Staffordshire County Council

Director of Public Health Annual Report 2019

Live Long and Prosper:

Digital Technologies for Health and Wellbeing

Director of Public Health Annual Report 2019

Live Long and Prosper:

Digital Technologies for Health and Wellbeing

Contents

Director of Public Health Annual Report 2019

Live Long and Prosper:

Digital Technologies for Health and Wellbeing

Introduction

1. Digital technologies are revolutionising our lives. This report examines the opportunities for using digital technologies in health and care, the evidence for benefits, and their potential application.
2. We are living longer than ever. However, our increased lifespan does not mean extra years in good health. For many people this means living longer in poor health, losing independence and requiring increasing levels of support from health and care services.
3. Health and care services are not well adapted to manage the increasing volume of people with multiple long-term conditions like diabetes or hypertension. These conditions cannot be cured but can be managed, often requiring support over many years. Managing these in the traditional way is generating huge increases in cost.
4. It is unlikely that the public sector can afford to keep on supporting people in the way that it has. The post-war welfare state has been changing over the decades, but slowly; and whilst funding has increased, it hasn't kept pace with demand. Services have tended to focus on responding when people are in crisis, rather than predicting and preventing problems from arising.
5. Digital technologies offer an opportunity to do things differently, enabling individuals to take more control of their health and wellbeing and reduce dependence on health and care services, as well as transforming the way that health and care services are organised and managed.
6. Other sectors offer a glimpse of the potential. Ten years ago, it would have been inconceivable to think that banks would start to disappear from our high street, but this is now the reality. Today people do most of their banking online; loan decisions are made instantly by computers; money moves seamlessly from one account to another and we can pay for goods with contactless digital technology on cards, phones and even our watches.
7. This report is not intended to be comprehensive. The aim is to stimulate ideas, promote the uptake of digital technologies and provide the evidence base to support their introduction and development in Staffordshire.

Director of Public Health Annual Report 2019

Live Long and Prosper:

Digital Technologies for Health and Wellbeing

Health and Wellbeing in Staffordshire

8. People living in Staffordshire have a life expectancy of 80 years for men and 83 years for women, and a healthy life expectancy of 63 years for men and 64 years for women, similar to England averages. People living in the most deprived areas will live on average seven to eight years less than those in the least deprived areas. They also will spend 12 years more in poor health.

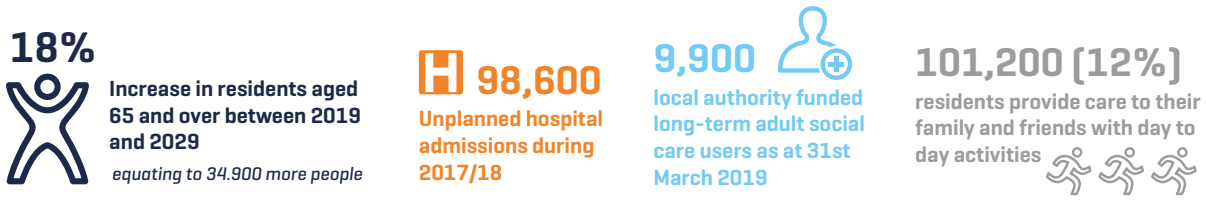
9. The major causes of ill health and deaths, cardiovascular diseases, cancers and respiratory diseases, can be attributed to the determinants of health: education, employment, housing and lifestyles. Around 40% of ill health is preventable with healthier lifestyles; obesity, smoking and diabetes the leading risk factors for ill health in 2017.[1]

10. The number of older people is growing faster than the number of working age people. Between 2019 and 2029 there will be an additional 11,200 people aged 85 and over in Staffordshire. By the time people reach 65 most will have developed at least one long-term condition such as diabetes or hypertension, and large numbers will have developed two or three long-term conditions.

11. This means that it is not uncommon for people to live for 15-20 years with multiple long-term conditions, many of which are preventable or could be delayed. The ageing population and the proportion of life spent in ill health is having a significant impact on demand for health and care services, increasing costs at a time when public sector finances are likely to remain constrained.

12. Digital technologies offer an opportunity to enable individuals to take more control of their health and wellbeing, maintain good health and prosperity for longer, help to manage long-term conditions, and reduce dependence on health and care services.

Figure 1: The demand on health and care services in Staffordshire



Source: 2016-based population projections, Office for National Statistics, Crown copyright, Hospital episode statistics (HES) via HES Data Interrogation System (HDIS), Copyright 2019, re-used with the permission of The Health & Social Care Information Centre. All rights reserved, Staffordshire County Council and 2011 Census, Office for National Statistics, Crown copyright

1. *Global Burden of Disease Study 2017. Global Burden of Disease Study 2017 (GBD 2017) Results. Seattle, United States: Institute for Health Metrics and Evaluation (IHME), 2017. Available from https://http://vizhub.healthdata.org/gbd-compare/*

Director of Public Health Annual Report 2019

Live Long and Prosper:

Digital Technologies for Health and Wellbeing

Current and Emerging Digital Technologies

13. The most pervasive digital technology has been, without doubt, the **smartphone**. Smartphones offer the ability to access and interact with an almost unlimited amount of information.

14. Smartphones have a powerful hold on us:

- People in the UK now check their smartphones, on average, every 12 minutes of the waking day.[2]
- One in 10 smartphone owners reach for their phone as soon as they wake up and one in three within five minutes of waking.[3]
- A third of UK adults have argued with their partner about using their mobile phone too much.
- A third of UK adults and half of 18 to 24 year-volds check their phones in the middle of the night.

