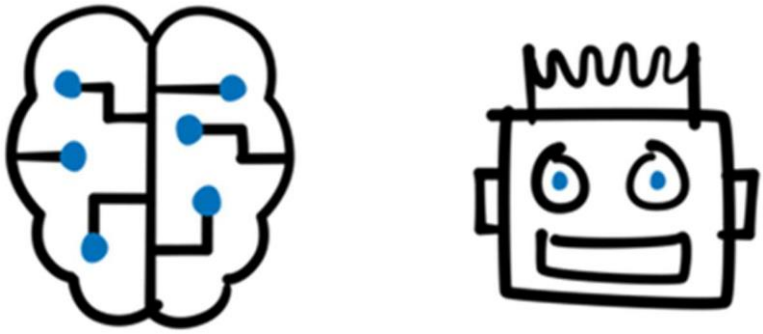

An AI Strategy for Great Ormond Street Hospital for Children 2025 - 2028

May 2025

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Contents

Foreword by Matthew Shaw.

Since our inception in 1852 our staff have been instrumental in using ground-breaking research and the latest technology to revolutionise the care of the children and young people we care for. This, our first, Artificial Intelligence (AI) strategy builds on this legacy and sets out how we aim to harness this technology in an ambitious yet thoughtful and responsible way. It sets out to undertake two broad and interrelated objectives: to enhance patient care and operational efficiency. It is launched at the foothills of what is expected to be a global AI revolution: all around us this technology is being used to enhance our daily lives.

We are children and young person's hospital and they expect us to use AI to make their care and experience better. But they are also clear that it cannot do everything and the contact they have with our teams, and the sense of community they feel is a vital part of their care journey. This strategy sets out how we will use AI to enhance clinical decision making, particularly in areas such as imaging, early disease detection, personalise treatments and patient monitoring. Integrating AI into our electronic patient record will reduce administrative burden on our staff which we anticipate will free up their time to focus more on direct patient care.

We currently operate in a resource constrained healthcare sector which is having a prolonged impact on staff well-being and morale. We have a duty to consider how we can harness the technology to carry out more repetitive tasks that can be done in the fraction of the time to free up staff time and resources. On an organisational level AI will be able to provide better insight in how we can run our hospital and optimise hospital operations through AI-driven scheduling, resource planning and cost efficiency.

We have not created this strategy alone. It has been developed through extensive dialogue with key stakeholders including staff, children and young people's representatives and non-executive directors. It reflects a broad understanding of AI's potential benefits and acknowledges the concerns around its ethical and responsible delivery. This is such an exciting area but we recognise that AI is not ready to make autonomous decision making and we will harness its potential in a responsible and ethical way. This means ensuring all our initiatives protect patient and staff data, are sustainable from both a financial and environmental perspective and of course meet regulatory requirements.

The potential benefits of AI are so great that we will establish a dedicated Department for Advanced Analytics and AI and we will upskill our workforce on safe and ethical AI use to ensure that our staff are well-equipped to work with these advanced technologies. We will also bring the outside world in by working to foster meaningful partnerships with commercial and academic institutions.

As we embark on this journey, we are committed to building a safe and sustainable future for GOSH and paediatric healthcare. By focusing on transparency, ethical compliance and continuous evaluation, we will maintain patient and staff confidence in our AI initiatives and continue our legacy of innovation to transform the lives of children and young people with rare and complex diseases.

Introduction.

Artificial Intelligence (AI) simulates human intelligence in machines programmed to think and learn like humans. It includes technologies like machine learning, natural language processing, computer vision and robotics. AI systems analyse vast amounts of data, recognise patterns and make decisions with minimal human intervention. Appendix 3 provides further details on the different types of artificial intelligence. For Great Ormond Street Hospital for Children (GOSH), AI has the potential to enhance patient care, streamline hospital operations and automating routine tasks, allowing healthcare professionals to focus on more complex aspects of patient care and support medical research by providing new insights.

The rapid advancement of AI presents an unprecedented opportunity for GOSH to revolutionise healthcare delivery. This strategy document outlines our vision to harness AI's potential to enhance clinical outcomes, drive efficiencies, and play a pivotal role in our future hospital strategy, including the building of a new state of the art children's cancer centre. By integrating AI into our operations, we aim to improve patient care, reduce clinician burden, and optimise hospital efficiency in a safe and sustainable manner.

At GOSH, we are committed to pioneering innovative solutions that transform healthcare and related research. Our AI strategy is designed to align with both the broader Trust strategy and national strategy and directives, ensuring that AI initiatives support clinical, operational and financial improvements.

To safeguard data security, GOSH has restricted access to freely available AI tools on the internet such as Google Gemini, ChatGPT and the free web-based version of Microsoft CoPilot. Doing so is essential to prevent sensitive patient, staff or commercially sensitive information from being inadvertently shared online. Our next steps in AI will focus on providing staff with the right tools to enhance efficiency and patient outcomes.

Implementing AI-driven solutions will enable GOSH to increase the degree of personalised treatment we are able to provide, enhance clinical decision making and improve resource management. By building a scalable AI infrastructure and fostering both commercial partnerships and partnerships with academic institutions and other NHS organisations, we will develop a skilled AI team to drive this transformation. Importantly, we will also upskill and educate our wider workforce on safe and ethical AI use.

The integration of AI into GOSH's operations offers numerous benefits that will significantly enhance our healthcare delivery. AI can support diagnosis by providing AI-assisted diagnostics, which enhance clinical decision making and reduce diagnostic errors. By streamlining administrative tasks, AI drives efficiencies and productivity gains, allowing clinicians to focus more on patient care. AI can also optimise hospital operations through AI driven scheduling, resource planning, and cost efficiency, ensuring that our resources are used effectively.

Data and analytics will underpin evidence-based decisions to enhance care for our children and young people while driving organisational efficiencies. AI will be central to our transformation into a data-driven organisation.

