Written evidence from RM Partners (PMA0111)

Questions
Personalised medicine and AI: the scientific background

1. What is the current state of the science underpinning personalised medicine – including genomics, AI-driven diagnostics, and advanced genomic therapies? What are the most significant near-term opportunities for patients to benefit in the NHS?

- AI-driven diagnostics: histopathology is still too varied (ie digitalisation) and AI in histopathology itself has had many challenges with implementation. Without sufficient pathology support, there is high variation in the offer of genetic testing to patients. This also impacts on hospital's participation into clinical trials, where there needs to be fast turnaround times for genetic results for eligibility of inclusion, creating an inequity. The most significant opportunity in the current environment is to reduce the variation in the turnaround time for genomic testing where it impacts on the patient's time to treatment.
- AI-driven diagnostics: Within cancer, this still has yet to yield major changes to the patient pathway. Over the last few years there have been a number of 'negative' trials where AI-augmented pathways have not produced significant change, and in fact, performed poorer than current clinician-led pathways (e.g. AI for chest X-rays).
- The promise of AI in revolutionising the current bottlenecks in the cancer diagnostic pathway is still yet to be realised. This may be due to the limited dataset that the AI is being trained on, or the way the AI is being implemented.
-]Genomic medicines – the NHS Test Directory is working well, but the turnaround times for testing is still too varied across Trusts, and therefore many patients are not being tested in time for personalised treatments to be offered in a timely manner.
- There are opportunities in the integration of genomic testing at the front end of the pathway, so that targeted treatments can be approached and considered early on. With the era of cancer vaccines, early results of cancer genetics will be significant. Other opportunities include the use of genomics for disease monitoring and follow up. The NHS continues to buckle under pressure and with the cancer incidence at 1:2, this is a huge burden on the NHS. Non-invasive testing of disease recurrence will allow this to be placed in the community rather than in the hospital.

a) Where are the major gaps in our understanding that could be addressed through further investment in research and development, and which research projects would you prioritise? What should the National Institute for Health and Care Research (NIHR), the Medical Research Council (MRC), and other health researchers fund to capitalise on this?

- Non-invasive genetic testing opportunities to improve access, throughput, experience, ie where saliva can replace blood (BRCA), where blood can replace tissue (pancreatic/biliary tract, hard to biopsy tumours)
- Data gaps: Support to draw in existing data where innovation has been trialled, tested, piloted, where available – everything is siloed and piecemeal, someone needs to draw it all together and needs assessments need to be conducted much more rapidly in order to evidence to be collected prior to further deployment.
- Genetic testing at scale with rapid turnaround time to enable timely access to personalised medicines

b) What possibilities exist for personalised medicine in the medium and long-term, and what is needed to unlock these opportunities? Are there examples of specific areas of UK practice, or practice overseas, which we should learn from to help deploy personalised medicine?

- More upfront genomic testing as part of diagnostic workup (thinking about the increase of targetable mutations, ie Ras). More work needs to be done with MCEDs and their utility in triage.
- Genetic testing as a prevention measure, normalising genetic testing so that people take on proactive monitoring of their cancer risk and health, and active measures to prevent (diet, lifestyle, behaviour etc).
- Longitudinal sampling through liquid biopsy to understand tumour evolution and resistance mechanisms (tumour biology) and disease monitoring to replace conventional imaging-based follow up (clinical management).
- Continued public awareness and patient education and awareness around genetics and AI acceptability.

The role of AI in personalised medicine - No response

2. What role could AI realistically play in accelerating the development and reducing the cost of personalised medicine? How close are we to understanding and realising its potential and what barriers need to be removed to fulfil it?

a) Where do you think existing AI tools could be most effective at advancing personalised medicine, for example across genomic analysis and drug discovery? Are there standout examples that could be more widely deployed? What is preventing more widespread adoption of promising tools?

b) How significant are the recent advances in AI to what is possible in

personalised medicine? What role do you see for recent developments in AI models for genomics, like AlphaGenome, which promise to more accurately predict the effects of genetic variation on health?
c) To what extent are Government goals – for example, around using AI to accelerate drug discovery – realistic, and what does it most need to invest in to ensure they can achieve these goals?

Health data research infrastructure
3. Personalised medicine depends on large scale genomic and health data being accessible and linked together. What further research infrastructure, in terms of data accessibility, compute etc. – is needed to support the development of personalised medicine and AI? Where are the gaps in current provision? How should the Government help ensure that its health data infrastructure is fit to deliver on this promise?

- There are increasing data SDEs with linked data, however does not include genetic information yet. Having access to a national database of genetic information would be a huge asset in driving future research and discovery of druggable targets. There is a shortfall in the types of scientists that can support further research in this area: bioinformacians, data scientists, geneticists, etc. Investment needs to be made in infrastructure but also workforce.

a) What recommendations would you have for bodies like the Health Data Research Service, Genomics England, and the Genomics AI Network to capitalise on the opportunities presented by these technologies?

