Workforce futures – the Topol Review and the impact of technology

Thought piece – February 2019

1 Background

The Topol Review was commissioned in December 2017 to explore how to prepare the healthcare workforce, through education and training, to deliver the digital future. In June 2018 Health Education England published an interim report '*Preparing the healthcare workforce to deliver the digital future*' that called for further evidence. Reflecting on this report the Whole Systems Partnership (WSP), who have a long track record in supporting health and social care with strategic change and workforce planning[1], recognised that gaining a better understanding of the dynamic between technology and the workforce was critical to ensuring high quality, affordable health and care services in the future.

In order to consider this challenge, we gathered a small group who could reflect on the challenges ahead. This group met on the 8th February 2019 at the University of Southampton. It consisted of senior academics and strategic workforce planning experts, including those with a range of professional and clinical backgrounds[2]. This short report reflects the material prepared for that discussion and the insights generated. On the 11th February 2019 the full Topol Review report was published by NHS England.

The backcloth against which this round table discussion took place includes the recognition that on current trajectories future health and care needs will outstrip resources. Whilst participants considered mainly changes in health, they acknowledged that changes in care delivery will also be essential. Technology is one factor that has the potential to deliver better and more personalised services, improved outcomes and greater efficiency in service delivery. However, navigating a transition to a technology-enabled service is complex with as many potential pitfalls as exciting opportunities.

Both the Topol Review and the NHS Long Term Plan (LTP) (January 2019) contribute to filling in gaps in our understanding of the direction of travel and provide some of the expectations for the introduction and impact of technology. However, the group agreed that there was a need to frame how we understand and therefore plan toward developing workforce capacity and capability using a population health approach. We believe that this will help navigate the journey, avoid an over-emphasis on any one individual technology or narrow population group, and allow for a more a systemic review of the impact that different technologies may have.

2 Scope – what technologies are covered?

The **Topol Review** covered the following areas of technology:

- ***Digital Health:*** defined as '*digital technologies and products that directly impact diagnosis, prevention, monitoring and treatment of a disease, condition or syndrome*' (HEE June 2018).

[1] www.thewholesystem.co.uk

[2] Prof Sally Brailsford, University of Southampton Business School; Jeremy Wyatt, Professor of Digital Healthcare & Clinical Advisor on new technologies for the Royal College of Physicians, University of Southampton; Dr Bernard M Groen, Strategic Planning Lead, North of England, Health Education England; Dr Deirdre Kelley-Patterson Centre for the Study of Policy and Practice in Health and Social Care University of West London; Peter Lacey, WSP Director; Trish Knight, WSP Associate and former Strategic Workforce Planner and Commissioner of Education and Training; John Deagle, WSP Associate; and Sylvia Wyatt, WSP Advisor.

- ***Artificial intelligence (AI):*** with a particular emphasis on machine learning, i.e. the ability of computers to learn directly from examples, data and experience and therefore to improve the diagnosis and prescription for a range of conditions.
- ***Robotics:*** including tele-operated surgery, exoskeletons, pharmacy/lab robots with the potential to significantly reduce errors and make routine procedures more efficient.
- ***Genomics:*** with the potential to significantly increase the personalisation of medicine and to make early diagnosis, particularly of rare conditions.
- ***Biotech and regenerate medicine:*** although not covered by Topol, this area has potential impact in getting organisms to produce new drugs, using stem cells to regenerate damaged tissues or entire organs.

The **NHS Long Term Plan** has made significant commitments in the area of Digital Health, a phrase used as an umbrella term covering much, although not all, of the Topol areas. These include:

- ***Digital access:*** to services that will help both patients and their carers manage their health.
- ***Decision support and AI:*** helping professionals to apply best practice.
- ***Predictive analytics:*** helping to support local health systems to plan care for populations.

The differences between the scope of the two documents is partly due to the timescales, with Topol looking to the 2040's whilst the Long Term Plan (LTP) makes commitments through to 2025 and up to 2030. For example, the latter states that "*in ten years' time, we expect the existing model of care to look markedly different. The NHS will offer a "digital first' option for most, allowing for longer and richer face-to-face consultations with clinicians where patients want or need it…*" (Long Term Plan, section 5.8).

There are three key principles underpinning the Topol Review, which are:

1. Patients need to be included as partners and informed about health technologies, with a particular focus on vulnerable/marginalised groups to ensure equitable access.
2. The healthcare workforce needs expertise and guidance to evaluate new technologies, using processes grounded in real-world evidence.
3. The gift of time: wherever possible the adoption of new technologies should enable staff to gain more time to care, promoting deeper interaction with patients.