GOSH will leverage its in-house expertise in digital technology, data and analytics, clinical system development and our DRIVE innovation unit. This expertise will be key in developing and implementing AI-driven solutions that enhance patient care and operational efficiency.

Vision.

Our vision is to deliver real world AI solutions that improve patient outcomes, our corporate functions and the working lives of our staff in a safe and sustainable way.

Challenges.

We recognise the challenges of AI adoption including trust issues, data security and the need for human oversight. Our strategy focuses on transparency, ethical compliance and continuous evaluation to maintain patient and staff confidence.

Deploying AI at GOSH involves addressing concerns about accuracy, bias, data security and fears of AI takeover. Building trust through transparency, ethical compliance and continuous evaluation is crucial. Robust human oversight with comprehensive policies, governance frameworks and regular bias audits is essential. Investment is needed for technical infrastructure and expertise.

High quality data is essential for training reliable AI models. Healthcare data often suffers from inconsistencies, missing values and biases that can compromise AI-driven insights. Our strategy emphasises robust data governance frameworks and continuous data quality assessments. We will implement stringent data validation processes and advanced data cleaning techniques to ensure dataset integrity. Regular bias audits will identify and mitigate disparities in the data, ensuring our AI systems provide equitable and accurate outcomes. By fostering a culture of data excellence and integrating comprehensive data management practices, we aim to build a reliable AI infrastructure that enhances clinical decision making and operational efficiency.

Addressing these challenges will enable GOSH to enhance clinical outcomes, drive efficiencies and improve patient care. We are committed to building a safe and sustainable future for paediatric healthcare.

Strategic priorities and enablers.

To deliver our AI vision for GOSH, we will focus on three strategic priority areas underpinned by three strategic enablers.

By focusing on these three strategic priority areas and three strategic enablers, GOSH can harness the power of AI to enhance clinical outcomes, streamline operations and drive innovation in paediatric healthcare. This comprehensive approach will ensure that AI is integrated safely and effectively, ultimately improving the quality of care for patients and supporting GOSH's mission to pioneer innovative digital solutions in healthcare.

Enhance clinical decision making and care with AI.

Implementing AI-assisted diagnostics will support clinicians in making more accurate and timely decisions. This includes:

- AI-powered imaging: Using advanced imaging techniques to detect anomalies and provide detailed insights that aid in diagnosis.
- Predictive analytics for early disease detection: Leveraging data to identify patterns and predict potential health issues before they become critical.
- Personalised treatment recommendations: Using AI to analyse patient data and suggest tailored treatment plans that improve outcomes.
- Enhanced patient monitoring: Providing real-time alerts to ensure timely interventions.

Integrating AI with our Epic Electronic Patient Record (EPR) will streamline workflows and reduce administrative burdens, allowing clinicians to focus more on patient care. We will use the AI solutions available within Epic, including the implementation of Epic's Nebula cloud platform. This platform provides a scalable and secure environment for deploying machine learning models, enabling data-driven insights and improved patient care. Nebula empowers Epic sites to unlock the full potential of the system, including pre-built Epic models and custom algorithms developed to address specific clinical challenges, driving innovation, improving patient outcomes, and enhancing operational efficiency.

Streamline operations and enhance efficiency.

AI-driven solutions can greatly enhance resource planning, scheduling and cost efficiency. Machine learning and advanced analytics add significant value across the organisation, benefiting both clinical and non-clinical colleagues. In 2024, GOSH took part in a London-wide pilot of ambient AI technology (TORTUS) to improve clinician support during patient consultations.

Data from the pilot indicates an average 10% reduction in consultation time per appointment. With GOSH clinicians handling 240,000 outpatient appointments in 2024, this efficiency gain translates into significant operational savings. Achieving a 10% efficiency improvement across all outpatient consultations could yield substantial benefits for GOSH.

Further planned initiatives include:

- AI-based staff shift planning: Optimising staff schedules to ensure adequate coverage and reduce burnout.
- Surgery scheduling: Using AI to manage operating room schedules, minimising downtime and maximising efficiency.
- Predictive models for ICU demand and bed occupancy: Forecasting patient needs to ensure resources are available when and where they are needed.
- Ambient AI technology: Utilising ambient AI technology during clinical consultations can significantly enhance efficiency and patient care. This technology allows clinicians to spend more time with patients rather than typing on a computer, improving the overall consultation experience and fostering better clinician-patient relationships.
- Provide summaries of care ahead of clinic visits and ward rounds.
- Provide suggested responses to messages from patients.
- Tailor order selection to condition type.
- Automate pathway steps such as adding to waiting list from clinic notes.
- Collate information into discharge summaries reducing manual creation.

Optimise non-clinical workflows.

Reducing the administrative burden on staff through automation will free up time for clinicians to focus on patient care. In 2025, GOSH will pilot CoPilot technology to streamline administrative workflows. CoPilot has created efficiencies in various sectors, including health and public sectors.

A 2024 CoPilot pilot at Buckingham Country Council found significant efficiency improvements and cost savings.

2024 CoPilot pilot at Buckingham Council

Pilot users between 10-20% more efficient

Admin averaged 60-90 mins saved per day

Specifically, the Council reported time savings of 10-20% for staff using CoPilot in business services. This reduction in time spent on routine tasks has allowed staff to focus on more meaningful work, thereby enhancing overall productivity and work quality. Within Customer Services it was found that customer services agents were able to save an average of 2 minutes per call which equates to a 33% efficiency saving. Administrators taking part in the pilot reported a 20% reduction in task completion time with an average of 60-90 minutes each per day. Generative AI has the potential to transform administrative workflows at GOSH by automating routine tasks such as data entry, document creation and billing and improving overall efficiency by handling tasks quickly and accurately, reducing errors and delays.