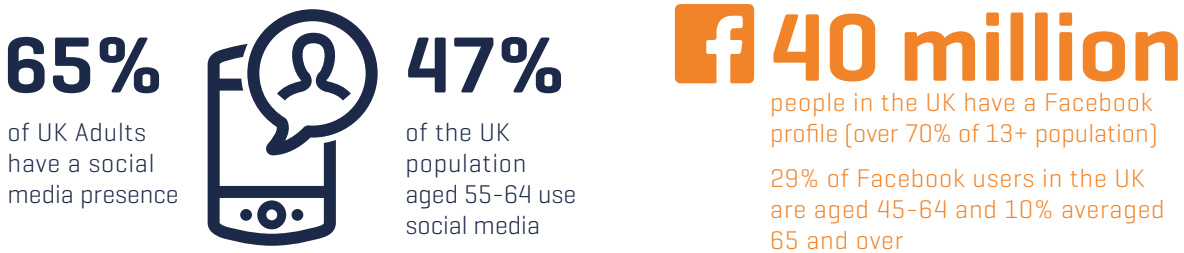
15. Almost 80% of people now own a smartphone with 91% of them using them daily. Only a few years ago the prospect of being able to run your life from a hand-held device would have been unthinkable to most people. Today from your phone you can do your banking, control most appliances in your home, book holidays, buy goods and have them delivered for free next day, plan walking, cycling and driving routes, video call another person anywhere on the planet, communicate with and influence millions of people through social media, and, take, edit and share professional quality photographs.

16. Smartphones can also enable individuals to monitor and manage their health. Leading brands have built-in sophisticated health management software. People access online artificial intelligence (AI) symptom checkers, have face-to-face Skype calls with a GP, access health and social support through applications, download behaviour change programmes, and access diet and physical activity applications.

17. One common use of smartphones is to access **social networks** – such as Facebook, Instagram, Snapchat and WhatsApp. Use of social networks is becoming almost ubiquitous (Figure 2).

18. Facebook offers an example of how these platforms can be used to promote health and wellbeing. Facebook is very widely used, and the fastest growing group of users are over 50.[4] This makes it a useful platform for advertising to groups of people with an elevated risk of health problems.

Figure 2: Social media in the UK



Source: https://www.avocadosocial.com/latest-social-media-statistics-and-demographics-for-the-uk-in-2019/

2. https://www.ofcom.org.uk/about-ofcom/latest/features-and-news/decade-of-digital-dependency
3. https://www.bbc.co.uk/news/business-37468560
4. https://www.statista.com/statistics/268136/top-15-countries-based-on-number-of-facebook-users/

19. In 2016 the proportion of eligible women taking up routine breast cancer screening invitations in North Staffordshire fell to its lowest rate in 10 years. To help drive up coverage, the local Breast Cancer Screening service set up a Facebook page to promote the service. They use the page to interact with users and provide breast cancer screening information such as eligibility, access to the service, and screening dates for GP practices, as well as to alleviate concerns or barriers to the service by having conversations with women prior to their breast screening appointment. It also enables women to contact the service at a convenient time to them to request breast screening information such as dates they were due to be screened. Breast screening rates for North Staffordshire increased from 71% in 2016/17 to 75% in 2017/18.[5]

20. Facebook also allowed the breast screening service to target specific geographical locations and age groups to ensure that relevant information is seen by women of breast screening age. This approach, implemented across seven GP practices, showed that it is possible to increase coverage rates by increasing uptake amongst women who were to be screened for the first time.[6]

21. When a person uses a smartphone, smartwatch, social media or shops online their data is collected, and they create a 'digital footprint'. By linking individual datasets together it is possible to create a '**Big Data**' set that includes large amounts of information about behaviour and lifestyles that influence our health: how active we are and places we visit, how many times in a week we visit a fast food outlet or go to the pub or the gym.

22. For some this raises questions about privacy and confidentiality. These concerns are being addressed through innovations such as **Blockchain**, which mean that information is decentralised and distributed across databases, making it more secure.

5. http://www.uhnm.nhs.uk/news/pages/North-Midlands-Breast-Screening-Service-going-from-strength-to-strength.aspx

6. https://www.twbstaffsandstoke.org.uk/publications/factsheets/35-digital-programme-factsheet-january-2019/file

23. Currently the public sector is not geared up to make use of 'Big Data'. There is a huge opportunity to use information about people's behaviour to predict their future health, and target advice and support to improve wellbeing. There is also potential to link data from different public sector organisations to provide a much richer picture of people's needs and how they use services. The decentralisation of data, from organisations to the individual, would allow all of the information about them to be combined and create a comprehensive and holistic view about their lives.[7,8]

24. **Artificial intelligence (AI)** is another new digital technology that has widespread applications. AI is already all around us and most of us use it every day on our smartphones and computers. It is evolving rapidly: online GP services use AI doctors, which have been developed by experienced doctors and scientists using deep learning methods.[9] These systems are able to assess known symptoms and risk factors to provide an informed diagnosis using up-to-date medical information.