- Improve access to data sets for researchers
- Support commissioning of genetics
- Work closer with NICE and MHRA to streamline approvals and adoption of emerging targets and treatments
- Support education and training of healthcare professionals
- Share best practice, ie establishment of Molecular Tumour Boards etc.

b) How effective has the government been at linking together health data through its genomics research projects and through the NHS, and where is further work needed?

- The launch of the unified genomics record is long overdue, considering the ample amount of genetics data that exists through routine clinical care, and through various research projects. The government needs to do more to make this data available in a timely manner so that evidence can be reviewed faster and implementation can be considered. Many genomics and AI projects are often run as siloed projects across the country, though using the same innovation. If there is a mandate for data to be held in a centralised repository, decision and policy makers, ie NICE can review without waiting for data to be published and formally submitted.

c) To what extent does the NHS's digital and IT infrastructure represent a major barrier to the deployment of these treatments, and are the Government's current attempts to address this and ensure interoperability adequate?

- There are two major barriers: most Trust IT systems require an overhaul to meet the ambitions set out by the cancer plan, let alone any capability to implement innovation in addition. Digital and IT funding resources are severely limited at Trust and system level as they are counted as capital funding. Investment in digital and IT cannot be measured within a financial year and longer term commitment to continue development and support is needed.
- Secondly, in order for innovation to be adopted system-wide at scale, working across different digital suppliers is extremely challenging as implementation cannot be approached as a once all for the system, and instead needs to be tailored and repeated for each hospital Trust, taking away time and resources. Because systems do not have a harmonised system of infrastructure, implementation is repetitive. Novel systems like Newton's Tree, an AI interoperability platform, can support systems with deployment, but this needs to be supported and resourced appropriately.

d) Health data research is often set back by a lack of public trust in how data is handled. How should the Government address public concerns? Are current data protection protocols and industrial partnerships appropriate?

- Given the national cancer plan's ambition is to move from analog to digital, along with that should include a mandate to work with the public and VCSEs to ensure that further inequalities aren't being created, and transparency with the handling of public data. This needs to be done across all levels of health systems: neighbourhood, hospital level, regional and national.
- Current data protection and information governance requirements are sufficient, however in some instances can become a hindrance when progressing work. Further refinement/mandate from the government to support the set up of AI software/vendors could help.

The life sciences sector

4. How effective is the UK at translating its strengths in life sciences research into clinically validated personalised medicine and AI tools, and into its industrial base in the life sciences?

- The UK has a huge wealth of knowledge and expertise in genomics, but the gaps are in implementation into widespread patient benefit.

a) What are the main barriers in moving personalised medicines and AI from the early-stage research to clinical trials and through to regulatory approval? To what extent is the national infrastructure for clinical trials able to keep up with developments in personalised medicines and AI?

- Regulatory approval is difficult to map out in the UK. In England, this requires approval from the MHRA, and then adoption into the NICE guidelines. Market access for personalised medicines and relevant genetic targets is not straight forward. Whilst NICE approves the targeted treatment, the approval and commissioning for genomic panel assays is protracted and goes through the NHS Genetics Test Directory, where the route to approval is unclear. These should work in tandem, or all be subsumed by NICE. The quality of approvals in the UK don't need to change, it's the timing and lack of transparency that causes industry to withdraw engagement.
- Clinical trial paradigms are improving for the better in the UK, with new delivery models that will decentralise, and pragmatic models that bridge the gap between strict clinical trials and real world representation. However, this is only considered in large academic hospitals, where there is sufficient resource and support for large scale sponsored trials, there remains a huge gap with smaller units, primary care, community care-led research infrastructure.
- There has been a very welcome move in research inclusion so that findings can be applied to real world, but this needs to be sustained and amplified further. Funders and journals should require equity assessments, inclusive design, etc, which the Government can help lobby.

b) Is there a concern that innovative start-ups, SMEs and industrial partners in this space will move efforts overseas owing to failures in NHS procurement, support for scale-up, sluggish regulation, or other factors? If so, what could be done to address this?

- This is already happening. When discussing with AI tech companies, the feedback has been that the UK is extremely slow, requiring more approvals than other countries, and that there is too much variation across the system to work at scale. Clinical trials are established at each site, with each site taking a wide range of time for approval and costings. The NIHR Schedule of Events Cost Attribution Tool (SoECAT) needs updating to support AI studies, as barriers have been put in place accessing routinely captured patient data.

c) Is the UK at risk of losing leading clinical academics, researchers, and innovators working on personalised medicine and AI to other countries? What can be done to ensure the UK retains and attracts the talent needed to remain

competitive in this field?