Further planned initiatives include:

- Automate pathways so that Referral-To-Treatment (RTT) pathways are closed when patients are discharged back to their GP.
- Provide predictions as to which patients are at a higher risk of not attending so reminder services can be more effectively targeted.
- Optical character recognition of scanned images and documents to enable quicker information collection for audits.

Build AI infrastructure and expertise.

Developing a scalable AI infrastructure that integrates seamlessly with existing hospital systems is crucial. To achieve our vision, it is vital that we build reliable technology infrastructure platforms to support AI systems. This includes both cloud services and on-premise infrastructure with specialised hardware for AI development and deployment. Additionally, GOSH needs to invest in both the training and recruitment of a team of AI specialists, data scientists and clinicians with the expertise to develop and maintain AI solutions. GOSH will establish a cross-functional Centre of Excellence to oversee AI efforts. This team will be responsible for driving AI research, development and implementation across the hospital.

Implementing robust cybersecurity measures is vital to safeguard patient data and maintain trust in AI-driven healthcare services. We will establish stringent controls and continuous monitoring, using advanced AI-driven security tools to detect real-time anomalies and automate responses to evolving cyber threats beyond AI-specific risks. This proactive stance ensures our AI ecosystem remains secure and resilient.

To effectively use AI at GOSH, we must ensure our information is well understood and securely stored in the correct format and on the right platforms. Generative AI becomes more valuable as it gains knowledge and understanding of our organisation. Interoperability between our generative AI tools and the platforms that store and process our information is crucial.

Create AI governance and trust.

To ensure the secure and responsible use of AI, GOSH will adopt the principles outlined in the AI Playbook (appendix 1) for the UK Government. These principles include using AI lawfully, ethically and responsibly, ensuring meaningful human control at the right stages, and managing the full AI life cycle. By adhering to these principles, GOSH can build a robust AI infrastructure that not only enhances clinical outcomes but also maintains public trust and complies with regulatory standards.

To build trust among patients, families and staff, it is essential to establish policies for the ethical and safe use of AI. This includes:

- Developing AI governance frameworks with polices for AI use within the hospital.
- Conducting regular bias audits to ensure AI systems are fair and unbiased.
- Engaging with key stakeholders (patients, families and staff) to address concerns and misconceptions about AI through transparent communication and involvement.
- Ensuring transparency by maintaining openness about AI processes, decision-making, and data usage to foster trust and confidence among all stakeholders.

AI must be transparent and explainable to patients, families and staff. Regular bias audits and fairness assessments must be conducted. Patient and staff engagement is essential to address concerns and build trust.

For safety and reliability, AI solutions must integrate with medical records for accountability. Establish AI revalidation and anomaly reporting systems; and ensure staff training on AI safety and oversight protocols.

Drive collaboration, research and innovation.

Partnering with academic institutions, NHS Trusts, industry leaders and other stakeholders will drive AI research and innovation. Key actions include:

- Sharing best practice: Collaborating on AI projects that align with clinical, operational and financial needs, such as predictive analytics.
- Fostering innovation: Encouraging the development of new AI technologies and solutions to improve patient care and hospital operations, including AI in genomics and rare disease research for novel insights into paediatric genetic disorders and rare or complex diseases.

- Predictive analytics for disease: AI modelling for childhood disease outbreaks, clustering, prognosis and resource planning.
- AI in genomics and rare disease research: Machine learning for novel insights into paediatric genetic disorders and rare or complex diseases.
- Clinical trial optimisation: AI-driven patient recruitment and drug response prediction.

Alignment with NHS Strategic Shifts

This strategy aligns with the UK government's three strategic shifts outlined in the “Road to recovery: the government’s 2025 mandate to NHS England”, published on 30 January 2025:

- From hospital to community
- From analogue to digital
- From sickness to prevention

By enhancing clinical decision-making and care with AI, the strategy supports the shift from hospital to community through more accurate and timely diagnoses, personalised treatment recommendations, and real-time patient monitoring. This can reduce hospital admissions and improve community-based care.

This strategy's focus on building a scalable AI infrastructure and integrating AI with existing systems like Epic aligns with the shift from analogue to digital, ensuring that GOSH leverages advanced technologies to streamline operations and enhance efficiency.

Additionally, the proactive use of AI for predictive analytics and early disease detection embodies the shift from reactive to proactive. This allows GOSH to anticipate and address health issues before they become critical, ultimately improving patient outcomes and operational efficiency.

Sustainability

The sustainable use of AI is integral to this strategy. We will prioritise energy efficient hardware and cloud services to minimise the environmental impact of our AI systems, selecting platforms and technologies that require less computational power to reduce energy consumption and environmental impact. Our AI development and deployment processes will adhere to sustainable practices, including working with suppliers and partners who prioritise renewable energy sources. We will focus on creating AI models that are both effective and resource efficient.

Regulatory compliance.

This strategy is designed to align with the regulatory compliance requirements and standards in the UK healthcare and research sectors. Ensuring adherence to these regulations is crucial for maintaining patient safety, data security, and ethical standards.

EU AI Act

The GOSH AI strategy aligns with the EU AI Act (July 2024) by ensuring AI systems are transparent, accountable, and fair. AI systems will be robust, secure, and non-discriminatory, with human oversight to ensure clinicians have the final say. Data privacy and security will comply with GDPR, and an AI ethics committee will oversee ethical implications. Continuous monitoring will maintain high standards, ensuring AI technologies at GOSH are safe, ethical and enhance patient care.

Data protection and confidentiality.

Implementation of AI at GOSH will comply with the General Data Protection Regulation (GDPR) and the Data Protection Act 2018. This legislation mandates the protection of personal data and ensures that patient information is handled with the utmost care. The implementation will also comply with the common law duty of confidentiality, which exists in parallel with the legislation. The AI systems will incorporate robust data anonymisation and encryption techniques to safeguard patient data. Regular audits and assessments will be conducted to ensure ongoing compliance with the duty of confidentiality and data protection legislation.

Medical Device Regulations 2002.