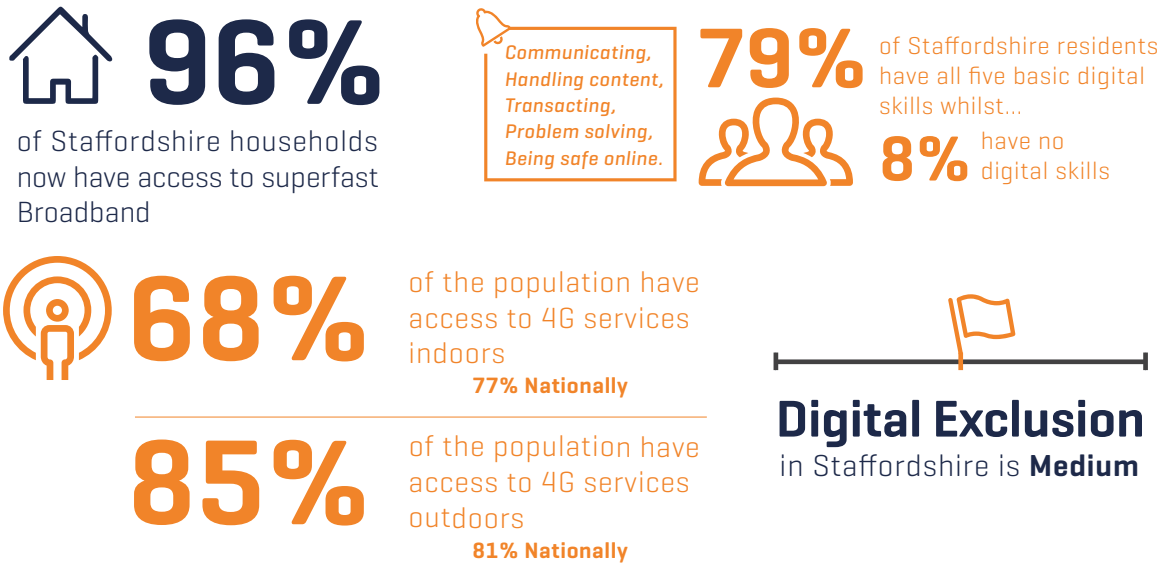
25. **Virtual reality** is already in use in healthcare and there are a number of types of applications: training doctors and nurses, pain management, physical therapy, the treatment of fears and phobias and supporting the cognitive rehabilitation of people with brain injury or stroke.[10]

26. Having **access to high speed internet** such as broadband and 4G is key for our residents and workforce to take advantage of emerging digital technologies. In addition to the physical infrastructure, residents need to have basic digital skills to enable them to take advantage of emerging digital technologies. People who are **digitally excluded** are unable to access online products or services or to use simple forms of digital technology (such as smartphones and tablets). This may be due to barriers to connectivity and lack of access to up-to-date technology, interest in use of digital or their level of digital literacy.

27. It is suggested that there are **five basic digital skills**, that people need to be digitally literate: managing information, communicating, transacting, problem solving and creating.[11] As well as residents, the workforce also needs the skills and confidence to promote the use of digital technologies where appropriate. The Department for Education have recognised this and have recently concluded a consultation on improving digital skills, through an entitlement to fully funded digital qualifications for those adults with no or low digital skills.[12]

7 https://getreferralmd.com/2019/01/healthcare-technology-trends-for-2019/
8 https://medicalfuturist.com/digital-health-trends-what-to-expect-in-2019
9 https://www.babylonhealth.com/
10 http://theconversation.com/five-ways-virtual-reality-is-improving-healthcare-79523
11. https://www.gov.uk/government/publications/essential-digital-skills-framework/essential-digital-skills-framework
12. https://www.gov.uk/government/consultations/improving-adult-basic-digital-skills

Figure 3: Digital access in Staffordshire



Source: http://www.superfaststaffordshire.co.uk/, OfCom (https://www.ofcom.org.uk/__data/assets/pdf_file/0019/122194/connected-nations-october-2018.pdf), https://www.ipsos.com/ipsos-mori/en-uk/basic-digital-skills-uk-report-2018 and Digital Heatmap 2017, The Tech Partnership.

28. The potential application of digital technologies in health and care has been recognised by the National Institute for Health and Care Excellence (NICE) who have worked with NHS England, Public Health England and MedCity to develop and publish a framework for evaluating digital technologies.[13]

29. The framework describes standards for the evidence that should be available, or developed, for digital technologies to demonstrate their value to the health and care system in the UK. This includes evidence of effectiveness relevant to the intended use of the technology and evidence of economic impact relative to the financial risk. The framework is intended to be used by technology developers to inform their development plans, and by decision makers who are considering whether to commission a digital technology.

30. The cost of many digital technologies varies. Many that offer information, advice and guidance can be free; others such as wearables come with a price. People who are better off tend to be the first to adopt and benefit most from digital technologies. There is also variation in take up of various digital technologies by the health and care system, including the workforce, across the country. This introduces a risk of health and care inequality that we need to understand.

13. Evidence Standards Framework for Digital Health Technologies (March 2019), © NICE 2019. All rights reserved https://www.nice.org.uk/Media/Default/About/what-we-do/our-programmes/evidence-standards-framework/digital-evidence-standards-framework.pdf

Conclusion:

As people live longer, but less healthy lives, there are increased demands on health and care services. There have been significant changes in access to and usage of digital technology over the last decade right across society. However digital exclusion still exists for some parts of the population, which could lead to inequalities. We need to ensure that the health and care workforce is digitally literate and able to take advantage of emerging digital technologies and solutions.

Recommendations:

R1. Superfast Staffordshire should continue to expand physical infrastructure such as access to broadband.

R2. Staffordshire County Council, alongside relevant adult education and skills partners should promote awareness of education and training opportunities to help residents develop basic digital skills.

R3. Staffordshire Health and Wellbeing Board should take a lead in increasing public awareness of health and care digital technologies to help them improve health and wellbeing or better self-manage their condition.

R4. Staffordshire NHS and Staffordshire County Council should provide continuous learning and tools for the health and care workforce to enable them to develop the skills and knowledge to 'digitally prescribe' where there is a good evidence base.

