Global Policy Network

Personalised Medicine and Artificial Intelligence

A Policy Report

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Personalised Medicine and AI

Call for Evidence

Contents

Abbreviations

AI – Artificial Intelligence

GPN – Global Policy Network

ICB – Integrated Care Board

MRC – Medical Research Council

NHS – National Health Service

NIHR - National Institute for Health and Care Research

RT4 – Roundtable 4

RT5 – Roundtable 5

UK – United Kingdom

Executive Summary

Personalised medicine and artificial intelligence (AI) offer significant potential to improve patient outcomes in the NHS through earlier diagnosis, more precise prescribing and more efficient care pathways. Advances in genomics, pharmacogenomics and AI enabled diagnostics means that these approaches are increasingly ready for wider clinical application. However, their implementation within routine care remains limited.

This report prepared by Global Policy Network draws on evidence from Roundtable 4 (Genomics and AI) and Roundtable 5 (Medicines Optimisation and Digital Infrastructure), alongside wider policy and academic research. It identifies that the primary barrier to realising the benefits of personalised medicine and AI is structural fragmentation across NHS data systems and service design.

The report identifies four interconnected challenges:

1. Fragmented data systems limit continuity of care and constrain clinical decision making. Patient data remains siloed across primary, secondary and community care, preventing a complete and accessible view of patient history.

2. Lack of interoperability restricts the effective use of AI. AI tools depend on high quality, integrated datasets, yet the current systems do not consistently communicate across care settings, reducing their clinical utility.

3. Absence of a unified medicines data infrastructure creates risks to patient safety. Prescribing data is dispersed across multiple systems, with no national Single Medication Record to support real-time, cross setting decision making.

4. Uneven implementation and system readiness risk reinforcing health inequalities. Adoption of personalised medicine is depended on local digital maturity, while workforce capability and evaluation frameworks remain insufficiently aligned to support scale.

Personalised Medicine and AI: Call for Evidence

"We have plenty of information, but the real challenge is turning that into insight and making sure it reaches the right people at the right time."

This submission is provided by Global Policy Network (GPN), an independent policy research institute specialising in health system reform, medicines policy and innovation. It draws on evidence from Roundtable 4 (Genomics and AI) and Roundtable 5 (Medicines Optimisation and Digital Infrastructure), which brought together more than 30 senior stakeholders such as specialised pharmacists, healthcare strategy consultants, and heads of pharmacy and medicines optimisation. These professionals represent a diverse, multidisciplinary background spanning the NHS, ICBs, primary care, academia, state pharmacy, and regulatory bodies. This submission identifies that the principal barrier to realising the benefits of personalised medicine and artificial intelligence is structural fragmentation in the NHS data systems and service design. These constraints limit the ability of the system to use data as a core clinical asset, and therefore, restrict the translation of innovation into routine care.

Summary of Key Points

- Personalised medicine and AI offer significant potential to improve patient outcomes, particularly through more precise prescribing and earlier diagnosis.
- However, their impact is currently constrained by fragmented health data systems and limited interoperability across the NHS.
- Data silos across, primary, secondary and community care reduce continuity of care and pose risks to patient safety.
- The absence of a national, integrated medicines record is a key structural barrier to implementation.
- Without addressing these foundational issues, further investment in AI and genomics is unlikely to deliver system-wide benefits.

Recommendations:

- Prioritise the development of a national Single Medication Record with read-write access across care settings.
- Establish mandatory interoperability standards across the whole health system, from NHS digital systems, such as EMPA platforms, to pharmacy and beyond.
- Develop a clear national framework for pharmacogenomics implementation to avoid fragmented rollout.
- Invest in workforce capability, particularly in digital skills and AI-informed decision-making.

1. The Current State of Personalised Medicine

Personalised medicine integrates genomic information, clinical data, and AI enabled analytics to tailor prevention, diagnosis, and treatment to individual patients. Advances in genomics and pharmacogenomics are already demonstrating clinical utility, particularly in improving drug selection and dosage and reducing adverse reactions (Rafi et al 2020). These developments indicate that the scientific foundations of personalised medicine are sufficiently advanced to support wider clinical application. However, while technologies such as whole genome sequencing and AI-driven diagnostics are advanced, their adoption within routine healthcare appears to remain at a relatively early stage (UK Research and Innovation, 2022).

Evidence from stakeholders suggests that implementation is not keeping pace with scientific progress. The discussion at Roundtable 4 (RT4) highlighted that while genomics and pharmacogenomics offer significant clinical potential, implementation is constrained by concerns around affordability, digital integration and the risk that early adoption may be uneven across regions, thereby reinforcing existing health inequalities if rollout is not nationally coordinated. For example, in the absence of national coordination, personalised medicine is likely to amplify existing inequalities, as digitally mature regions adopt innovations faster while others fall further behind. This reflects a broader disconnect between innovation and delivery, in which scientific advances are not matched by corresponding changes in system infrastructure and further highlights that the challenge is no longer about whether personalised medicine is technically feasible, but whether the NHS is institutionally configured to deliver it at scale.