AI solutions used in clinical settings will be classified as medical devices and will adhere to the Medical Device Regulations 2002 (MDR). This includes obtaining the necessary certifications and approvals from regulatory bodies such as the Medicines and Healthcare products Regulatory Agency (MHRA). GOSH will ensure that all AI-driven medical devices undergo rigorous testing and validation to meet safety and efficacy standards.

Ethical standards.

The ethical development and use of AI is central to GOSH's strategy. Our approach is built on transparency, accountability and fairness. To uphold these principles, we will establish an AI ethics committee. This committee will oversee all AI projects, ensuring they align with our core values and ethical standards. The ethical standards section is further expanded in Appendix 2.

Clinical Governance.

To maintain high levels of patient care, we will establish clear protocols for AI use in clinical decision-making, ensure AI recommendations are subject to human oversight, and provide staff training on the safe and effective use of AI tools. Further information on the staff training plan is in appendix 7. Regular reviews and updates to the clinical governance framework will incorporate new developments in AI technology and regulatory requirements.

Continuous monitoring and evaluation.

To ensure ongoing compliance with regulatory standards, GOSH will implement a continuous monitoring and evaluation process for its AI systems. This will involve regular performance

assessments, bias audits, and impact evaluations to identify and address any issues that may arise. Feedback from patients, families, staff and regulatory bodies has been incorporated into the AI strategy to ensure it remains aligned with best practices and regulatory requirements.

GOSH will ensure that all partners and suppliers using AI adhere to the highest standards of safety, ethics, and regulatory compliance with an expectation that suppliers are transparent about their use of AI in processing GOSH data.

By aligning the AI strategy with these legal and regulatory compliance requirements and standards, GOSH will build a safe, ethical, and effective AI ecosystem that enhances patient care and operational efficiency. Continuous monitoring will include deploying AI management platforms such as Newton Tree to ensure all custom algorithms are assessed before deployment. A team of clinical scientists will robustly test the AI before, during, and after implementation to ensure it remains fit for purpose. All staff will receive training in their responsibilities in the appropriate use of AI, coupled with standards of practice, ensuring that in clinical settings, a record of what was originally produced by AI and how it was adapted is documented in the patient notes.

Digital and data literacy.

To fully leverage and deliver these technological advancements, a digitally confident and enabled workforce is essential. We recognise the varying levels of digital literacy among staff and will ensure support for all in using digital resources. A digital literacy assessment was undertaken at GOSH in 2024 to evaluate our current position across the Trust and identify knowledge and skill gaps, enabling us to create a comprehensive support and training package. We will collaborate with colleagues across the organisation to develop the digital workforce needed to fully exploit AI.

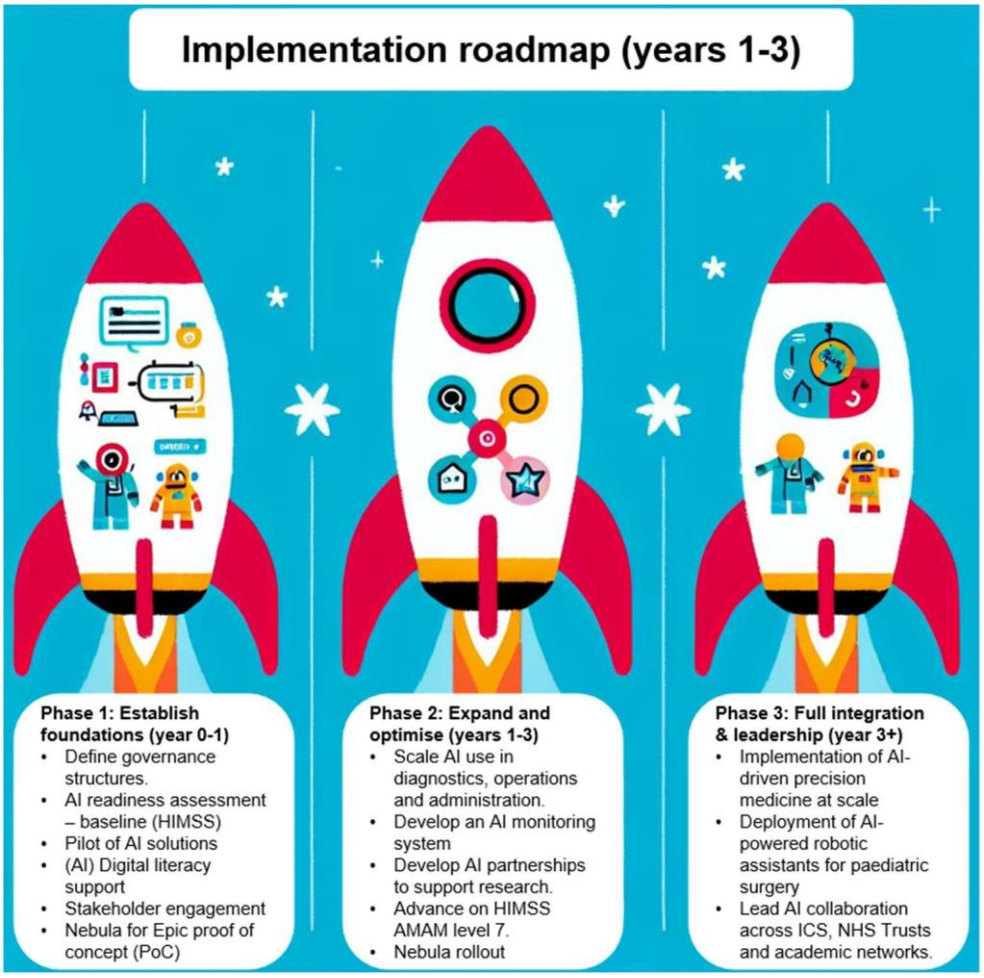
Artificial Intelligence playbook for the UK Government.