This theme of releasing time for clinical-patient consultation illustrates a welcome focus on the importance of relationships,

3 Framing the challenge

In approaching the challenge set out by Topol and the LTP, i.e. to prepare the health and care workforce for a digital future, we took an approach that was rooted in population health needs and that recognised the different types of impact that could be envisaged including:

A. Technologies that impact on the incidence of conditions, including reductions in the risk factors associated with the onset of different conditions.

B. Technologies that change the nature of the care provided, including improvements in the effectiveness and efficiency of care delivery.

C. Technologies that impact on where care is provided, including the provision of remote care and care provided at home.

Figure 1 represents these as three dimensions of a care function cube, a method of framing the strategic workforce challenge developed by WSP and applied in a wide range of strategic transformation challenges and at different levels of geography. Each part of the cube represented in Figure 1 (using illustrative and a non-exhaustive breakdown for each dimension) requires a workforce of enough capacity and capability to ensure the best outcomes, both of which will be influenced by the introduction of new technologies.

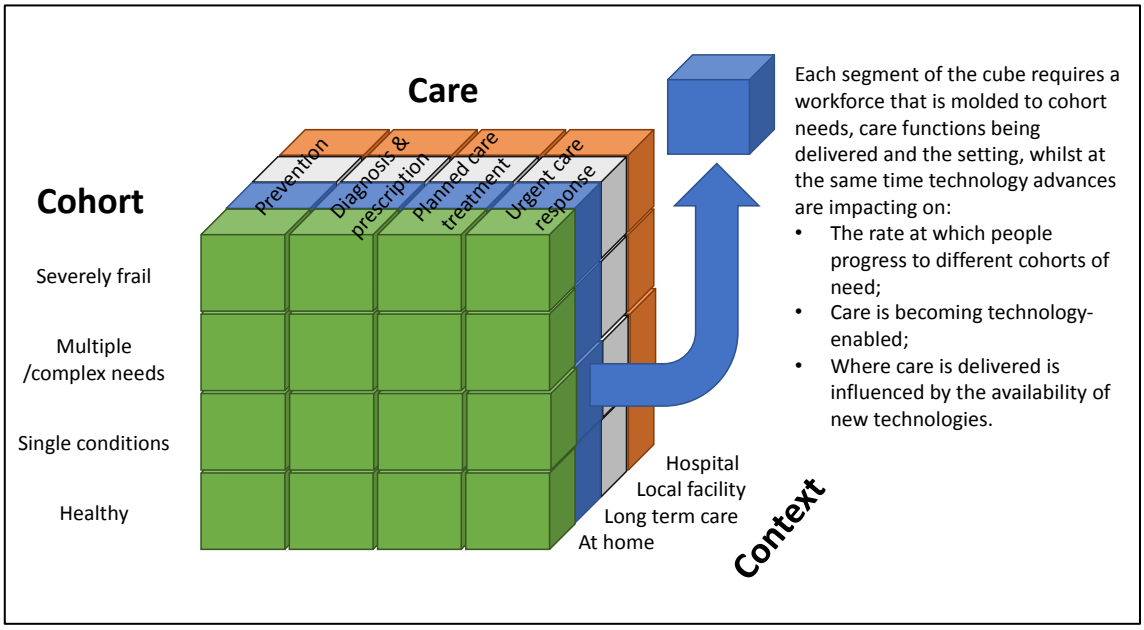


Figure 1 The care function cube used to frame the contribution of technology to strategic workforce planning

In considering each broad area of technology, or when considering each specific advance, it is therefore appropriate to ask the following questions:

1. Cohorts of need (Technology Grouping A):
    a. On which population cohort(s) will the technology advance have an impact, how wide or narrow is the cohort?
    b. Will the technology impact be to prevent the incidence of a condition or to slow down the progression of need?
    c. What is the adoption profile of the new technology advance, including any early adoption examples already in place from which evidence of impact can be gauged?
2. The care impact (Technology Grouping B):
    a. Does the new technology create a new care function, and if so, does it replace an existing one?
    b. Does the new technology transform an existing care function either through delivering greater efficiency and/or improved outcomes?
    c. Does the new technology need a new skill?
3. Context (Technology Grouping C):
    a. Does the technology change the locus of care, for example to a primary care setting or to someone's home?

The full impact on the workforce can only emerge when each of these elements is better understood.

