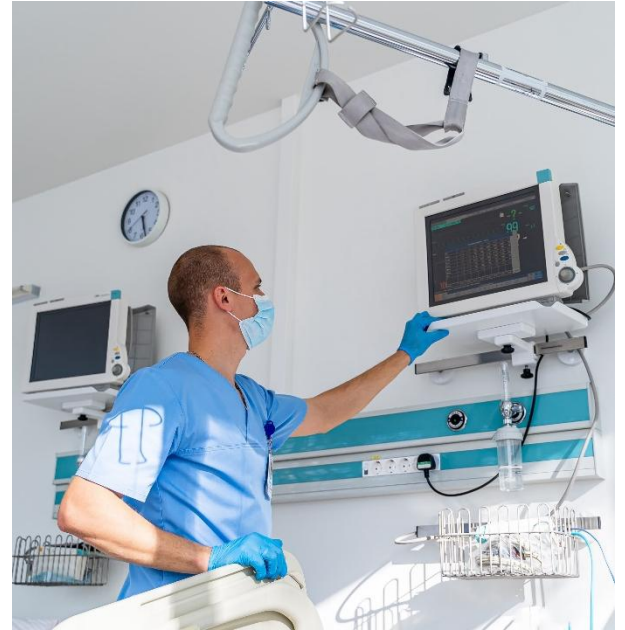
By harnessing these emerging technologies, the NHS can enhance productivity and create capacity so its workforce can focus on delivering high-quality, timely patient care. Three focus areas include:

Clinical workforce: Automation and AI have the potential to augment and support the clinical workforce. AI-enabled solutions can analyse large quantities of patient data and clinical guidelines to generate personalised diagnostic and treatment recommendations for care teams to review. Chat-based assistants can provide low-level triage and patient education to reduce clinician workload. RPA can streamline clinical documentation and administrative tasks, freeing up more time for direct patient care.

Operational and administration workforce: RPA makes it easier for NHS organisations to improve operational efficiency through automation of back office, high volume tasks. Software AI assistants can take over repetitive data entry, claims processing, appointment scheduling, and other high volume, lower-risk tasks to boost productivity. AI-powered conversational interfaces can handle common IT, human resources (HR), and facilities service requests from employees. Natural language processing can automate report generation and analysis. Gradually automating these back-office functions will allow the NHS to direct its nonclinical workforce to more strategic areas that require human skills.

Workforce management: AI and data analytics tools can provide workforce insights to help NHS leaders with tasks like modelling future skills demand, predicting staffing needs and optimising rosters based on in-bound patient demand. Chat assistants and knowledge solutions can provide on-demand learning and development for employees. Automation can handle some recruitment and onboarding steps to aid hiring. Together, these technologies can transform workforce planning and management, which means workforce staff can focus on strategy, culture, and engagement.

NHS use cases for technology to improve productivity

The NHS Long Term Plan and NHS Workforce Plan highlights digital transformation as a key enabler '*to help clinicians apply best practice, eliminate unwarranted variation across the whole pathway of care, and support patients to manage their health and condition*.' Globally, healthcare organisations are already using AI and automation to address common NHS use cases:

Ambient voice automation: Ambient voice automation transcribes consultations, allowing automatic capture of patient interactions and translation of conversations into structured clinical notes in real time. Natural language processing can also automate some patient documentation workflows to identify actions and help suggest and automate responses.

Medical image analysis: AI tools enhance and reconstruct medical images to aid diagnosis and create automated reports, expediting clinical decisions and reducing clinician workload. For example, pathology labs are using AI-powered image analysis to screen digital slides for cancer cells and prioritise cases requiring immediate attention.

Precision (P4) medicine: Using AI and automation, Predictive, preventive, personalized, and participatory medicine incorporates multiple data sources such as the patient record, biometric data, and genomic data to personalise treatment and care – from individual risk scores to application of tailored algorithms to predict an individual's response to medication. Increasingly, models are expanding to include additional data sets, such as patient wearable data, to improve risk profiling and personalise intervention plans.

Personal health assistants: Emerging AI technology allows patients to interact with data-driven chat-based assistants to help them navigate care systems. Deploying virtual assistants to manage appointment scheduling and pre-visit documentation 24/7 frees up staff time to focus on highest need and digitally excluded patients.

Healthcare document summarisation: AI can help clinicians and administrative staff summarise and generate insights from health documents – from medical papers, therapeutic research and clinical guidelines – to guide evidence-based decision making. These tools help readers focus on key points of a document, transform unstructured text into standardised formats and highlight important attributes to drive better decisions.