2. Evidence and Research Gaps

The United Kingdom (UK) is widely regarded as a global leader in genomics (Department of Health and Social Care, 2017) supported by national infrastructure such as the NHS Genomic Medicine Service and large-scale datasets including UK Biobank. However, similar to other countries such as Australia (Stark et al, 2019), challenges remain in translating these advances into consistent clinical practice. Current evaluation frameworks tend to prioritise short-term costs, while failing to capture longer-term benefits associated with prevention and improved patient outcomes.

Further gaps relate to the integration of genomic insights into routine clinical workflows. Although advances in sequencing data analytics have improved the availability of genomic data, clinicians often lack access to actionable information at the point of care. This reflects wider limitations in in digital infrastructure and the absence of integrated decision-support systems. As a result, there is a disconnect between the generation of genomic data and its application in practice. In this case, research funders such as NIHR and MRC should prioritise studies that focus on implementation as well as innovation. This includes pragmatic trials in

real-world NHS environments, research into equitable access and adoption, and the development of health economic models that account for downstream savings and long-term value.

Despite its potential, implementation appears to remain uneven, with variation in adoption across regions and many technologies still in early-stage deployment rather than routine practice (National Audit Office, 2020). Evidence from applied policy research conducted by Global Policy Network (GPN), draws on structured stakeholder roundtables involving clinicians, pharmacists and system leaders and indicates that concerns around affordability, digital integration, and the risk of widening health inequalities remain significant barriers to implementation, particularly where rollout is uncoordinated or limited to early adopters (RT4). As one participant states, "what we don't want to do is open up the floor to privilege those that have had the testing done," while another stressed that "we need to be careful that access remains equitable… making sure that we get equitable access right."

3. Future Opportunities for Personalised Medicine

As the field evolves, in the medium to long term, personalised medicine has the potential to shift healthcare towards a more anticipatory and preventative model. This includes earlier identification of disease risk, more targeted interventions and reduced reliance on trial-and-error prescribing. Such a shift could significantly improve patient outcomes while also reducing inefficiencies within the system. However, realising this potential will require coordinated national leadership and clear implementation frameworks. Without consistent standards and strategic direction, there is a risk that personalised medicine will be adopted in a fragmented manner, leading to variation in access and outcomes. For example, France's Genomic Medicine Plan 2025 (OECD, 2021) represents a government-led strategy to embed genomic sequencing within routine healthcare, aligning funding infrastructure and clinical delivery at a national level. This illustrates that that where personalised approaches are successfully embedded, this is typically supported by strong governance, aligned incentives and integrated data systems.

4. The Role of AI in Personalised Medicine

Artificial intelligence has a well-defined and immediate role to play in advancing personalised medicine. AI can particularly support genomic analysis by enabling faster and more accurate interpretation of genetic variants, as well as improving risk stratification and early diagnosis. It also has applications in clinical decision support, where it can assist clinicians in selecting the most appropriate treatments based on individual patient characteristics. In drug discovery, AI can accelerate the identification of therapeutic targets and reduce the time and cost associated with development. These applications demonstrate that AI has the potential to significantly enhance both the efficiency and effectiveness of healthcare delivery (NHS

England, 2022). However, the extent to which these benefits can be realised depends on the ability of the health system to support theist integration.

Evidence from stakeholders indicates that the primary barrier to adoption of artificial intelligence in personalised medicines is system readiness. While AI tools are increasingly capable of supporting genomic analysis, diagnostics and clinical decision making, their effectiveness is fundamentally dependent on the availability of high-quality, integrated data and their alignment with clinical workflows (OECD, 2021). Delegates in Roundtable 5 consistently emphasises that data silos across primary, secondary and community care constrain the effective use of AI, particularly in medicines optimisation and prescribing decisions. In practice, patient data remains fragmented across multiple systems that do not communicate effectively with one another. This limits clinicians' ability to access a complete and up to date view of patient history and therefore restricts the usefulness of AI tools that rely on comprehensive datasets to generate accurate insights.

A central tension is that AI is often positioned as a transformative solution, yet its effectiveness is fundamentally dependent on the quality, accessibility and integration of underlying data. In this context, AI does not resolve system fragmentation but instead exposes it. Where data systems are incomplete or poorly connected, AI risks reinforcing existing inefficiencies rather than overcoming them.