Director of Public Health Annual Report 2019

Live Long and Prosper:

Digital Technologies for Health and Wellbeing

Summary of Digital Technologies in Health and Care

Table 1: Summary of selected digital technologies in health and care

Technology	Brief description	Strength of evidence[14]	Population who can benefit[15]	Summary
Digital information, advice and guidance (IAG)	Digital IAG is increasingly available over the internet to improve knowledge and influence behaviours. The use of smartphones, tablets and personal decision aids, to obtain health and wellbeing related IAG has become very popular and covers a broad range of topics including promoting healthier lifestyles, managing long-term conditions, choosing health and care services and planning for older age.	Good	Large	Digital technologies can provide accessible and cost-effective information, advice and guidance that has the potential to offer benefits on a large scale. They may not be as effective as face-to-face interventions, however many applications are free or low cost to the user and therefore any changes that result - for example heathier lifestyles - could be achieved without significant investment being required. There are examples of NHS approved applications for managing long-term conditions which have benefits for both the individual and the NHS with no adverse outcomes observed at relatively low cost.
Consumer wearables	These are devices that can be worn by individuals and provide real time feedback about health and wellbeing. Fitness trackers are the most common application, providing feedback about the volume and intensity of physical activity.	Poor	Medium	Consumer wearables are useful for monitoring personal wellbeing including activity levels. People who are self-motivated to improve their health are likely to already own wearables; however, their effectiveness in those who are not motivated is not known. They can have a high cost and there is insufficient evidence of cost effectiveness to justify roll-out at population level. The accuracy of some wearables is not known, and this may cause increased demand from the 'worried well' seeking advice from health and care professionals.
Biometric monitoring and implantable drug delivery	Biometric monitoring measures and collects data about people's unique physical characteristics. It can be used to monitor and detect changes in the body that individuals may or may not be aware are happening and help identify early warning signs. Digital implantable drug delivery systems enable people to have medication released into their bloodstream continuously as their body requires.	Medium	Medium	There are established benefits in terms of convenience for some individuals with diabetes from biometric monitoring devices as well as implantable drug delivery systems - although the impact on disease progression is less clear. These systems require little invasive intervention and involve use of everyday technologies like smartphones at minimum inconvenience to patients whilst improving medication compliance. There are some promising developments for the use of innovative biometric technology for heart failure in the US. These systems are currently being trialled within the UK and as such the transferability of the cost benefits are unknown. The technology is evolving rapidly and offers a great deal of promise although there may be some risks including technology failure. Each one should be individually reviewed for its benefits and risks.
Linking electronic records	Electronic records allow data linkage which can improve care, enable early intervention and improve health and care policy.	Medium	Large	Linking electronic records has the potential to improve care, assist early intervention and support strategic planning of services. However, it has yet to demonstrate improved outcomes on a large scale and it is not yet clear whether the benefits are commensurate with the costs. There are several examples from the UK where linking electronic records has been achieved and these could be used to inform similar developments in Staffordshire.

14. Evidence has been grouped into three categories: good - there is high level evidence to support this area; medium - there is some good evidence, but more research and trials are needed to ensure that the evidence is robust; poor - there is little or no evidence to support this area

15. Population who can benefit has been grouped into three categories; small is less than 20% of the total population; medium is between 20% and 70% of the population and large is at least 70% of the population

Summary of Digital Technologies in Health and Care

Technology	Brief description	Strength of evidence[14]	Population who can benefit[15]	Summary
Telemedicine	Telemedicine is the provision of clinical care remotely using telecommunication and information technology, including text, audio and video consultation.	Medium	Large	Telemedicine is likely to play an increasing role in health and care services as people look for greater convenience, and to mitigate workforce shortages and reduce costs. Face-to-face consultation remains the gold standard and the benefits, risks and costs of telemedicine should be explored thoroughly before and during roll out - including whether telemedicine reduces or increases the demand for traditional services.
Telecare / Assistive Technology	Telecare is a combination of alarms, sensors and other equipment to help people live independently. Emerging digital assistive technologies such as Alexa or Google Home can be used to control aspects of the home and remind people to take medication or that a carer is due to visit.	Medium	Medium	Telecare and assistive technology have the potential to improve quality of life and maintain people's independence, allowing them to remain at home safely. They may prevent hospital admissions and the need for long-term care. More evidence is needed to ascertain their effectiveness and cost effectiveness before a clear case could be made for state funding at population scale, however they are unlikely to do harm.
Artificial intelligence	Artificial intelligence (AI) enables analysis of information and decision making by computer systems using visual perception, speech recognition and algorithms to make decisions, traditionally undertaken by humans.	Good	Large	Artificial intelligence is likely to play an increasing role in health and care services as people look for greater convenience, and to mitigate workforce shortages and reduce costs. A number of systems have already been introduced or are being piloted. It is vital that systems are accurate and that they safeguard data security and privacy.
Care robots	Care providers, academics and charities are showing increasing interest in using robots to support provision of care to both improve quality of care and reduce costs in the face of rising demand. Robots can provide three types of assistance: physical, social, and cognitive.	Poor	Small	There is potential for robots to contribute to the provision of care, alongside human carers. The technology is developing rapidly, although there remain some practical and ethical issues.

Director of Public Health Annual Report 2019

Live Long and Prosper:

Digital Technologies for Health and Wellbeing

Digital Information, Advice and Guidance

31. Digital information, advice and guidance (IAG) is increasingly available over the internet to improve knowledge and influence behaviours. The use of smartphones, tablets and personal decision aids, to obtain health and wellbeing related IAG has become very popular and covers a broad range of topics including promoting healthier lifestyles, managing long-term conditions, choosing health and care services and planning for older age.

32. Estimates suggest that around four million applications containing health and wellbeing related IAG are being downloaded every day.[16] With over 327,000 different applications to choose from, it can be difficult for individuals as well as health and care professionals to know which are most beneficial.