To deliver the AI strategy and vision at GOSH, we will use the “Artificial Intelligence Playbook for the UK Government” (February 2025) as our guide. This playbook outlines ten principles for the safe, responsible, and effective use of AI in government organisations. By following these principles, we will navigate AI deployment complexities, maximise AI benefits and mitigate risks. Further information on our approach to risk mitigation can be found in appendix 8.

Benefits realisation.

Ensuring robust benefit realisation is essential. We will establish clear metrics and KPIs to measure the impact of AI initiatives, regularly review progress against these metrics, and make necessary adjustments to maximise benefits. This will involve continuous engagement with stakeholders to ensure that the AI solutions deliver tangible value and align with organisational goals.

Implementation roadmap (years 1-3).



Year 1: Establish foundations.

In the first year, the focus is on laying the groundwork for the AI strategy. This involves defining who will lead the initiative and establishing the monitoring and reporting structures within the Trust. A gap analysis will be conducted to assess current capabilities, infrastructure, and use cases (appendix 6). Using the Healthcare Information and Management Systems Society (HIMSS) Analytics Maturity Assessment Model (AMAM) framework, a roadmap will be created to guide the development of an AI-driven hospital and assess AI readiness within the organisation. An AI governance structure will be established, including the formation of an analytics council. The Department of Advanced Data Analytics and AI will be set up along with a governance framework. Pilot projects will be launched to test AI-driven solutions in diagnostics, scheduling, and administrative automation. AI literacy training will be developed for staff to ensure they are well-equipped to work with AI technologies. Continuous stakeholder engagement will be maintained to address any trust and perception concerns. Year 1 will also see the implementation of Nebula Proof of Concept within Epic.

Years 1-3: Expand and optimise.

During this phase, the focus will be on scaling and optimising AI use across various hospital operations. AI applications in diagnostics, operations and financial management will be expanded. An AI monitoring system will be developed to track performance and ensure safety. Partnerships will be formed with the NHS, industry, and academia to collaborate on healthcare AI research projects. We will advance towards HIMSS AMAM level 7, which signifies a high level of AI-driven hospital operations.

Year 3+: Full integration and leadership.

In the final phase, the goal is to achieve full integration of AI technologies and take a leadership role in the field. AI-driven precision medicine will be implemented at scale, allowing for more fully personalised and effective treatments. AI-powered robotic assistants will be deployed for paediatric surgeries, enhancing surgical precision and outcomes. The organisation will lead AI collaboration efforts across Integrated Care Systems (ICS), NHS Trusts, and academic networks, fostering innovation and knowledge sharing.

What does this mean for our stakeholders?

Stakeholder		How will things improve?
Patients and families		This strategy will significantly improve the experience and outcomes for our patients and their families. Ambient AI will streamline patient consultations, allowing clinicians to focus on patient interaction rather than data entry. AI-assisted diagnostics will support more accurate and timely decisions, leading to better-informed diagnoses and treatment plans. Highly personalised treatment recommendations will ensure each patient receives the most effective care tailored to their needs. Enhanced patient monitoring through AI will enable timely interventions, preventing complications and improving overall patient care.
Care delivery		This strategy is set to significantly enhance care delivery at GOSH. Ambient AI will reduce the administrative time clinicians spend during consultations, allowing them to focus more on patient care. AI-powered imaging and predictive analytics will enhance early disease detection, leading to better patient outcomes. Additionally, integrating AI with the Epic EPR will streamline workflows and minimise administrative burdens, making the entire process more efficient.
Support services		This strategy is set to significantly enhance support services. By leveraging generative AI in administration, we anticipate notable efficiency improvements. AI-driven solutions will enhance resource planning, scheduling and cost efficiency.

Research		This strategy will enhance research by facilitating partnerships with academic institutions, NHS Trusts, and industry leaders, providing researchers with opportunities to collaborate on cutting-edge AI projects. Researchers will have access to AI-driven solutions that support diagnosis, streamline administrative tasks, and optimise hospital operations, allowing them to focus more on innovative research. AI will enable better data management through predictive analytics and personalised treatment plans, enhancing the quality and efficiency of research. By fostering partnerships and creating a scalable AI infrastructure, the strategy will attract funding and resources, supporting researchers in their endeavours. These benefits will position GOSH at the forefront of healthcare innovation, setting new standards for paediatric care and ensuring a brighter future for patients and researchers.
For everyone		AI will optimise hospital operations, improve resource management, and support medical research, ensuring a safe and sustainable future for paediatric healthcare

Appendices

Appendix 1 – AI Playbook for the UK Government.

The **AI Playbook for the UK Government**[1] outlines ten principles for the safe, responsible, and effective use of AI in government organisations.

1. **You know what AI is and what its limitations are**: Understand AI technology, its capabilities, and its limitations to use it safely and responsibly.
2. **You use AI lawfully, ethically, and responsibly**: Ensure AI tools are used in compliance with legal and ethical standards, addressing issues like data protection and bias.
3. **You know how to use AI securely**: Implement security measures to protect AI systems from cyber threats and ensure they are resilient.
4. **You have meaningful human control at the right stages**: Maintain human oversight in AI decision-making processes, especially for high-risk decisions.
5. **You understand how to manage the AI life cycle**: Manage the entire AI life cycle, from choosing the right tools to maintaining and updating systems.
6. **You use the right tool for the job**: Select the most appropriate AI technology for specific tasks, considering both AI and non-AI solutions.
7. **You are open and collaborative**: Engage with other government departments, civil society, and the public to ensure transparency and collaboration.
8. **You work with commercial colleagues from the start**: Collaborate with commercial partners to ensure AI solutions meet ethical and commercial standards.
9. **You have the skills and expertise needed to implement and use AI solutions**: Ensure your team has the necessary skills and knowledge to develop and maintain AI systems.
10. **You use these principles alongside your organisation's policies and have the right assurance in place**: Align AI use with organisational policies and implement assurance measures to monitor and mitigate risks.