AWS and GE HealthCare improve patient care with AI

Challenge

The healthcare sector generates vast amounts of unstructured data, with 97% inaccessible to physicians. Existing technology couldn't efficiently aggregate, analyze, and interpret this data securely.

Solution

AI and machine learning services like Amazon Bedrock and Amazon Q

Results

- ⊘ Streamline clinical and operational workflows
- ⊘ Expedite delivery of care innovations
- ⊘ Enable more personalized, intelligent care
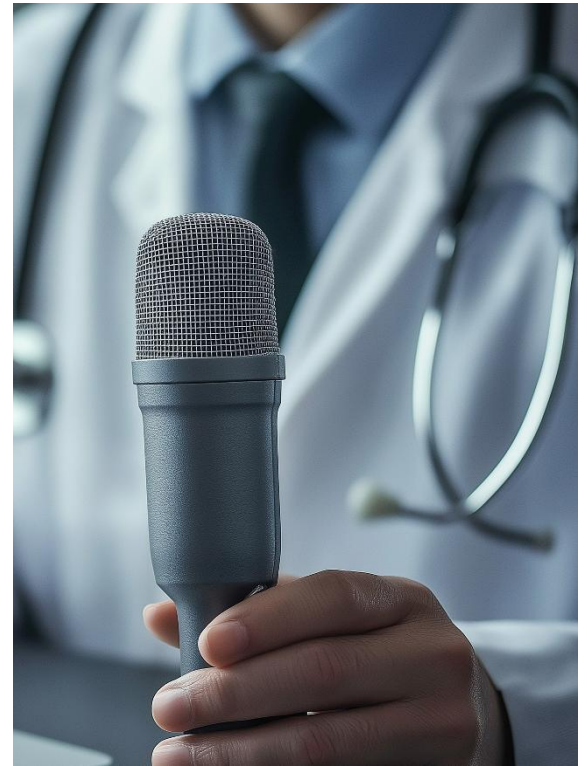- ⊘ Accelerate development of healthcare applications

GE HealthCare

" These foundation models hold the potential to revolutionise health care data and make precision health care analytics as universal as the web."

Ambient voice automation

Ambient voice technology represents a revolutionary approach to clinical documentation and workflow optimisation in healthcare settings. The term "ambient" refers to the technology's ability to operate naturally in the background of a clinical environment, capturing and processing conversations without requiring direct interaction from clinicians. This hands-free, AI-driven approach marks a significant departure from traditional documentation methods, where clinicians manually input information or use basic dictation systems. By using advanced speech recognition, natural language processing, and ML capabilities, ambient voice solutions create a more natural and efficient healthcare environment.

AWS HealthScribe uses advanced ambient voice technology and natural language processing to address the growing documentation burden in healthcare settings. This AI-powered service automatically converts patient-clinician conversations into accurate clinical notes. AWS HealthScribe integrates with Amazon Comprehend Medical, which provides powerful medical natural language processing features. The system expertly extracts and categorises medical conditions, medications, dosages, and treatment procedures while identifying protected health information for compliance purposes. It can recognise and standardise medical abbreviations, establish clinical context, and create meaningful connections between related medical concepts, providing comprehensive and accurate documentation.

Amazon HealthScribe

Amazon Comprehend Medical

The system works seamlessly in the background, capturing and processing medical conversations in real time while maintaining strict compliance and data security standards. By automating the documentation process, clinicians can dedicate more time to patient interaction and clinical decision-making. The structured data output supports more efficient clinical coding while the system's ability to maintain detailed audit trails provides regulatory compliance. The technology integrates smoothly with existing healthcare IT infrastructure, supporting healthcare interoperability standards such as Fast Healthcare Interoperability Resources (FHIR) while maintaining data sovereignty and governance requirements.

Medical imaging analysis

The integration of emerging technologies into medical imaging help radiologists and pathologists address the growing backlog of images, enhancing workflow efficiency and diagnostic accuracy. Through the combination of AWS HealthImaging, Amazon Bedrock, and specialised AI services, AWS provides a comprehensive solution for automated medical image analysis that helps prioritize cases and streamline clinical workflows.

The AWS medical imaging solution uses deep learning models specifically trained on diverse medical imaging datasets, including X-rays, CT scans, MRIs, and pathology slides. These models automatically detect and highlight potential abnormalities, prioritise urgent cases, and generate preliminary analysis reports. The system operates by processing incoming images through multiple AI models simultaneously, each specialised in detecting specific conditions or anomalies. This parallel processing approach significantly reduces the time between image acquisition and initial analysis, enabling faster patient care decisions.