- Yes – CRUK has been extremely vocal about this.

Innovation in the NHS: deployment

Deployment in practice

5. Translating cutting-edge medical science into routine NHS treatment has long been recognised as a problem. Considering personalised medicine and AI as an example, what are the key systemic barriers, such as procurement processes, workforce, or IT infrastructure, that prevent or delay the deployment of proven innovations across the NHS? Which of these barriers are the most important in practice?

- The NHS is not ready at all to move at pace and scale. There are huge delays across the system: research governance, legal contracting, procurement, workforce, digital structures and capacity. There is no specific funding for implementation, Trusts will seek funding externally for a short term pilot before using that to develop a business case, and as funding is extremely limited, many Trusts have placed freezes against recruitment of posts and business cases, even though there may be cost savings.

- All of the above are barriers to adoption, but all required for sign off in order for implementation at Trust level. Where one innovation (blood test, IT software, etc) is set up at one Trust, it needs to be established from scratch, at square one with the next Trust. There is no method or process of setting up at scale, once for all, with one sign off point at clinical governance, one sign off point for information governance, one sign off for legal, contracting, procurement etc.

- With personalised medicines, once NICE has approved, the hospitals across West London are relatively harmonised, through established clinical pathway groups set up by the cancer alliance, and network working across London. There is more variation with the personalised medicine clinical trials, as clinicians are reluctant to refer patients to other hospitals for access to novel drugs.

a) Why have previous attempts to address this not succeeded? What would be effective in addressing these problems?

Healthcare systems and pathways are complex, therefore implementation of proven innovations at scale across the NHS relies on a number of factors and enablers - a few of which a described below:

- Clinician, Management and Patient/service user acceptance - personalised medicine and AI are fast-moving fields however, it takes time to build engagement and trust to enable use of these technologies

in clinical pathways of care. The pace of change and the time needed to build trust are not aligned

- Estates and technical infrastructure - outdated hospital buildings and outdated operating systems and equipment can hinder the ability of clinical teams to adopt AI tools. High capacity internet connection, adequate power supply, specialist equipment with physical space for more processors and cooling are needed to make use of AI capabilities in clinical pathways
- Workforce capacity - transforming pathways of care to implement new AI tools requires staff time to upskill, test, develop standard operating procedures . There may be a requirement for additional staff to manage increased administrative burden
- Funding - sites that wish to adopt new technologies struggle to secure funding. This is due to:
    - the difficulties in being able to demonstrate return on investment for technologies that often require significant upfront investment - however the benefits are realised over the medium to long term i.e. preventative or early intervention AI diagnostics.
    - external funding covers the cost of the tech, but not the associated implementation costs
    - Commissioning pathways and governance structures for health tech are not consistent
- Integration with existing systems - integration with existing systems for electronic patient records, imaging networks and linking IT systems is necessary. IT teams can be limited in their capacity to upgrade or change existing structures to accommodate new AI tools

To understand and support mitigation of the challenges of real-world implementation of AI technologies, NICE is engaging with system stakeholders to inform development of healthtech guidance that is usable in the context of structural and system barriers

- With the surge of AI innovation, a national roadmap or toolkit for all the supporting processes (as mentioned above, procurement, legal, digital) to reduce delays in set up would be extremely helpful. This would prevent a lot of work that is currently happening in silos. As well as a mandate to share evaluations wider, for full transparency, so that the same repeated failed pilots do not have to be repeated elsewhere, but instead, more appropriate endpoints or use cases can be considered.
- Beyond research and clinical trials, more funding needs to be available for the purposes of implementation, with an understanding that the

evidence has already been developed, but funding is there to support set up and addressing challenges.

b) What are examples of good practice within the NHS of adopting these innovations that should be learned from and could be deployed more widely? What would need to happen to make that a reality?

- During the pandemic, adoption of new methods of working, adoption of novel technologies (remote working, remote consultations etc), was shown to be acceptable and feasible rapidly and efficiently. Granted this occurred as this was a national priority and other work was stepped down to enable this. To make this a reality, there needs to be dedicated implementation workforce working across systems, standardised governance, and ring fenced funding.

c) To what extent are issues in adopting innovation in the NHS down to an overstretched workforce, particularly of clinical academics, and what needs to be done to address this?