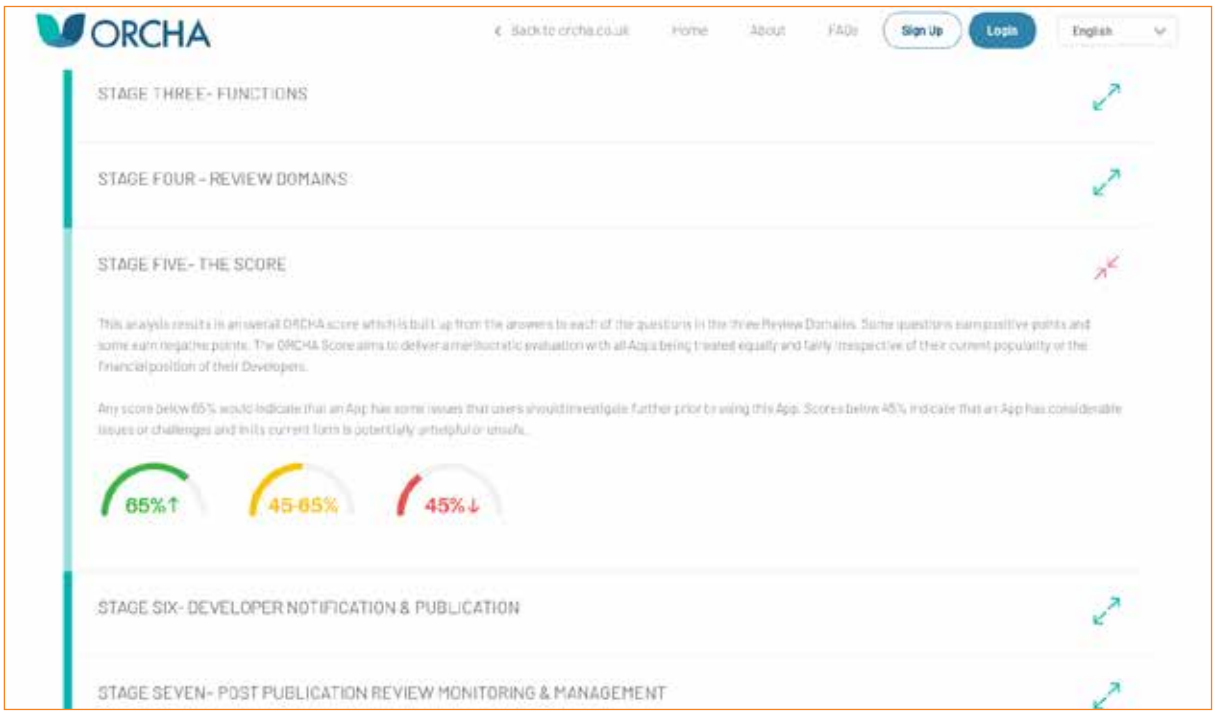
33. The Organisation for the Review of Care and Health Applications (ORCHA) is the world's leading health and wellbeing application evaluation and advisor organisation. They have highlighted some of the challenges of using health and wellbeing-related applications (Figure 4) and have found that large numbers of individuals with long-term conditions don't use an application to help them manage their condition.

34. ORCHA offers a website that shows the various health and wellbeing applications that are available, as well as grading them according to functionality, data and security, clinical assurance and user experience and suitability (Figure 5 and Figure 6). This means that people can see at a glance the best application for their needs. ORCHA conducts reviews for NHS England and NHS Digital and are accelerating the roll-out of their service across the NHS.

Figure 4: The challenges of using health applications

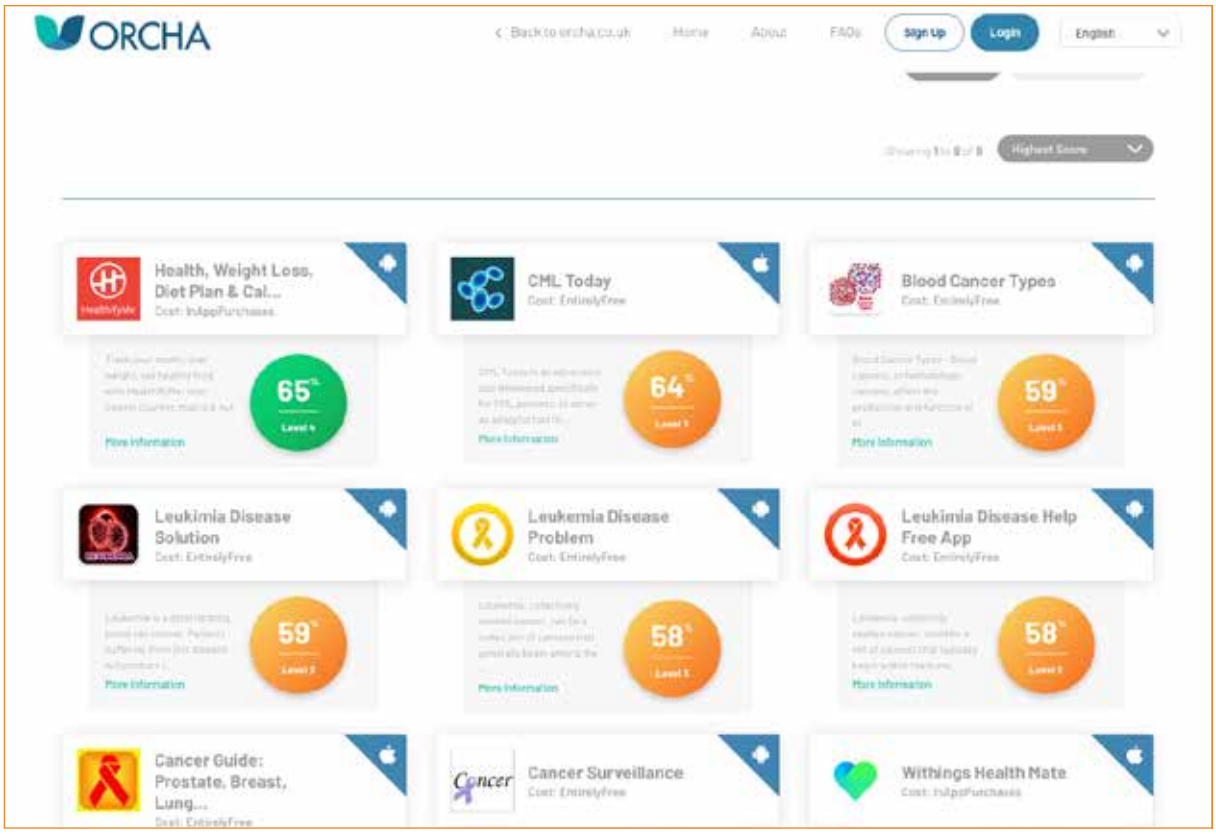
16. *https://www.orcha.co.uk/about-us/, accessed 15 March 2019*