The generative AI system's automated reporting capability represents a significant advancement in clinical workflow efficiency. Using natural language processing and generation capabilities, the solution can automatically create detailed preliminary reports from imaging findings. These AI-generated reports follow standardised medical terminology and reporting structures, including key measurements, observed abnormalities, and comparative analyses with previous studies. Clinicians can review, modify, and approve these preliminary reports, significantly reducing the time spent on documentation while maintaining diagnostic accuracy.

For healthcare providers, the benefits extend beyond time savings. The system's ability to prioritise cases based on detected urgency helps ensure critical cases receive immediate attention. Integration with EPR systems enables automated correlation of imaging findings with patient history and clinical data, providing a more comprehensive view for diagnosis. Additionally, the solution maintains comprehensive audit trails and quality control measures, supporting both regulatory compliance and continuous improvement of AI models.

Precision medicine and personalised healthcare

Population health is predicated by the shift from reactive to proactive care, personalised based on an individual or groups of individuals unique risk profiles. As clinicians have increasing access to vast quantities of data however, applying these principles in practice is time-consuming and often requires coordinated decision making across multiple care teams and points of care.

AWS generative AI and analytics services enable healthcare organisations to integrate and analyse vast amounts of patient data from multiple sources—including EPRs, genomic sequencing, biometric data, and real-time monitoring devices. Accessed through Amazon Bedrock, these services synthesise complex medical information and generate actionable insights. These models can analyse patient data across multiple dimensions—including genetic markers, lifestyle factors, environmental influences, and medical history—to generate holistic patient records, comprehensive risk assessments and personalised treatment and prevention plans. Detailed treatment plans consider individual patient characteristics, preferences, and predicted outcomes, supporting shared decision-making between care teams and patients. Real-time analytics capabilities also allow for continuous monitoring from various data sources, helping care teams to triage risk based on live data and divert resources appropriately.
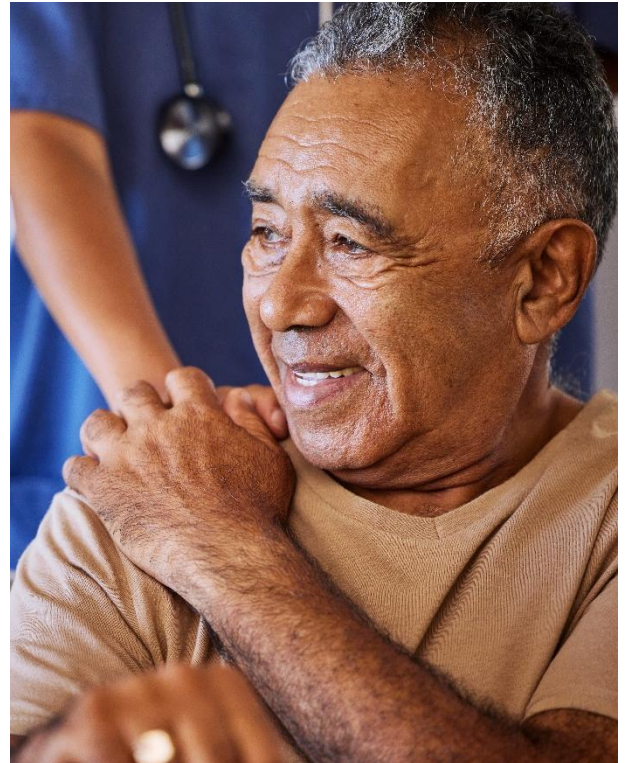
Personal health assistants

A personal health assistant is an AI-powered digital companion that acts as an intelligent intermediary between patients, care teams, and medical information. These virtual assistants serve dual purposes: supporting patients in their daily health management and helping clinicians deliver more efficient and personalised care. For patients, they function as 24/7 healthcare companions, offering everything from medication reminders to symptom monitoring. For clinicians, they serve as digital scribes and patient engagement tools, collecting and organising patient data while managing routine patient interactions, allowing healthcare providers to focus on more complex aspects of care delivery. Personal health assistants bridge the gap between periodic healthcare visits, offering continuous support and monitoring while reducing the burden on healthcare providers.