- This is affecting places that do not have a dedicated workforce for transformation, which is most district general hospitals, or non-specialist centres (where there is no separate income (ie commercial research) being generated to fund innovation/transformation posts). It's not only clinical academics that don't have the time and bandwidth, but also the operational managers, digital/IT teams, ringfenced time for all involved clinical staff for education and training etc (thinking about nursing staff and genomics education).

d) Considering the patient perspective, what needs to be done in order to encourage uptake of personalised medicine in the NHS and provide a service that puts patient needs first?
- clear, concise information given to the patient at the start of the pathway, with options to find out more from trusted sources.
- involvement with patient, public, VCSE representatives to understand barriers and co-produce information and co-design some of the processes
- transparency around why patient is being offered the genetic test, how the results will be relayed, understanding the impact of results and what it means to their family members, and how the data is stored.
- a clear understanding of the alternatives in language that is acceptable, ie what is the alternative treatment if the patient refuses a personalised treatment, what does that look like, in terms of treatment side effects and survival?

Regulating AI and personalised medicine – No response
6. How should the NHS and relevant regulators, including the Medicines and

Healthcare products Regulatory Agency (MHRA) and the National Institute for Health and Care Excellence (NICE), as well as professional and clinical bodies, balance the need to evaluate new personalised and AI-driven treatments with making innovative treatments available to patients? To what extent is the regulatory framework around personalised medicine and AI appropriate and proportionate, and where could it be improved?

a) Does the MHRA, under new leadership, have sufficient regulatory capacity to assess the newest developments in personalised medicine and AI? What can we learn from regulatory regimes in other countries?

b) Is the MHRA's framework for software and AI as a medical device appropriate and keeping up-to-date with the latest developments?

The health economics of personalised medicine and AI – No response

7. One major barrier to personalised medicine is that it can be expensive and it may vary in effectiveness depending on individuals. This means it may not fit within NICE cost-effectiveness models and the NHS's desire to standardise the care people receive. Are current appraisal frameworks and commissioning models for the NHS appropriate for personalised medicine? What are the health economics implications of personalised medicine?

a) What prospects are there for reducing the costs of personalised medicines as they are deployed more widely across the NHS? How effectively can we forecast how the cost of treatments might evolve? Is there fragmentation in the way that personalised treatments can be commissioned and funded in the NHS which create barriers to adoption?

The Government's strategic approach to innovation in the NHS

8. What should the Government do, at a strategic level, to strengthen the feedback loop between medical research, the life sciences industry, and the NHS, so that innovations developed domestically can be adopted at scale in the NHS, and clinical insights from the NHS can feed back into R&D and the life sciences sector? What would be the most important interventions you would prioritise to improve this process? What does the NHS most urgently need to do to position itself to benefit from innovations in personalised medicine and AI?

- When the National Cancer team had the Cancer Innovation programme, it was effective at horizon scanning and evaluated innovation across England, and determined which innovations were most ready for deployment at scale, Colon Capsule Endoscopy and Capsule Sponge. The national cancer team worked at scale across all cancer alliances, with a clear mandate that these innovations would be evaluated at national scale, with ringfenced funding and clinical input to deliver. Where it failed was at the end of the evaluation, and even though a business case was developed for Capsule Sponge, the take up of both innovations was extremely limited. Had the national team worked alongside NICE on an Early Value Assessment route, and had NICE reviewed the evidence generated from these large scale evaluations and found them favourable for adoption into the guidance, a lot of hospitals across the country would have been ready for a seamless implementation.

- The NHS and government needs to work closer with the regulating bodies, so that transformation can be delivered. Without a clear mandate, hospitals revert to status quo.

a) Does the Government have the right structures in place to govern and oversee innovation in the NHS? Is it clear who has ownership of pushing research, innovation, and new technologies within the NHS? How effective are the links between projects like Genomics England, NIHR/MRC research, the Cell and Gene Therapy catapult, and NHS patient care? Are the Government's target-driven strategies, like the National Cancer Plan, effective at driving innovation?

- The government and the various bodies mentioned above are not currently effective to drive innovation in the UK. Research continues to still be too siloed. Competitive research funding creates silos. Lack of funding specifically for the delivery of implementation does not support take up of innovation.
- The national cancer plan is very ambitious with driving research and innovation, but not necessarily the implementation of innovation into NHS business as usual for all. Some areas will be great at this (ie Manchester), but there will be many areas where there are too many challenges. The national cancer plan doesn't describe who leads on the implementation of innovation.

b) To what extent is fragmentation across trusts, integrated care boards, and national bodies, contributing to uneven or slow adoption of innovation? Are there any reforms that could realistically address this?

- a huge amount. When every local region or Trust is given autonomy to decide on their plans and processes, it creates large amounts of variation, and it requires duplication in the system to introduce change.
- The national innovation programme given the right mandate and funding could reform this by setting out requirements for each system, harmonising enablers (procurement, legal, information governance – a 'set up once' for the system approach) and working jointly with regulatory bodies (NICE, MHRA etc), and commissioning bodies to ensure that commissioning in place before the end of the implementation period.