On the basis of such intelligence, questions that will help frame the decisions that need to be made include:

1. Will the care function being delivered, aided by the new technology, require a different skill mix and/or specific new roles, for example the data scientist/analyst/bioinformatician?
2. Given the timescales over which the change is anticipated will the focus of workforce development be on changes in basic training and/or in retraining existing staff?
3. Will there be any redundant roles, and if so, how will this element of transformation be handled?
4. How will 'the machine as part of the team' (Topol interim report p14) be understood and facilitated?
5. What is the readiness of the existing workforce to adopt the new technologies?

4 Exemplars

4.1 Introduction

In the context of the round table discussion it was necessary to provide both a focus and an accelerated/demonstrator approach to test the above framework. Table 1 was prepared by Professor Wyatt and presented to the group.

AI application	Type or location of care	Potential implications
Image interpretation	Mammography, digital pathology, pigmented lesions	More accurate, earlier detection: fewer radiologists?
Natural language understanding	Translate path / radiology reports to coded data; speech interfaces; chat bots for triage	More data to mine Systems become accessible to all (no cyberdivide)
Knowledge based decision support	Guideline recommendations at point of care; support for less skilled people	Upskilling of staff eg. triage nurses ("substitution") More self diagnosis and self care
Machine learning from coded data	Predictive analytics to target drugs, tests, preventive care & other interventions to high risk care groups	Greater efficiency, lower side effects

Digital Health area	Type or location of care	Potential implications
Remote monitoring eg. telehealth	Enables more people to be discharged earlier, prevents exacerbations of long term conditions	Less demand on acute services ?
Online consultations	Any time, any where; hard to reach care groups	More consultations Unmet need exposed?
Apps & wearables	Support for healthy lifestyle Tailored self management support with incentives	Less demand on acute services Rich seam for data mining
Electronic records	Sharing of patient data across teams, clinical settings & with patient	Less duplication - no more near misses ?
ePrescribing systems	No more typos, wrong doses, drug interactions in primary / secondary care	Fewer never events, less litigation
Online ordering of lab / imaging tests	Primary / secondary care	Less duplication & missed results
Learning health systems	Provides infrastructure for rapid learning cycles, getting research into practice, detecting errors	More rapid acceptance of partly tested innovations; better oversight of staff

Table 1 The potential implications of some key applications for AI and Digital Health

The group was presented with a view of how digital and AI could impact on staff and healthcare arising from these examples, as shown in Figure 2. Taking the contents of Table 1 and the future vision captured in Figure 2 participants in the round table used the framing of the care function cube to explore two case studies, as outlined in the following sections, namely:

- Taking a disease progression approach for people with Type II diabetes;
- Taking a service pathway approach for people with urgent care needs.

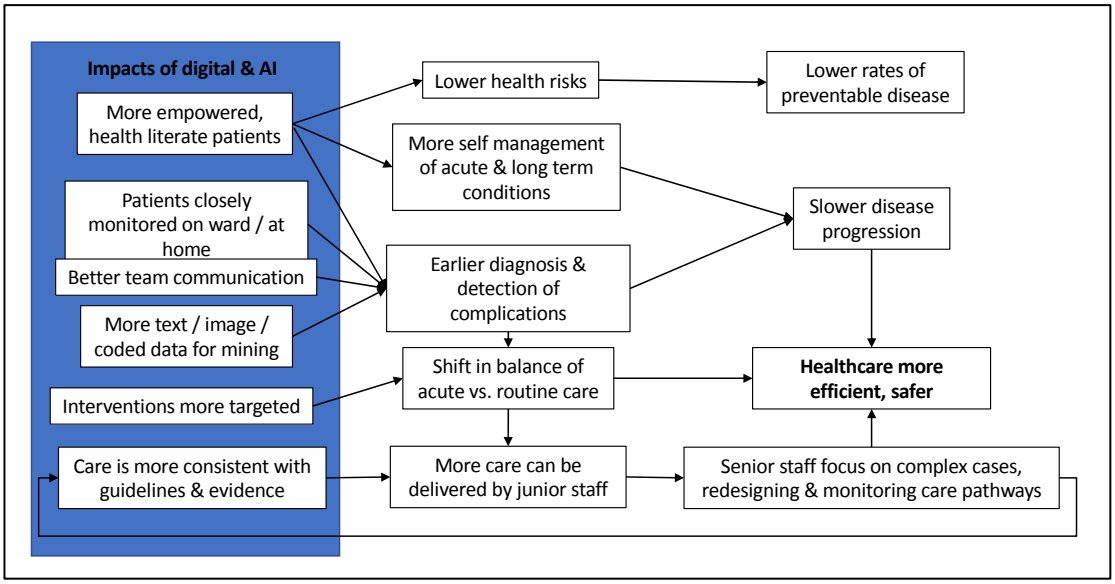


Figure 2 Optimistic view of how digital and AI could impact on staff and healthcare