Benefits for patients:

- 24/7 access to health information and support
- Personalised medication and appointment reminders
- Real-time symptom monitoring and guidance
- Easy access to educational resources
- Seamless communication with healthcare providers

Benefits for clinicians:

- Reduced administrative burden
- Automated patient monitoring and triage
- Enhanced patient engagement and compliance
- Data-driven insights for treatment decisions
- Improved care coordination and follow-up

The foundation of AWS personal health assistant technology lies in its sophisticated natural language processing capabilities and healthcare-specific AI models. Through Amazon Lex and Amazon Bedrock, assistants engage in natural, context-aware conversations with patients, understanding complex medical terminology and patient concerns. The integration with Amazon Comprehend Medical enables the system to interpret and process healthcare-specific language, ensuring accurate and relevant responses to patient queries. This conversational AI is further enhanced by incorporating medical knowledge bases and clinical guidelines, allowing it to provide evidence-based information and guidance.


Security and privacy form crucial components of these health assistants, with AWS robust compliant infrastructure protecting patient interactions and data. The assistants can securely access patient records, medication schedules, and treatment plans through integration with electronic health records systems, providing personalised reminders based on individual health profiles.

Healthcare summarisation

Medical knowledge is expanding at an unprecedented rate, with thousands of research papers, clinical guidelines, and medical documents published daily. AWS healthcare document summarisation technology addresses this information overload by employing advanced AI and natural language processing to distil complex medical content into actionable insights. This solution helps healthcare professionals and patients navigate vast amounts of medical literature efficiently, enabling better-informed clinical decisions and improved patient understanding.

At the core of this technology is AWS HealthScribe, Amazon Q, and Amazon Bedrock generative AI capabilities, combined with specialised healthcare models trained to understand medical terminology and concepts. These models can process various types of medical documents—from research papers and clinical trials to patient records and treatment guidelines—extracting key information and creating concise, contextually relevant summaries. The summarization operates at multiple levels of complexity to serve different user needs. For clinicians, the system can generate detailed technical summaries focusing on methodology, clinical outcomes, and statistical significance, while highlighting potential implications for current medical practices. For patients, the same content can be transformed into clear, understandable explanations that maintain medical accuracy while avoiding technical jargon. This dual-audience capability means that complex medical information remains accessible to all stakeholders in the healthcare journey.
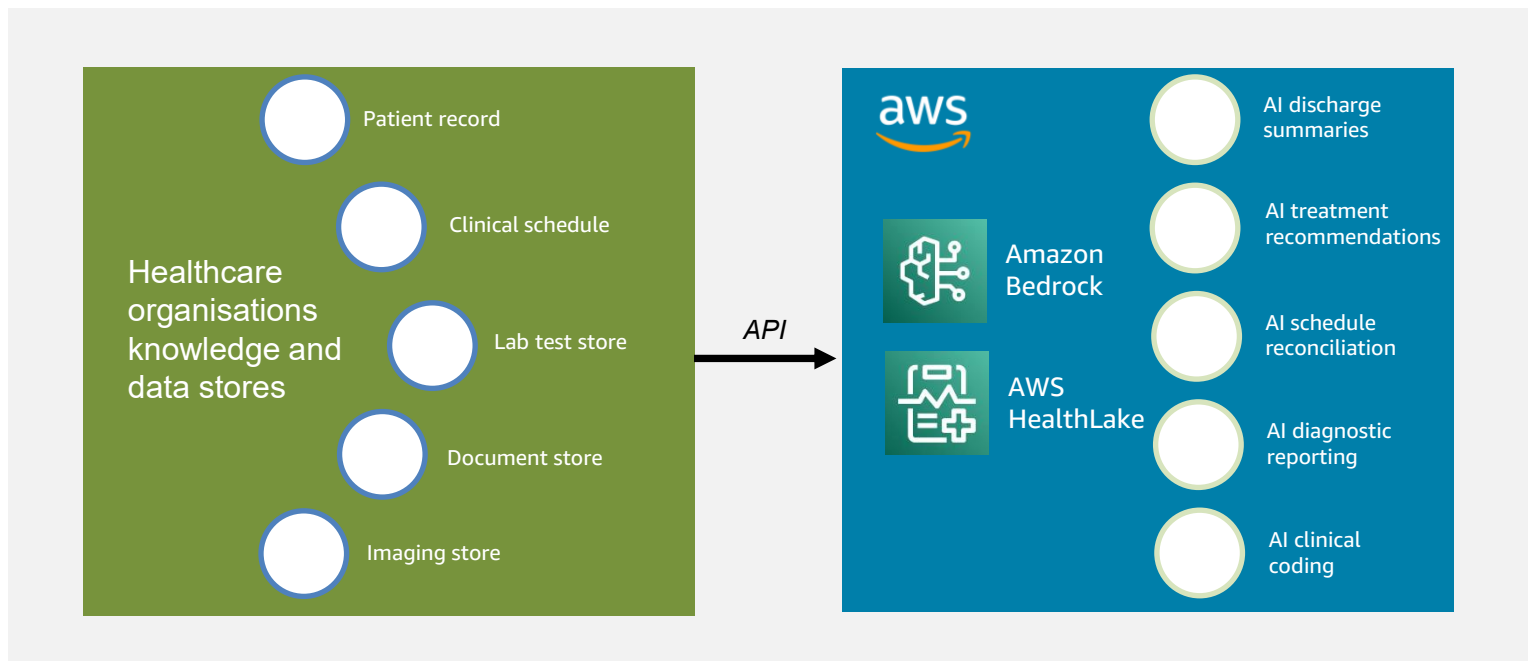
Document standardisation represents another crucial aspect of this technology. Using AWS ML capabilities, unstructured medical texts can be automatically converted into standardised formats following healthcare industry conventions. This standardisation enables easier integration with electronic health record systems, facilitates better data analysis, and supports interoperability across healthcare offerings. The system can also automatically tag and index documents, making them easily searchable and retrievable for future reference. Real-time analysis capabilities allow the system to identify and highlight critical information such as drug interactions, contraindications, and emerging treatment protocols.