Figure 5: ORCHA's grading system



Source: https://appfinder.orcha.co.uk

Figure 6: Applications from the ORCHA Library



Source: https://appfinder.orcha.co.uk

35. See ORCHA at: https://youtu.be/YWKU338zGQY OR https://youtu.be/8VcuUAmbWt4

5.1 Information, advice and guidance (IAG) to encourage healthier lifestyles

36. Various IAG applications are available to enable and support people to achieve healthier lifestyles including smoking cessation, weight management, alcohol consumption and physical activity. Traditionally behaviour change has required intervention from a healthcare professional, which creates issues with scalability and cost. Digital technologies offer an opportunity for intervention on a large scale at no or low cost and there is growing evidence of effectiveness.

37. Behaviour change requires both motivation (a person's desire to change) and capacity (their physical ability or skills required to reach that goal). NICE recommends that digital health technologies that aim to change behaviour should be consistent with accepted and effective behaviour change techniques. NICE is currently assessing the evidence around digital technology-based behaviour change applications for healthier lifestyles which will be published in August 2020.[17]

Example 5a: Digital technologies for weight management

38. A healthy weight is important for health and wellbeing and many people want to lose weight. Obese adults who lose 5% of their body weight improve their physical and mental wellbeing and reduce their risk of diabetes and cardiovascular disease.

39. In Staffordshire, around one in ten children aged four to five are obese, which doubles to one in five by the time they are aged 10 to 11. Estimates suggest that around two thirds of adults in Staffordshire are overweight or obese, with a quarter obese, both higher than the national average. Coupled with this are high numbers of residents who eat unhealthily and are inactive.

40. Lifestyle services with face-to-face counselling, either individually or group based, and accompanied by self-monitoring, are considered the most effective interventions to help people lose weight. However, face-to-face approaches are not appropriate for everyone. They may be difficult to access, time-consuming and expensive.

41. A variety of applications are available to help people lose weight (Figure 7). Many of these combine IAG with the ability for people to self-monitor progress towards their goals.

17. https://www.nice.org.uk/guidance/gid-ng10101/documents/final-scope

Figure 7: Applications to help people lose weight

https://www.nhs.uk - provides advice, tips and tools to help you make the best choices about your health and wellbeing.

www.weightwatchers.com - the global leader in weight loss, but recently changing its approach; Weightwatchers welcomes anyone who wants to build healthy habits-whether that means eating better, moving more, developing a positive mindset, focusing on weight, or all of the above. Weekly or monthly subscription with community meetings and weigh-ins or access to an online community.

www.dietdoctor.com - trustworthy scientific and practical knowledge about health, make diet doctor inspiring and simple to use. Diet doctor is accessible and free for everyone. Diet doctor focusses on making low carb simple for people who could benefit, and who want to try it.

www.noom.com - noom combines the power of digital technology with the empathy of real human coaches to deliver successful behaviour change.

www.calorieking.com - enables individuals to find nutrition facts for their favourite brands and fast-food restaurants in their trusted food database. Individuals can track what they eat with their free online calorie counter and learn how to lose weight and keep it off.

www.freedieting.com - free online diet plans and weight loss programmes

There are also many others of which some can be found at: https://www.similarweb.com/top-websites/category/beauty-and-fitness/weight-loss

42. There is a substantial amount of evidence about weight loss applications with the evidence predominately suggesting that face-to-face consultations remain more effective, particularly in terms of long-term weight loss.[18,19,20,21] However digital technologies are more effective than no intervention and have the advantage of being more easily accessible, scalable and lower cost (Figure 8).

18. Beleigoli AM, Andrade AQ, Cançado AG, Paulo MN, Diniz MDFH, Ribeiro AL; Web-Based Digital Health Interventions for Weight Loss and Lifestyle Habit Changes in Overweight and Obese Adults: Systematic Review and Meta-Analysis; J Med Internet Res 2019;21(1):e298; Accessed 1 May 2019: https://www.jmir.org/2019/1/e298/

19. Ryan K, Dockray S, Linehan C. A systematic review of tailored eHealth interventions for weight loss. Digit Health. 2019;5: 2055207619826685. Published 2019 Feb 5. doi:10.1177/2055207619826685; https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6366004/

20. Siopis G, Chey T, Allman-Farinelli M. A systematic review and meta-analysis of interventions for weight management using text messaging. Journal of Human Nutrition & Dietetics. 2015;28:1–15

21. Hurkmans, Emalie et al. "Face-to-Face Versus Mobile Versus Blended Weight Loss Program: Randomized Clinical Trial" JMIR mHealth and uHealth vol. 6,1 e14. 11 Jan. 2018

Figure 8: Comparison of digital versus face-to-face interventions for weight loss

	Digital interventions	Face-to-face interventions
Reach	Digital interventions can reach large populations relatively easily	Smaller proportion of population, e.g. 2-5% traditionally
Accessibility	Accessible to all digitally literate people 24 hours seven days a week as long as you have a smartphone and access to Internet	Need to be relatively close and available in terms of both time and geographical accessibility for sessions
Cost	Free or relatively cheap; Cost of smartphone and internet	Varies depending on provider, average of around £50-£90 for a 12-week programme.[22]
Drop-out rate	>= 20%	>= 20%
Outcomes (mean difference in weight) between digital and face to face intervention	Face-to-face interventions were likely to see significantly more weight loss (around 0.82 kg more) than digital interventions although no significant differences were noted for overall BMI changes etween the two groups. However, people using digital interventions are likely to lose 2.14kg more than no interventions. Digital interventions were less effective than face-to-face interventions for long-term weight loss.[23]	