[1] https://www.gov.uk/government/publications/ai-playbook-for-the-uk-government

Appendix 2 – Responsible and ethical framework for AI implementation at GOSH.

Three laws of AI healthcare

Inspired by the Hippocratic oath (circa the fifth and third centuries BC) and Asimov's Three Laws of Robotics.

1. AI systems must benefit the health and well-being of the individual and prevent harm. (**primum non nocere - first do no harm**)

2. AI systems must protect confidentiality and be equitable and unbiased in their healthcare recommendations for all individuals. (**equity and confidentiality**)

3. AI systems must operate under the supervision of qualified healthcare professionals, ensuring transparency in their analysis to enable effective oversight. (**human clinical supervision**)

Principles of AI use

We have developed a set of principles that guide the responsible use of AI at GOSH and UK hospitals today.

They will evolve through consensus as we learn, aligning with our vision and expanding our AI capabilities.

Patient centred care: AI will not be used independently; care will always be overseen by experienced healthcare professionals.	
Thorough evaluation: Rigorous evaluation using simulated patient data and controlled pilot settings.	**Data security and privacy:** As is our standard practice to safeguard patient information.
Cybersecurity and compliance: Compliance with regulations such as GDPR is mandatory.	**Cost-effectiveness:** Cost-effective, providing a meaningful return on investment for GOSH and the wider health system.
Bias-free care: Bias mitigation and monitoring should be an integral part of the system.	**Stepwise implementation:** Layered and stepwise approach to implementation; changes are carefully managed and monitored.

Data protection: We will never permit the removal or transfer of identifiable patient data.	**Transparency and data review**: Transparent about their effectiveness through regular reviews.
Clinical focus: At this stage - our primary use is to support clinical care and enhance operational delivery.	**Continuous innovation**: We will continuously innovate to improve our approach to AI technologies.

FUTURE-AI: international consensus guideline for trustworthy and deployable artificial intelligence in healthcare. – 10th January 2025

Clusters of requirements	Core principles
Fairness, diversity, inclusiveness, non-discrimination, unbiased AI, equity	Fairness
Generalisability, adaptability, interoperability, applicability, universality	Universality
Traceability, monitoring, continuous learning, auditing, accountability	Traceability
Human centred AI, user engagement, usability, accessibility, efficiency	Usability
Robustness, reliability, resilience, safety, security	Robustness
Transparency, explainability, interpretability, understandability	Explainability

FUTURE-AI: international consensus guideline for trustworthy and deployable artificial intelligence in healthcare

Appendix 3 – Types of Artificial Intelligence.

Artificial Intelligence (AI) encompasses various technologies that simulate human intelligence in machines. These technologies can be broadly classified into the following types:

1. **Machine Learning (ML)**
   - **Supervised learning**: Involves training an algorithm on a labelled dataset, meaning that each training example input is paired with an output label. The algorithm learns to make predictions or decisions based on the input-output pairs.
   - **Unsupervised learning**: The algorithm is trained on unlabelled data and must find patterns and relationships within the data. Common techniques include clustering and association.
   - **Reinforcement learning**: The algorithm learns by interacting with its environment, receiving rewards or penalties based on its actions, and aims to maximise cumulative rewards.
2. **Natural Language Processing (NLP)**
   - **Text analysis**: Involves extracting meaningful information from text, such as sentiment analysis, topic modelling, and named entity recognition.
   - **Speech recognition**: Converts spoken language into text, enabling voice-activated systems and applications.
   - **Machine translation**: Automatically translates text or speech from one language to another.
3. **Computer vision**

- **Image recognition**: Identifies objects, people, or scenes in images and classifies them into predefined categories.
- **Object detection**: Locates and identifies multiple objects within an image or video.
- **Facial recognition**: Identifies and verifies individuals based on their facial features.

4. **Robotics**
   - **Autonomous robots**: Robots that can perform tasks without human intervention, using sensors and AI algorithms to navigate and interact with their environment.
   - **Collaborative robots (Cobots)**: Designed to work alongside humans, assisting with tasks and enhancing productivity.

5. **Expert systems**
   - **Rule-based systems**: Use a set of predefined rules to make decisions or solve problems in specific domains, such as medical diagnosis or financial planning.
   - **Knowledge-based systems**: Incorporate domain-specific knowledge and reasoning capabilities to provide expert-level solutions.

6. **Generative AI**
   - **Generative Adversarial Networks (GANs)**: Consist of two neural networks, a generator and a discriminator, that compete against each other to create realistic data samples, such as images or audio.
   - **Variational Autoencoders (VAEs)**: Encode input data into a latent space and then decode it to generate new data samples, often used for data augmentation and anomaly detection.

Appendix 4 – Key stakeholder groups and engagement approaches.

Stakeholder	Engagement Approach	Key Concerns and Mitigation
Hospital leadership (CEO, COO, CFO, R&I Director, CMO, CN)	Regular strategy meetings, financial projections	ROI, budget impact **Demonstrate cost savings and efficiency gains**
Clinicians and healthcare staff	AI literacy training, co-development workshops	Job security, automation bias **Human-in-the-loop model, clear AI safety protocols**
Patients and families (YPF, YPAG)	AI awareness campaigns, opt-in AI decision support	Trust, data privacy **Transparent AI use, patient opt-out mechanisms**
Regulatory bodies (NHS, MHRA, NICE, ICO)	Compliance workshops, early consultation	Ethical AI use, GDPR compliance **Proactive adherence to NHS AI governance**
Academic and research partners	Joint research projects, NHS AI Lab collaborations	Access to data, ethics **Strict governance and data protection policies**
Technology and industry partners	Public-private AI development projects	IP ownership, hospital data access **Hospital retains control over AI outputs**

Appendix 5 – Prioritisation matrix (with examples).

