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# House of Lords Select Committee on the Long-Term Sustainability of the NHS: response from the PHG Foundation

Used properly, biomedical and digital science and technologies have the potential to improve healthcare and underpin more efficient and cost-effective health systems. We welcome the opportunity for wider engagement with the issue of NHS sustainability through this call for evidence, and are delighted that the committee has already highlighted the need for longer-term thinking by government about the future of our health system.

Our response is focused on addressing questions 1, 6 and 8 - those that have an explicitly technological dimension, or where we feel that science and technology might be important in solving the problems highlighted.

Rather than considering how technology can be used to sustain the current model of healthcare delivery (e.g. by reducing demand and increasing efficiency), we believe that what is urgently needed is expert analyses and public debate that embrace the rapid evolution of both technology and the society in which it is embedded.

We suggest that technological and societal changes should be harnessed to drive a more radical transformation in health care enabled by the new emphasis on personalisation. Underlying this transformation is the principle that individuals would take more responsibility for staying healthy and minimising morbidity through periods of acute and chronic illness by their own personal and self-directed preventive healthcare programmes.

Our detailed responses to individual questions follow below.

### **The future healthcare system**

*Question 1: Taking into account medical innovation, demographic changes, and changes in the frequency of long-term conditions, how must the health and care systems change to cope by 2030?*

A number of current initiatives, including the NHS Test Bed programme and the 100,000 Genomes Project, seek to harness new biomedical and digital technologies to enable more precise and personalised approaches to healthcare. What is lacking from current health and care policy is, in our view, a coherent, long-term vision of how such initiatives can be connected to one another, and used as the framework around which a truly 'person-centred' health system that effectively prevents and promptly recognises and treats ill health can be re-shaped

The challenge to the NHS is to imagine and plan for a future, 15-20 years or more from now, in which new and emerging technologies such as mobile health apps, implantable biosensors, genome sequencing and the sophisticated use of data are a central part of a transformed health system, having replaced rather than supplemented existing approaches to healthcare and disease prevention.

Furthermore, if the health system is to deliver the radical improvement in disease prevention that will be needed to reduce demand on healthcare services, then it must start now to create and evaluate ways of productively combining these technologies, enabling more continuous and accurate monitoring of health, more precise targeting of preventive and early and accurate diagnosis with treatment aimed at minimising or reversing impact of disease and reduction of the need for further healthcare interventions.

This may require a degree of creativity and of the allocation of suitable time, space and 'permission' to pilot approaches at a level of risk not currently possible within the highly regulated and constrained NHS that exists today.

### **Prevention and public engagement**

*Question 6: What are the practical changes required to enable the NHS to shift to a more preventative rather than acute treatment service?*

NHS healthcare and public health (PHE) services have an important role to play in prevention as well as acute care. Currently this is largely mediated through major public health programmes aimed at structural measures in society (e.g. smoking bans, food pricing policy, public transport and leisure facilities) and at the population as a whole through major health promotion and screening programmes (e.g. Healthcheck) and programmes of secondary prevention (e.g. intensive smoking or dietary intervention and rehabilitation following heart attack).

We believe that the NHS must also recognise and develop a personalised dimension to disease prevention. This should include the personalised assessment of risk both for common and rare disorders and will often include genetic determinants alongside other biomarkers and more conventional personal and lifestyle risk factors. In particular there will be many subsets of common disease (familial hypercholesterolaemia and coronary heart disease provides a current example) where finding a genetic variant will lead to highly effective preventive action. Health systems of tomorrow must find ways of obtaining and using this information. This will require, among other things, much more priority being given to genetic testing with systematic family cascade testing to identify affected relatives.

The health systems should also reconsider their approach to screening as a means of disease prevention and early detection. It is likely that some relaxation will be required of the current national approach which aims for full-scale national programmes with a one-size fits all attitude to individuals and decided against strict screening criteria. In the future, people will wish to access many different screening tests from diverse sources according to their own judgement of disease risk, seriousness and personal preference and health systems will need to adapt to make best use of this behaviour.