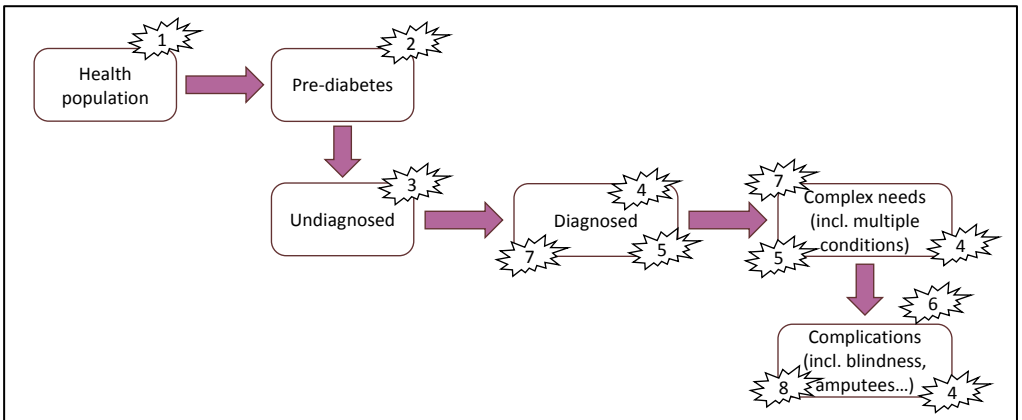
4.2 Diabetes

There are 4 million people in the UK with Diabetes costing the NHS over £14bn pa, more than 10% of the NHS budget. The introduction of digital health and AI has the potential to:

- Reduce the number of cases of Type II diabetes through lifestyle interventions;
- Enable early diagnosis through machine learning on routine lab results and wearables data;
- Improve self-care with wearables, apps, serious games, social media…
- Enable earlier detection of complications with surveillance on app data, machine learning from retinal or infrared foot images…
- Reduce the drugs bill & side effects with smart insulin pumps, ePrescribing based on evidence-based guidelines & insights from a diabetes learning health system;

Together, these could further reduce side effect rates of blindness, kidney failure, heart attacks, chronic foot ulcers, below-knee amputations, which would result in less demand for diabetes specialist nurses, diabetologists, ophthalmologists, renal physicians, cardiologists, limb surgeons, surgical appliance makers.

The points of impact of the different technologies explored by the group is illustrated in Figure 3. This provides a potential launching point for considering the workforce questions outlined in the earlier framework, i.e. considering the levels of need and likely workforce capacity and capability across the pathway as a result of the technologies being introduced.