AI use case selection matrix for GOSH

Evaluation criteria

Each AI use case is scored (1-5) on the following dimensions:

1. **Clinical impact**
   Improves patient outcomes and quality of care.
2. **Operational efficiency**
   Reduces administrative burden and enhances workflows.
3. **Feasibility**
   Ease of technical implementation and integration with existing systems (e.g., Epic, ICT)
4. **Ethical and regulatory compliance**
   Ensures fairness, transparency and meets NHS/ GDPR regulations.
5. **Financial and environmental sustainability**
   Cost-effectiveness, ROI, funding availability, environmental cost
6. **Security and data protection**
   Mitigates cybersecurity risks and protects patient data.
7. **Adoption readiness**
   Acceptability by staff, patients and leadership.

Scoring key:

- **5** = High Impact / Easy to Implement
- **3** = Medium Impact / Moderate Challenges
- **1** = Low Impact / Difficult to Implement

AI use case	Clinical impact	Operational efficiency	Feasibility	Ethical and regulatory compliance	Financial and environmental sustainability	Security and data protection	Adoption readiness	Total score (max: 35)	Priority level
AI for imaging (Radiology – X-rays, MRI, CT, US)	5	4	4	4	4	4	4	29	High
AI for digital pathology (automated slide analysis, cancer detection)	5	4	3	4	4	4	3	27	Medium
AI-powered virtual assistants (chatbots for FAQs and triage)	3	5	5	4	5	4	5	31	High
AI-based workforce scheduling and optimisation	2	5	5	4	5	4	5	30	High
AI for medical documentation automation	4	5	4	4	5	4	4	30	High
AI for predictive patient deterioration	5	5	3	4	4	4	3	28	High
AI for claims processing and fraud detection	1	5	5	4	5	5	5	30	High
AI-driven financial forecasting budgeting	2	5	4	4	5	4	4	28	High
AI For identity and access management (Cybersecurity)	1	5	4	5	5	5	4	29	High
AI-enhanced procurement optimisation	2	4	4	4	5	4	4	27	Medium
AI-driven personalised medicine (Genomics-Based Care)	5	3	3	3	3	4	3	24	Medium

AI use case	Clinical impact	Operational efficiency	Feasibility	Ethical and regulatory compliance	Financial and environmental sustainability	Security and data protection	Adoption readiness	Total score (max: 35)	Priority level
AI In paediatric robotics	4	2	2	3	2	4	2	19	Low

Appendix 6 – Use case examples.

A. AI for clinical care

1. AI-assisted diagnostics
    - Use Case: Machine learning models for early detection of paediatric diseases (e.g. sepsis, congenital disorders, radiology AI).
    - Impact: Faster, more accurate diagnoses; reduced diagnostic errors.
    - Challenges: Bias in datasets, clinician trust, integration with Epic/EHR.
    - Mitigation Plan: Bias audits, process transparency human-in-the-loop review.
2. AI-enhanced personalised medicine
    - Use case: AI-driven treatment recommendations based on patient genetics and history.
    - Impact: Precision medicine; better outcomes for complex paediatric conditions.
    - Challenges: Data privacy, patient perception, regulatory hurdles.
    - Mitigation plan: Clear patient consent processes, NHS-compliant AI governance.
3. AI-powered virtual assistants (chatbots and triage)
    - Use Case: AI-driven chatbot for symptom checking, appointment scheduling and FAQs.
    - Impact: Reduced admin burden, improved patient engagement, 24/7 accessibility.
    - Challenges: Handling sensitive queries, ensuring accuracy.
    - Mitigation Plan: Limited scope for critical symptoms; clear escalation pathways.
4. AI-enabled paediatric rehabilitation with robotics
    - Use Case: AI-driven robotic therapy for children with mobility impairments.
    - Impact: More effective therapy sessions; better patient engagement.
    - Challenges: Cost, regulatory approvals, staff training.
    - Mitigation Plan: Partner with universities and med-tech firms; phased rollout.

B. AI for hospital operations optimisation and efficiency

1. AI-driven staff and surgery scheduling
    - Use Case: AI-powered scheduling to optimise shifts and surgical slots.
    - Impact: Improved efficiency, reduced wait times, better staff allocation.
    - Challenges: Staff buy-in, AI interpretability, integration with existing systems.
    - Mitigation Plan: Co-design with clinical staff; provide override options.
2. AI-enhanced resource and bed management
    - Use Case: Predictive AI models to forecast ICU demand, optimise bed occupancy.
    - Impact: Reduced capacity strain, better emergency preparedness.
    - Challenges: Data accuracy, seasonal variability.
    - Mitigation Plan: Continuous model monitoring and adjustment.
3. AI-powered automated documentation

- Use Case: NLP based AI to automate medical documentation, reducing admin workload.
- Impact: More time for direct patient care, reduced burnout.
- Challenges: Accuracy, legal compliance, privacy concerns.
- Mitigation Plan: Human-in-the-loop validation, encryption for sensitive data.

C. AI for Research and Innovation

1. Predictive analytics for paediatric disease trends
    - Use Case: AI-driven epidemiological modelling for conditions like Respiratory Syncytial Virus (RSV) and influenza.
    - Impact: Better public health planning, early warning systems.
    - Challenges: Data-sharing policies, accuracy of long-term predictions.
    - Mitigation Plan: Collaborate with NHS and academic research partners.
2. AI in genomics and rare disease research
    - Use Case: AI-powered genomic analysis for rare paediatric diseases.
    - Impact: Faster identification of rare conditions, improved treatment options.
    - Challenges: Need for large datasets, ethical concerns.
    - Mitigation Plan: Secure partnerships for ethical data-sharing agreements.
3. AI for clinical trial optimisation
    - Use Case: AI-assisted patient recruitment, trial matching and drug response prediction.
    - Impact: Faster and more inclusive trials; precision treatments.
    - Challenges: Regulatory approvals, ensuring diversity in trials.
    - Mitigation Plan: Transparent patient selection criteria, regulatory compliance.