Most people will require support to access and make the best use of new technology-enabled interventions. In order to get the maximum health system and public health benefit from these opportunities we believe that the health system needs to consider at an early stage what support will be required and who should provide it (not necessarily a health professional) as well the nature of the interface with the health system. For example, if an individual accesses screening tests whose results may be indicative of increased risk or early disease, will the health system necessarily pick up the cost of subsequent investigation and treatment?

*(g) How could technology play a greater role in enhancing prevention and public health?*

One of the key components of a more effective public health service, from a technological perspective, would be the ability to deliver sensitive and specific surveillance of the health states of individuals and the environments in which they are situated. In theory at least, such information could be used to more accurately determine pre-symptomatic risk of disease, allowing risk stratification matched to targeted and tailored preventive interventions, and also for earlier diagnosis of disease, allowing more effective 'secondary' prevention through earlier access to healthcare-based interventions to alter the disease process and outcomes.

Advances in both biomedical and digital technologies mean that this 'personalised prevention' approach is within our grasp. Wearable and implantable sensors - measuring behaviour, physiology and even biochemistry - are being developed for a wide range of health applications. They enable real-time surveillance of our state of health, which in combination with other sources of environmental, social and health data could be combined to direct us to more appropriate and effective preventive interventions, without the need for expensive 'upfront' interactions with healthcare professionals.

An example of this approach as applied to secondary prevention is the 'artificial pancreas', a closed-loop system consisting of an implanted glucose sensor, a mobile device for monitoring the data it produces and an implanted insulin pump. Trials of such devices are ongoing in children with Type 1 diabetes, with the aim of improving the control of their diabetes. The impact of such approaches on the health and wellbeing of chronic disease patients could be considerable, and improving their health might, with suitable changes to the way the health system operates, reduce their healthcare service utilisation significantly.

Data from emerging biomedical and digital technologies will serve not only to prevent disease in those from whom it was collected, but should also have a significant impact on population health. This could be achieved through effective capture and integration of data from monitoring devices, health records, environmental and social information. The application of 'big data analytics' and in particular machine learning techniques, to such large and heterogeneous data could allow identification of subgroups in the population at higher risk of disease, to whom interventions such as enhanced screening should be targeted, or sub groups of the population for whom particular interventions should not be offered for reasons of safety or lack of effectiveness. Thus 'big data' and technologies that generate it could, at least in principle, drive a rationalisation in the allocation of healthcare resources and a consequent decrease in cost, or at least an increase in cost-effectiveness.

### Digitisation of services, Big Data and informatics

*Question 8: How can new technologies be used to ensure the sustainability of the NHS?*

As noted in our introductory remarks and response to question one, the extent to which any new biomedical or digital technologies are able to 'ensure the sustainability of the NHS' in 2030 will be a function of the extent to which they drive the radical transformation of the health system and our approach, as individuals, to managing our own health. It is theoretically possible to model and even predict the impacts of such technologies on demand and cost reduction, but we should not be constrained in our future developments by current NHS practice. Instead, we must first imagine the ways in which cultural and social shifts in our expectations of healthcare and attitudes towards health, our rapidly changing relationship with technology and the knowledge to which it gives us access, will re-shape how we expect to stay healthy in 15-20 years' time. For major system change, need to develop future scenarios including possible changes in these factors in order to develop a different model of care which could fulfil future sustainability requirements.

*(a) What is the role of technology such as telecare and telehealth, wearable technologies and genetic and genome medicine in reducing costs and managing demand?*

The role of these technologies is first and foremost to improve the quality and effectiveness of healthcare. In the shorter term, they are being implemented predominantly in areas of currently unmet need, and so are not as yet supplanting existing services to any great extent. As such they will probably increase overall costs to the NHS in the short term.