43. At a population level, adult weight management programmes produce small average losses of weight and therefore little impact on population obesity. However, as morbidity and early death caused by weight and obesity are costly to the NHS, small reductions, or even maintenance of, population obesity and weight would be cost effective long-term. Weight management interventions are deemed to be cost-effective if they do not cost more than on average £100 per intervention.[24]

44. National research suggests that, on average, weight management programmes will support a reduction of 1 kg/m2 in BMI for each person. If two thirds of people in Staffordshire who have excess weight made use of digital support to lose weight, and we assume that 20% of people drop out, then we could see a 4% point reduction in the number of overweight people and a 1% point reduction in overall obesity rates. As a result, the number of people with excess weight in Staffordshire would be 60%.

45. There may be some benefit from combining traditional approaches with digital technologies. The Track programme combined face-to-face counselling with an application that enabled self-monitoring and provided feedback to reinforce behaviour change. A randomised controlled trial demonstrated that an additional 20% of people in the intervention group lost more than 5% of their body weight and maintained this at 12 months.[25]

22. https://www.nice.org.uk/guidance/ph53/resources/costing-report-pdf-69241357

23. Beleigoli AM, Andrade AQ, Cançado AG, Paulo MN, Diniz MDFH, Ribeiro AL; Web-Based Digital Health Interventions for Weight Loss and Lifestyle Habit Changes in Overweight and Obese Adults: Systematic Review and Meta-Analysis; J Med Internet Res 2019;21(1):e298; Accessed 1 May 2019: https://www.jmir.org/2019/1/e298/

24. https://www.nice.org.uk/guidance/ng7/evidence/report-1-cost-effectiveness-considerations-from-a-population-modelling-viewpoint-8735005

25. https://www.sciencedirect.com/science/article/pii/S0749379718321056?via%3Dihub

Case Study 1: Use of digital technologies for weight management

R is a 35 year-old working mum with three young children. She manages to balance a busy working life juggling home life, shifts, school runs and child care. R works varying shift patterns including nights and weekends. R makes sure that her family are eating healthily but turns to convenience food for herself for work.

R's shift pattern makes it difficult for her to stick to the three meals a day with healthy snacks in-between that many weight management groups advise. R doesn't attend any face-to-face programmes as she is unable to attend regular weigh-in meetings as her shift pattern varies and she doesn't want to pay for meetings that she can't attend when she is at work. R has tried the online version of weight management meetings but doesn't have the time to keep up with the fast-paced forums and quickly became lost in the site and felt unsupported.

R downloaded a weight loss app that calculated how many calories she needed to eat each day using her self-reported height and weight. R could also input the amount of physical activity she had done if she wanted to use this to eat more. R found this really convenient as she could input what she was eating as she was going along at work. R found this option suited her lifestyle and she told her friends and family about it. R soon had them on board too and they created their own community group on the app that supported each other. R found this method much more suited to her needs.

26. https://www.sciencedirect.com/science/article/pii/S0749379718321056?via%3Dihub

5.2 Information, advice and guidance for managing long-term conditions

46. Around one third of people have one or more long-term conditions, management of which accounts collectively for three-quarters of spend on health and care services.[26] A range of digital technologies are available to help people monitor and manage long-term conditions.

Example 5b: MyCOPD

47. Chronic obstructive pulmonary disease (COPD) is a long-term respiratory condition that affects 2% of Staffordshire residents, some 17,700 people.[27] There are around 2,000 unplanned hospital admissions and 450 deaths due to COPD annually among Staffordshire residents.

48. MyCOPD is a self-management application that helps people manage COPD more effectively through education, symptom tracking, inhaler technique coaching, and pulmonary rehabilitation (Figure 9). It also enables healthcare professionals to remotely monitor and manage people in real-time. MyCOPD has been used in the North of the county for around 12 months and the South from April 2019 onwards.

Figure 9: MyCOPD app

Source: https://mymhealth.com/mycopd

27. Department of Health, Long-term Conditions Compendium of Information: Third Edition, 2012

49. Evidence suggests that MyCOPD can improve symptom scores, correct 98% of inhaler errors without clinical involvement, double recovery rates from acute exacerbations, provide the same outcomes as class-based pulmonary rehabilitation, and reduce the time required for annual reviews by 50%.[28] An independent Department of Health economic analysis suggests that unplanned hospital admission rates in people who used the MyCOPD app fell by 25-35%.[29,30] Feedback from users is also typically positive (Figure 10).

Figure 10: Feedback from users of MyCOPD

"Last year, before using MyCOPD, I had 12 exacerbations, this year I have had two. I now know when and how to take my medication, when to use my rescue pack and I perform my rehab exercises most days. I know far more about my COPD than before. I rely on my doctor far less than before." (**Patient Feedback 1)**

"Since I started using MyCOPD, I have lost weight, my depression has lifted, and I see my GP just once a year (compared with twice-monthly visits previously). I have not needed hospital treatment for 18 months" **(Patient Feedback 2)**

Source: NHS Innovation Accelerator, Implementation Toolkit - myCOPD, 2017, http://www.swahsn.com/wp-content/uploads/2017/05/Implementation-Toolkit_myCOPD.pdf (accessed 25 March 2019) and https://atlas.ahsnnetwork.com/mycopd-2/ and https://nhsaccelerator.com/wp-content/uploads/2018/09/Case-studies.pdf (accessed 25 March 2019)

50. MyCOPD costs around £20 per individual to the NHS over a lifetime, or £40 if individuals choose to buy the app directly themselves. This compares to at least £400 for a six-week pulmonary rehabilitation course. Based on NHS modelling a Clinical Commissioning Group (CCG) with an average COPD population of 5,000 people would expect to make savings in the first year of over £200,000 if deployed to 60-80% of their COPD population. This equates to estimated savings of over £700,000 if applied to Staffordshire's COPD population and an estimated cost of £284,000 for an 80% uptake. Based on the modelling this could result in 415 and 580 fewer unplanned admissions.