Getting Started on AWS

Often, the hardest part for NHS organisations looking to deploy emerging technologies to address workforce productivity challenges is knowing where to start. Getting started requires a structured approach focused on value creation. Using our four-stage approach, NHS organisations can explore the benefits of these new technologies in a methodical, incremental and responsible way that focuses on the highest value applications.

NHS adoption strategy

Learn — AWS will conduct an introductory session to learn more about your organisational goals and share how other organisations are using AI and automation to enable their workforce

Engage — AWS will conduct a series of structured design workshops to discuss your specific use cases, define success metrics develop an experimentation plan

Create — AWS and AWS Partners will conduct a proof of concept to showcase how AI and automation can support delivery of your selected use cases and present the results to you and your key stakeholders

Productionise — AWS and AWS Partners will create an execution roadmap to help you to develop and deploy your selected use cases in production, including considerations for scale and responsible use

NHS Gen AI Skills Development and Innovation

Whether you are a clinician interested in how Gen AI can boost efficiency or a Transformation Director looking for new ways to improve back office productivity, we have digital skills programmes to help you build practical knowledge and skills. Trainings can be tailored to the way you like to learn - from brief, on-demand videos to hands-on, interactive challenges in a secure sandbox environment.

For NHS organisations looking to innovate faster, AWS's Generative AI Innovation Centre pairs your team with our internal experts to imagine, identify, and implement generative AI solutions securely. Teams of AWS scientists and strategists with deep AI/ML expertise will guide you through your innovation journey – from selection of high impact workforce productivity use cases to integration of solutions into automated workflows and scaling. Through the process, your team will receive hands-on help developing solutions, mapping requirements, employing best practices, and scaling to production, so that you can quantify the business value of new tools.
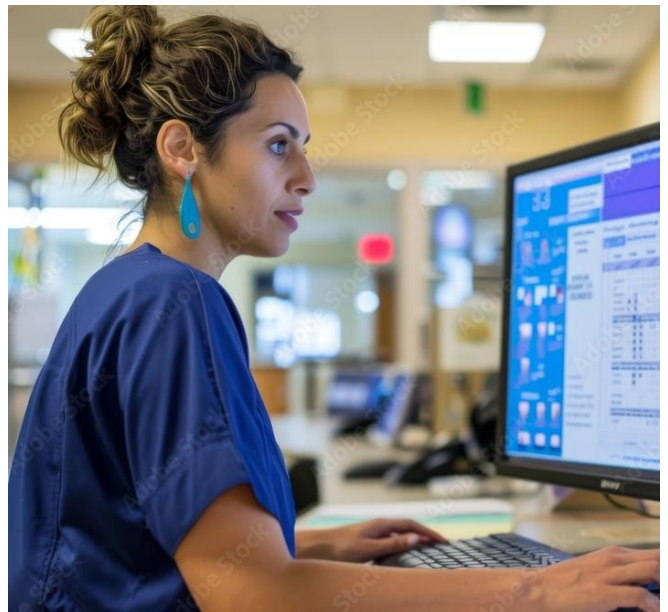
Ready to start?

To get started, contact your AWS account team to learn more on how we can:

- Support you on your cloud generative AI landscape
- Build your AWS Cloud business case
- Identify the best procurement route for your NHS organization
- Identify quick wins and opportunities

AWS resources

- Guidance for NHS Trusts Adopting AWS Cloud Services
- Generative AI in Healthcare & Life Sciences
- AWS for Healthcare & Life Sciences
- Healthcare solutions

Get in touch

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