In the longer term, as the intrinsic costs of these technologies declines further, they have the potential to reduce costs where they supplant existing less effective or more costly approaches to healthcare. However, the reduced cost and increased effectiveness of the technologies themselves is unlikely to be rate-limiting in the process of achieving sustainable services overall. The ability of new technologies to deliver reductions in demand and cost-savings will often depend on changes across the pathways of care in which they are embedded, shifts in the location of 'activity' e.g. from hospital to community or GP to patient, and their adoption at a scale and with a degree of integration across organisations that are currently hard to imagine the NHS in its current form achieving.

*(b) What is the role of 'big data' in reducing costs and managing demand?*

Data (big or small) are useless unless converted into knowledge and information that are acted upon. The health service is already awash with 'big data', but its inability to standardise it, aggregate it, share it, analyse

it and then use it intelligently to drive changes in practice means that its impact on reducing cost and managing demand are limited. The example of the National Cancer Registry might be useful to consider as an example where big data, if collected systematically and subject to standardisation and in depth analysis can be used to drive improvements in care. Whether or not use of this data reduces cost and demand overall is less clear, as analysis of such health data may be equally or more likely to reveal gaps in care requiring more investment to close, or highlight opportunities to introduce innovative new interventions for unmet needs e.g. targeted cancer therapies that are associated with high costs.

*(c) What are the barriers to industrial roll out of new technologies and the use of 'Big Data'?*

Industrial scale roll-out of a new technology implies a centrally controlled and co-ordinated approach to planning, implementation and change management. There are legitimate questions to be asked about the extent to which such 'top down' approaches are necessary or desirable for all technologies, but this aside, the barriers include:

- » Fragmentation of the health system – the financial and organisational independence of hospital trusts (reinforced by the Health and Social Care Act 2012) results in misaligned incentives to compete, not co-operate and to a drive to develop 'distinctive' services rather than learn from and adopt best practice developed elsewhere (the 'not invented here' problem).
- » Essential sharing of knowledge, data and experience (in particular mistakes and failures) are not encouraged so each independent laboratory/hospital/clinical service is doomed to 'reinvent the wheel', wasting time and money and leading to incoherent and inconsistent implementation of technologies that rely on consistency and scale to achieve patient benefit.
- » Further fragmentation between community, social care and hospital services adds to the challenge of applying consistent standards during technology implementations, and to the challenge of achieving the economies of scale and interoperability on which their success so often depends. There are some signs that the Vanguard programmes and NHS Test Beds could begin to remove some of these barriers, but it remains to be seen whether they do so in practice.

- » The slow and uneven pace of digitisation across different parts of the UK, and across different specialities/sectors within the health service inhibits the useful application of 'Big Data'. Gaps in the data will reduce the utility of analysis that depends upon it, and health inequalities are likely to emerge where areas that have digitised more rapidly are able to provide more effective services, not least through enhanced intelligence about 'what works' in their area.
- » Regulatory and technological barriers to sharing all forms of health data, including but not limited to genomic data, severely impede the utility of 'big data' driven analytics. The lack of centralised infrastructure to aggregate, store and share the multitudes of health data required to driven the development and delivery of personalised medicine is a huge barrier to progress.
- » Preference for local solutions – failures of previous 'top down' approaches to technology implementation (e.g. Connecting for Health) has led to the development of an organisational culture in which localism and bottom-up 'bespoke' approaches to technology implementation are favoured. This may be an appropriate way to meet local needs (e.g. to establish a hospital EHR that serves the needs of that particular facility), but fails to meet the needs of the system as a whole in delivering standardised, interoperable and accessible data that can be used to improve patient care nationwide. For specialist services such as those delivering genomic medicine, a closely managed centralised top-down approach such as that taken by NHSE in the designation of the Genomic Medicine Centres has proved successful in driving through changes in IT and laboratory practices to enable the more rapid adoption of whole genome sequencing across the NHS.
- » Risk aversion – the industrial scale implementation of new technologies will often require a 'leap of faith', as the benefits cannot be fully demonstrated prior to full scale implementation. For example, the expected benefits of genomic medicine will only be fully realised once genome data is available at scale and when genome sequencing costs and turnaround times are lowered significantly through industrial scale use. This evidence can only be produced after the enormous capital investment was made by Genomics England to establish the sequencing and IT infrastructure required to deliver the 100, 000 Genomes Project. This investment was a significant risk, without guaranteed returns. However, there is little financial or political scope for the NHS to take similar risks (nationally or locally), given the need to prioritise short term sustenance of existing services.