D. AI in Human Resource (HR) management

1. AI-Powered workforce scheduling and optimisation
    - Use Case: AI-driven shift scheduling that balances workload, prevents burnout and ensures optimal staffing levels based on real-time hospital needs.
    - Impact: Reduces administrative burden on HR; improves staff well-being by preventing overwork; ensures compliance with NHS staffing regulations.
    - Challenges: Staff resistance to AI scheduling; data privacy concerns.
    - Mitigation: Co-development with staff and flexibility options; strict role-based access controls for workforce data; provide override options.
2. AI-Based staff well-being and mental health monitoring
    - Use Case: AI-powered sentiment analysis from staff feedback, email tone analysis and surveys to detect early signs of burnout or dissatisfaction.
    - Impact: Supports proactive staff well-being programmes; reduces absenteeism and improves morale.
    - Challenges: Privacy concerns with AI monitoring staff communications.
    - Mitigation: Strict anonymisation and opt-in policies.

E. AI in hospital financial management

1. Predictive budgeting and cost optimisation
    - Use Case: AI predicts future hospital expenses, revenue fluctuations and budget shortfalls based on historical and real-time financial data.
    - Impact: Helps optimise spending and resource allocation; improves financial stability by predicting cash flow needs.
    - Challenges: Data quality issues affecting predictions; resistance from finance teams.
    - Mitigation: Continuous data validation; AI works as a decision-support tool, not a replacement.
2. AI-Driven procurement optimisation
    - Use Case: AI analyses supply chain data to forecast optimal ordering levels for medical supplies and pharmaceuticals, preventing waste and shortages.
    - Impact: Reduces waste and stockouts; saves costs by ensuring optimal supplier contracts.
    - Challenges: Staff resistance, AI supply predictions disrupted by global shortages.
    - Mitigation: Co-development with staff, adaptive AI models with real-time supply chain updates.

F. AI in hospital cybersecurity management

1. AI for threat detection and cyber incident response
    - Use Case: AI-powered real-time anomaly detection in hospital networks to identify and respond to cyberattacks, ransomware and phishing attempts.
    - Impact: Reduces risk of data breaches and downtime; improves incident response speed.
    - Challenges: False alarms leading to alert fatigue.
    - Mitigation: Continuous model improvement and human review.
2. AI for Identity and Access Management (IAM)
    - Use Case: AI-powered behavioural biometrics and access controls to detect unauthorised access attempts and enforce role-based security.
    - Impact: Prevents insider threats and data leaks; ensures GDPR and NHS cybersecurity compliance.
    - Challenges: Staff frustration with access restrictions.
    - Mitigation: Adaptive security that balances usability and protection.
3. AI for medical device security monitoring
    - Use Case: AI continuously monitors connected medical devices (IoMT) for vulnerabilities, preventing cyberattacks on infusion pumps, ventilators and monitoring systems.
    - Impact: Protects critical medical equipment from cyber threats; reduces risk of ransomware attacks on hospital infrastructure.
    - Challenges: High volume of connected devices creates complexity.
    - Mitigation: Automated prioritisation of high-risk devices.

Appendix 7 – Staff training plan.

Training Module	Target Audience	Purpose	Delivery Mode
AI Literacy 101	All hospital staff	Basics of AI in healthcare	E-learning, webinars
AI and clinical decision support	Doctors, nurses, AHPs	How AI augments (not replaces) medical decisions	Hands-on workshops
AI bias and ethical considerations	Clinicians, ethicists	Addressing bias, ensuring fairness	Case studies, ethics panels
AI and epic integration	IT and informatics teams	Managing AI workflows within Epic	Technical training sessions
AI safety and reporting protocols	All clinical staff	How to report AI errors and anomalies	Live demos, incident simulations

Target Outcome: A fully AI literate workforce that understands how AI works, when to trust it, and when to challenge it.

Appendix 8 – Risk mitigation framework for AI implementation.

Key AI risks and mitigation strategies

Risk category	Specific risk	Potential impact	Mitigation strategy
Bias and fairness	AI models may underperform for specific patient groups (e.g., ethnic minorities, rare conditions)	Inequitable healthcare outcomes	• Regular bias audits and fairness monitoring • Use diverse training datasets • Independent fairness reviews
Clinical safety	AI misdiagnosis or incorrect recommendations	Harm to patients, legal liability	• Human-in-the-loop review for AI decisions • Clinician override mechanisms • Mandatory transparency features in AI tools
Automation bias	Clinicians may over rely on AI suggestions without critical evaluation	Medical errors, reduced clinical vigilance	• AI training for clinicians on when to trust vs. override AI • Regular automation bias reviews

Risk category	Specific risk	Potential impact	Mitigation strategy
Data privacy and security	Unauthorised access to patient data, data leaks	Breach of GDPR/NHS regulations, reputational damage	• End-to-end encryption • Role based access controls • Compliance with NHS Digital Security Standards
AI model drift	AI accuracy degrades over time as patient demographics or medical practices change	Declining performance, patient safety concerns	• Continuous AI model monitoring • Regular retraining and validation
Legal compliance	AI decisions may not be legally defensible if challenged	Legal disputes, regulatory penalties	• Documented AI decision trails • AI governance board reviews • Patient consent mechanisms
Operational integration	AI tools disrupt existing workflows instead of improving efficiency	Resistance from staff, inefficiencies	• Co-design with clinical and operational teams • AI must integrate seamlessly with Epic and hospital workflows
High implementation costs	AI deployment requires significant upfront investment	Financial strain, risk of budget overruns	• Phase-wise rollout focusing on high impact, low cost AI solutions first • Seek grants, partnerships, and ROI driven funding
Ethical concerns in AI use	Patients and staff worry about AI "replacing" human care	Distrust in AI, resistance to adoption	• Clear communication strategy about AI as an augmenting tool, not a replacement • Patient friendly explanations of AI use in decisions