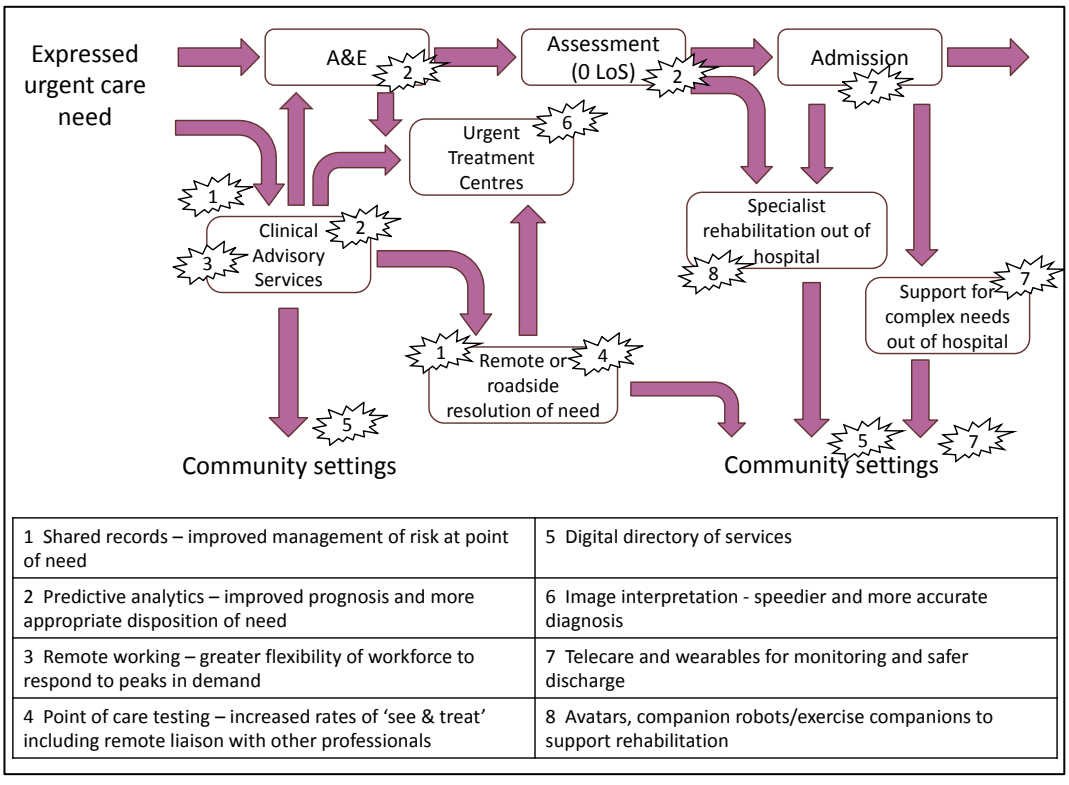


1 Genomics used to identify people with heightened risk of developing diabetes	5 Image interpretation improving the identification of risks of complications
2 Apps/wearables, social media and lifestyle interventions targeted at reducing the risk factors	6 Robotics for eye surgery
3 Machine learning on routine lab results, wearables data etc improving rates of early diagnosis	7 ePrescribing for accuracy and efficacy of medicines
4 Knowledge based decision support to shape care and advice to personal needs	8 Exoskeletons/improved prosthetics

Figure 3 A population health approach to understanding the impact of Digital and IA technologies for people with Type II Diabetes

4.3 The urgent care pathway

In one typical Integrated Care System (ICS) being supported by WSP there were c.250,000 A&E attendances costing the local NHS c.£16M and c.80,000 unscheduled admissions to hospital costing the local NHS c.£176M. Scaled up to a UK total, this also represents somewhere in the region of £14bn spend each year. The technology contributions to reducing what and where urgent care needs present, and in the pathways following an episode of care in a hospital, are both potentially significant.



1 Shared records – improved management of risk at point of need	5 Digital directory of services
2 Predictive analytics – improved prognosis and more appropriate disposition of need	6 Image interpretation - speedier and more accurate diagnosis
3 Remote working – greater flexibility of workforce to respond to peaks in demand	7 Telecare and wearables for monitoring and safer discharge
4 Point of care testing – increased rates of 'see & treat' including remote liaison with other professionals	8 Avatars, companion robots/exercise companions to support rehabilitation

Figure 4 Potential technology contributions to service transformation

Figure 4 illustrates the potential contributions that new technologies could make at different stages of the urgent care pathway. This provides a starting point for the potential application of the framework outlined above which would proceed from this to ask the questions about the impact on the capacity and capability within the workforce to deliver each care function indicated in the diagram to achieve the best health outcomes for people at the point of an expressed urgent care need.

5 Conclusions

5.1 Possible high-level scenario

What then is a possible future scenario arising from the full adoption of Digital health and AI in health and care systems? The following was presented as a speculative but not unreasonable ambition, that we could:

- Reduce disease incidence (by 20%?) and progression rates (by 30%?);
- Increase early diagnosis rates (by 30%?);
- Empower patients & lower skilled staff to take on (30%? of) care activities that previously required core or skilled staff;
- Reduce errors (by 30%?) and enable them to be detected earlier (by 20%?);
- Enable us to more accurately target individuals or groups for prevention, expensive drugs or procedures (by 30%?);
- Help staff to act more consistently with the evidence and hence improve outcomes (by 40%?);
- Overcome distance and time barriers, so could expose unmet need and increase demand (by 10%?);
- Release time for improved quality in care particularly in patient/care giver interactions (increase by 5%?);
- Enable us to learn better from every patient encounter, monitor progress daily and rapidly address problems or exploit new opportunities.

5.2 Insights and learning

The following insights emerged during the round-table discussion and subsequently in the development of this report.