5. Strategic Priorities for Government

There was strong consensus in Roundtable 5 that the absence of a unified medicines data infrastructure represents critical constraint on both patient safety and the effective deployment of artificial intelligence. Delegates reiterated that current medicines data is fragmented across primary care, hospitals and community pharmacy systems, with limited interoperability between them. This fragmentation creates gaps in prescribing histories, delays in clinical decision making and further increases the risk of medication errors, particularly at transitions of care. Participants identified a national Single Medication Record, with universal read-write access across care settings, as essential infrastructure rather than a digital enhancement.

The significance of a Single Medication Record extends beyond improving data visibility; it fundamentally reshapes how the system can use data in clinical practice. A unified medicines record would enable real-time access to comprehensive prescribing information, supporting safer and more accurate decision-making, while also providing a consistent data foundation for AI-driven tools. Arguably, without this AI applications in personalised medicines are constrained by incomplete or inconsistent datasets, limiting their reliability and clinical utility. Evidence from NHS transformation efforts suggests that where shared care records have been implemented, improvements in coordination and patient safety are observed. Although these benefits remain uneven due to variation in system integration and functionality.

More broadly the need for a Single Medication Record reflects a deeper structural issue in how data is organised within the NHS. Current systems are designed around organisational boundaries rather than patient pathways. This results in data being siloed across institutions rather than integrated across the continuum of care. Therefore, addressing this requires moving towards treating medicines data as a shared clinical asset that underpins all aspects of care delivery.

6. Data Infrastructure and Interoperability

Realising the potential of personalised medicine and artificial intelligence requires a step change in how national data bodies coordinate infrastructure, standards and implementation. Evidence from Roundtables 4 and 5 indicates that current efforts are limited by fragmentation in how data is structured, assessed and used across the health system. Organisations such as the Health Data Research Service, Genomics England and the Genomics AI Network therefore have a critical role not only in advancing research capability, but in ensuring that data is usable and actionable within routine care (Goldacre, B & Morley, J, 2022).

A key priority should be the development of interoperable, clinically integrated data environments that link genomic, prescribing and health record data across care settings. Roundtable 4 highlighted that genomic insights are often not translated into clinical decision making due to poor integration with electronic prescribing systems and limited access at the point of care. Addressing this requires moving beyond data repositories and towards systems that support real-time, decision ready information. Natural bodies should subsequently prioritise standards and infrastructure that enable seamless data exchange across primary, secondary and community care, including alignment with medicines data systems and clinical workflows (Thierry, 2022).

In parallel, there is a need to shift from a predominantly research focused model towards one that actively supports implementation and adoption. Evidence from Roundtable 5 indicates that even where data exists, its impact is limited by a lack of integration into clinical pathways and decision-making processes. National data initiatives should therefore place greater emphasis on implementation science. This includes how tools are embedded within workflows, how clinicians interact with data and how outputs are translated into practice. It further includes supporting the development of shared platforms, clinical decision-making tools and workforce capability in data use and interpretation.

Finally, national bodies must play a stronger role in ensuring consistency and equity in how personalised medicine is deployed across the NHS. There is the risk that innovation will develop unevenly, with more digitally mature regions adopting new capabilities faster than others. Roundtable discussions emphasised that this could exacerbate inequalities if not addressed proactively. Identifying and establishing clear national frameworks for data governance, interoperability and access will be essential to ensure that the benefits of personalised medicine and AI are realised consistently across the system.

7. Barriers to Data Integration

As noted in 3a, effective linkages of healthcare data across the NHS need further development. Fragmented data systems across primary, secondary, and community care prevent genomic data from being used in everyday care decisions (Heeney et. al., 2023). The NHS's goal of moving toward a single patient record has great promise, but the current lack of interoperability between systems continues to stall this movement (NHS, 2025). The government should focus future work on integrating genomics programmes' data into NHS workflows across care settings, ensuring simple and equitable access.

8. Gaps in Digital Capability

Our roundtables stressed that the NHS's digital and IT infrastructure remains a major barrier to such deployments. NHS organisations have massive disparities in digital capabilities, creating inconsistent electronic prescribing and medication administration systems. These problems further contribute to the difficulty in integrating genomic data directly and uniformly into patient care. These concerns are further complicated by the digital literacy levels of staff, who may not be able to appropriately use such technology even if it is available to them (Mantel-Teeuwisse et al., 2021). Therefore, the government's push for interoperability must also consider training and education in digital literacy.

9. Building Public Trust in Data Use

Our delegates spoke directly to this concern:

"If you don't have that trust with the patient, that person is never going to engage with the system."

Delegates highlighted community-led engagement models as particularly effective for building trust and understanding barriers and motivations in populations experiencing elevated levels of digital exclusion. They emphasised that pharmacy teams, because of their accessibility and established relationships with patients, are well placed to act as trusted anchors for digital inclusion, supporting patients to engage with digital tools alongside their medicines use. This highlights a need for national and system-level digital inclusion strategies to explicitly recognise and embed pharmacy within delivery plans, rather than treating digital inclusion as a standalone or purely technological issue.