*(d) How can healthcare providers be incentivised to take up new technologies?*

Suitable appraisal and evaluation of new technologies will remain important; whilst some risks must be accepted, there should also be sufficient flexibility to allow healthcare providers to decline to take up new technologies without evidence of benefits from use in other systems. With respect to suitable incentivisation measures:

- » With increasing recognition of the importance of patient-centred care, a requirement to demonstrate responsiveness to patient-led demand for technologies could be a useful element within incentivisation measures. Inevitably, there will remain a need to balance this form of demand against limited resources and other needs (including from less demanding, but no less deserving) patients and citizens.
- » In the same way, measures to encourage patients and citizens to use new technologies on offer (especially those such as wearables that may require active compliance) are worth consideration. In some chronic diseases, technologies offer better disease control, fewer side effects resulting from disease or treatment and better long term outcomes. For example, continuous blood glucose monitoring offers many patients (particularly those with unstable diabetes) closer control of their blood sugar resulting in fewer episodes of hyper- or hypoglycaemia and ultimately improved quality of life. Educating patients about the potential clinical utility of such devices via informed healthcare providers is essential.
- » Financial incentives for the adoption of new technologies (whether as pilots or permanent services) will remain powerful drivers for providers.
- » Clinical leaders are crucial in successful adoption of new technologies and approaches, and so clinical engagement should be incentivised. Measures should include the establishment of networks of 'clinical champions' (as pioneers of new technologies) with suitable professional and financial recognition of the value of these roles, including paid time away from clinical duties to develop and implement pilots, share professional learning, and participate in the development of national (and international) guidance for how these technologies can most successfully be used.



This last activity should extend to multidisciplinary and cross-sector collaborative work to ensure that the potential impact of new technologies in the NHS is understood and properly anticipated alongside pilot trials. This, the sort of work in which the PHG Foundation has particular expertise, must include consideration of not only clinical and logistical factors but also economics, law, ethics, and policy drivers, barriers and needs.

Of note, healthcare providers have a responsibility to ensure that the most vulnerable and disadvantaged (e.g. the elderly, those lacking capacity, children), especially those who cannot benefit from improved health through their own efforts, still have access to high quality, safe and timely health care. Health providers therefore need to ensure that these groups are not marginalised or excluded through being less able to benefit from new technologies.

*(e) Where is investment in technology and informatics most needed?*

The effectiveness with which technologies, informatics and data can help develop, inform and improve a future (learning) healthcare environment is contingent on not one, but several areas of need. From a very practical perspective the ability to harness 'big-data' analytics for health first requires data to be in a digital format. In this respect the drive towards a 'paperless' NHS is crucial. However the view of the National Advisory Group on Health Information Technology in England is that the £4.2 billion currently committed to digitising the NHS will not be sufficient to enable digital implementation and optimisation in all NHS trusts. Unless this challenge is addressed there could be longer term disparities in the levels of digital maturity across the country with consequences for health inequalities.

Besides investment in physical infrastructure it is equally vital to invest in approaches to address the barriers to the use of 'big data' and technology listed in 8(c) / paragraph 3.5. These include (but are not limited to):

- » Fostering a system that is receptive to cultural change
- » Undertaking public engagement and awareness (e.g. around the value and importance of health data sharing)
- » Ensuring the right skills-mix and capacity to analyse big data.

The success of digitisation, big data and technology in the NHS will rely on a whole-system approach.

The PHG Foundation is an independent non-profit health policy think tank. We work to achieve the prompt, effective and responsible application of biomedical and digital technologies within health systems

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