From a population/patient outcomes perspective:

1. ***Investing in relationships:*** That the goal of re-investing time saved by the introduction of new technologies in the patient-clinician relationships may be in jeopardy if that benefits of quality relationships on patient outcomes isn't evidenced in the same robust ways that the contributions being made by technology will be evidenced.
2. ***Limitations and biases toward bio-medical models of health:*** That there are significant, but highly relevant, social and environmental factors involved in maintaining people's health and wellbeing that may never be fully accommodated within an enhanced digital world, for example the humanising potential of hands-on care.
3. ***Complex needs and frailty:*** As population health needs continue to shift toward the needs of people with complex needs or high levels of frailty, care needs to be taken to ensure that these cohorts are well represented in the evidencing of benefit from appropriate technologies.

4. ***Unmet need:*** It is reasonable to expect that unmet, and currently unmeetable need will both be identified through the introduction of new technologies and that whilst in each case the benefit might be demonstrable the combined effect, and the timing of the benefits may slow adoption.
5. ***Personalisation of healthcare:*** The widespread use of genomics will lead to an increased focus on personalisation of care. The tension between individual versus population benefits and therefore costs will need to be understood and the workforce will need the skills to adapt to this changing focus.

From a workforce training and development perspective:

6. ***Training for a system wide workforce:*** The potential for more technology driven care services to be delivered by the private sector needs to be considered in the resourcing of the training and development of staff. There needs to be fairness in the cost and benefits from the requirements of training and developing a 'technology enabled' workforce
7. ***The NHS v's home-world divide:*** Reasons why new technologies are widely and readily adopted by members of the NHS workforce in their 'home lives' whilst adoption in the NHS is often slower needs to be explored and understood from a behavioural perspective in full light of the systems and processes expected in the adoption and use of new technologies in the health sector.
8. ***Generation factors:*** Patients and professionals of different ages have different propensities for the adoption and acceptance of new technologies, notwithstanding many 'exceptions that prove the rule'. It is therefore likely that the potential impact, and the strategies to embed new technologies, will need to differ in the light of this consideration.
9. ***The nature of training and education:*** It is reasonable to assume that the development of a 'technology ready workforce' will challenge the nature of existing training programmes due to different types of training and workforce development both in length and content. Each new technology may require a different mix of technical skills, governance issues and changes in culture and other components
10. ***Disinvestment:*** In any transformation or discontinuity in the nature of health and care the question needs to be asked about what will not be required in the future. In the way we have framed the challenge this may be 'less of the same', for example through prevention benefits, or may be a radical replacement of a current role or capability. Dependant on the timescales for impact this could mean significant needs for retraining as well as changes to education programmes.
11. ***Filling released time***: Lessons need to be learnt from previous experience to ensure 'released time' is rechannelled to meet patient need not redirected to peripheral activities
12. ***The new workforce:*** Ensuring there is a workforce trained to support the development and maintenance of the new technologies.

From a system perspective:

13. ***The NHS/private sector challenge:*** The provision of much of the technology with the potential to improve the efficiency of care delivery could be delivered by non-NHS commercial providers, whilst some of the skills required to interpret and apply these technologies are described as being 'embedded' within the care delivery process. It will therefore be important to consider the balance between deriving benefits from the contribution of commercial partners whilst continuing to embed an overarching understanding in NHS staff.
14. ***Changes over time:*** The timescales over which a technology could have an impact varies hugely from an immediate benefit, for example through improved

efficiency, through to benefits that will not fully materialise even by the end of the period of the Topol review. Whilst these are incredibly difficult to predict to any degree of certainty and will be out of scope for current strategic workforce planning decisions, they are none-the-less worth recognising. An example of this extreme might, for example, be the benefits from genomic screening and resultant prevention strategies, where it could take well into the 2030s for such programmes to become widely accepted and embedded, and that the resultant benefits in terms of reduced demand on NHS services may not emerge for a number of decades after this.

5.3 Application and Next Steps

This work is very much seen as early steps in a topic which will be hugely significant for the shape and for the success of health and care over the next decades. The scope of the topic is huge, but next steps could include the following.

- The development of generic processes, starting with population driven demand for system level application.
- Development of illness specific approaches (e.g. for Asthma, where initial findings support significant benefits from technology).
- Look at overall impact to allow top down, bottom up reconciliation and learning.
- Highlighting existing and future digital awareness training and opportunity.
- Looking at ways to utilise the technology enabled knowledge of individuals in their home lives into their roles in healthcare.
- Extend the thought processes and discussions with relevant constituencies.