Literature also supports the efficacy of this process. The process of co-designing solutions with patients is essential to ensure innovation, inclusivity, and meaningful adoption of digital health interventions, and that patient engagement improves both uptake and outcomes of those interventions (Greenhalgh et al., 2017).

10. Cost Pressures and Long-Term Value

Economics-based research suggests that pharmacogenomics could be cost-effective and possibly cost-saving in the long run, saving not only funds but improving patient outcomes (Apellaniz-Ruiz et al., 2024). Our roundtable participants stressed that affordability, particularly in the short term, and determining how it is measured, is still a significant obstacle which implementation efforts will have to overcome. They spoke to how many of these benefits are seen over longer periods and hard to quantify in terms of immediate impacts to costs. Therefore, simply looking at a cost sheet of period-to-period financial effects may be inadequate for measuring these financial savings, both due to increased efficiency as well as improved health outcomes for patients. Investment in research into the long-term benefits of personalised medicine will allow more accurate appraisal of their value. One of our roundtable participants summarized the problem with translating such financial impacts:

"One of the problems that we have with genomics is that the value of genomics can be seen as the statistics around it, the statistics of the evidence base that by doing a test and changing the line of treatment or optimising dose, you're statistically going to prevent some safety issue or some ADR, or improve efficacy. But that's really hard to translate into money in the real world." (Clinical Pharmacy Lead)

11. Governance and Accountability

Despite national priorities around genomics innovation, oversight mechanisms for this innovation in the NHS are inadequately developed for the task (Heeney, C. et al., 2023). Our participants repeatedly stressed the need for clear national frameworks for implementing these technologies, ensuring meaningful implementation, accountability, and equitable access. NHS structures are currently without these clear national guidelines, leaving adoption processes up to individual bodies. This lack of implementation planning, combined with workforce digital literacy and digital infrastructure inadequacies, further complicate these technologies becoming widely used in everyday care (Mantel-Teeuwisse, A.K. et al., 2021). NHS structures should consider these issues in future planning around these issues for more effective technological adoption and innovation.

12. Fragmentation and Accountability

Fragmentation across trusts, Integrated Care Boards (ICB's) and national bodies contributes to uneven adoption of innovation by diffusing responsibility for implementation. In practice innovations are often developed or piloted successfully, but no single part of the system is accountable for ensuring they are adopted at scale. This is particularly problematic for system wide innovations, such as personalised medicine and AI, where benefits depend on coordination across multiple settings and the effective integration of data systems (Goldacre et

al, 2022). As a result, adoption becomes inconsistent and dependent on local capacity and priorities, rather than the value of the innovation itself.

Addressing this requires shifting from a model that solely encourages innovation to one that embeds accountability for its adoption. This could involve linking national priorities more directly to local performance expectations, alongside standardising key enablers such as digital infrastructure and procurement processes. Therefore, clear mechanisms are needed to ensure that proven innovations are implemented consistently.

Conclusion

Personalised medicine and artificial intelligence are often presented as transformative innovations in healthcare. However, the evidence set out in this report demonstrates that the primary barrier to their adoption in the NHS is not scientific capability, but structural fragmentation within data systems, service design, and governance.

While the UK is well positioned as a global leader in genomics and data-driven innovation, these strengths are not consistently translated into routine clinical practice. Patient data remains fragmented across care settings, interoperability is limited, and implementation is uneven. As a result, the benefits of personalised medicine and AI are constrained, and there is a risk that their adoption may reinforce existing inequalities rather than reduce them.

Addressing these challenges requires a shift in focus from innovation generation to system integration. This includes establishing a unified medicines data infrastructure, strengthening interoperability across the NHS, embedding clear national implementation frameworks, and ensuring that workforce capability and digital literacy keep pace with technological development. Conversely, with the right foundations in place, these technologies have the potential to support a more integrated, preventative and patient-centred model of care.

Roundtable Participants and Contributors

Roundtable 4 – The Future of Pharmacy: Innovation, Integration and Impact

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- Aris Saoulidis – NHS East Genomics
- Gemma Quinn – University of Bradford
- Sarah Trust – NHS
- Nirusha Govender – NHS Kent and Medway Integrated Care Board
- Akash Patel – Pharmacy
- Nabeel Syed – Great Ormand Street Hospital
- Shahzan Zafar – Wye Valley NHS Trust
- Sonia Bhangu – Churchill Healthcare
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Roundtable 5 – The Future of Medicines Optimisation

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- Laura Boyd – Health Innovation Yorkshire & Humber
- Marina Khan – NHS Birmingham and Solihull ICB
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