51. NHS England will fund MyCOPD licenses for patients with a diagnosis of severe or very severe COPD up to a maximum of 20% of the total COPD patient population per CCG under the NHS Innovation and Technology Payment Programme. This means that around 3,550 Staffordshire residents could benefit from access to MyCOPD equating to a saving of £142K based on NHS modelling and no cost to Staffordshire's NHS.

52. See MyCOPD at: https://mymhealth.com/mycopd OR https://youtu.be/AmbMKpiaEe0

28. NHS Digital, Quality and Outcomes Framework; achievement, prevalence and exceptions data, 2017/18, Copyright © 2018 Health and Social Care Information Centre

29. NHS Innovation Accelerator, https://nhsaccelerator.com/mycopd (accessed 25 March 2019)

30. NHS Innovation Accelerator, Implementation Toolkit - myCOPD, 2017, , http://www.swahsn.com/wp-content/uploads/2017/05/Implementation-Toolkit_myCOPD.pdf (accessed 25 March 2019)

Example 5c: GDm-HealthTM for people with gestational diabetes

53. Diabetes in pregnancy increases risks to pregnant women and their babies, whilst good blood glucose control can improve pregnancy outcomes. In Staffordshire around 5% of pregnant women have pre-existing or gestational diabetes, equating to around 390 women every year.[31]

54. Women with pre-existing or gestational diabetes are expected to attend an outpatient clinic every two weeks during their third trimester and provide details of blood glucose measurements either in person or by email. GDm-Health™ is currently used by pregnant women with pre-existing or gestational diabetes in four Trusts across the country. The application allows pregnant women to self-monitor and track blood glucose readings. It also allows for these to be sent through a secure website to healthcare professionals who can follow up through an SMS message.[32]

55. The app has been proven to be safe with no adverse effects. Outcomes, including glycaemic control, are also the same as those receiving usual clinical care; however, the evidence suggests that women preferred using the app as a mode of care.[33] There are currently four NHS trusts using the system, at an approximate cost to the Oxford University Hospitals NHS Foundation Trust of £42,583 per year. Based on the costs of standard care, using GDm-Health™ could save approximately £230 per woman by reducing the need for appointments (Figure 11).[34]

Figure 11: Impact of GDm-Health™

Source: https://www.sensynehealth.com/gdm based on evaluation from over 1,000 patients at the Royal Berkshire NHS Foundation Trust

31. North M, Bourne S, Green B, et al. P238 A randomised controlled feasibility trial of an E-health platform supported care vs usual care after exacerbation of COPD. (RESCUE COPD). Thorax 2018;73:A23, https://thorax.bmj.com/content/73/Suppl_4/A231.1
32. https://www.nice.org.uk/guidance/ng3/chapter/Introduction
33. https://www.nice.org.uk/advice/mib131/chapter/Summary
34. Mackillop L, Hirst JE, Bartlett KJ, Birks JS, Clifton L, Farmer AJ, Gibson O, Kenworthy Y, Levy JC, Loerup L, Rivero-Arias O, Ming WK, Velardo C, Tarassenko L; Comparing the Efficacy of a Mobile Phone-Based Blood Glucose Management System With Standard Clinic Care in Women With Gestational Diabetes: Randomized Controlled Trial (accessed via https://mhealth.jmir.org/2018/3/e71)

56. If 90% of pregnant women in Staffordshire with pre-existing or gestational diabetes used the GDm-Health™ app, this would equate to around £81,000 savings based on around 700 fewer clinic visits.

57. See GDm-Health™ at: https://www.sensynehealth.com/gdm and https://www.youtube.com/watch?v=znt8XhU2_JE

5.3 Information, advice and guidance to help people choose and use health and care services

Example 5d: The NHS App

58. The NHS App provides a simple and secure way for people to access a range of NHS services on their smartphone or tablet. The application allows people to:

- Check their symptoms using the health A-Z on the NHS website.
- Find out what to do when they need help urgently using NHS 111 online.

59. The NHS App was released at the end of 2018 with the plan for all GP practices to be connected to the app by 1 July 2019, enabling residents to use all features. When their GP practice is connected people can:

- Book and manage appointments at their GP practice.
- Order their repeat prescriptions.
- Securely view their GP medical record.
- Register as an organ donor.
- Choose whether the NHS uses their data for research and planning.[35]

60. See the NHS App at: https://digital.nhs.uk/services/nhs-app OR https://www.youtube.com/watch?v=BRdMEAdNlXc

61. As at 15 May 2019, 111 of the 113 practices in Staffordshire were connected to the NHS App.

62. A pilot of the NHS App ran from September to December 2018 on users and practice staff. The pilot involved more than 3,000 users from 34 GP practices across England. Users generally liked the look and feel of the NHS App with ordering repeat prescriptions and viewing their own medical records as being the most useful services on the app. They also found that the medical information accessible via the app was good. Users disliked the use of two-factor authentication (biometric authentication has since been also added) and found the names of appointments they could book confusing. They also felt that appointments were sometimes restricted and not always what they wanted.[36]

35. https://www.nice.org.uk/advice/mib131/chapter/Costs-and-resource-use (accessed 25 March 2019)
36. https://digital.nhs.uk/services/nhs-app

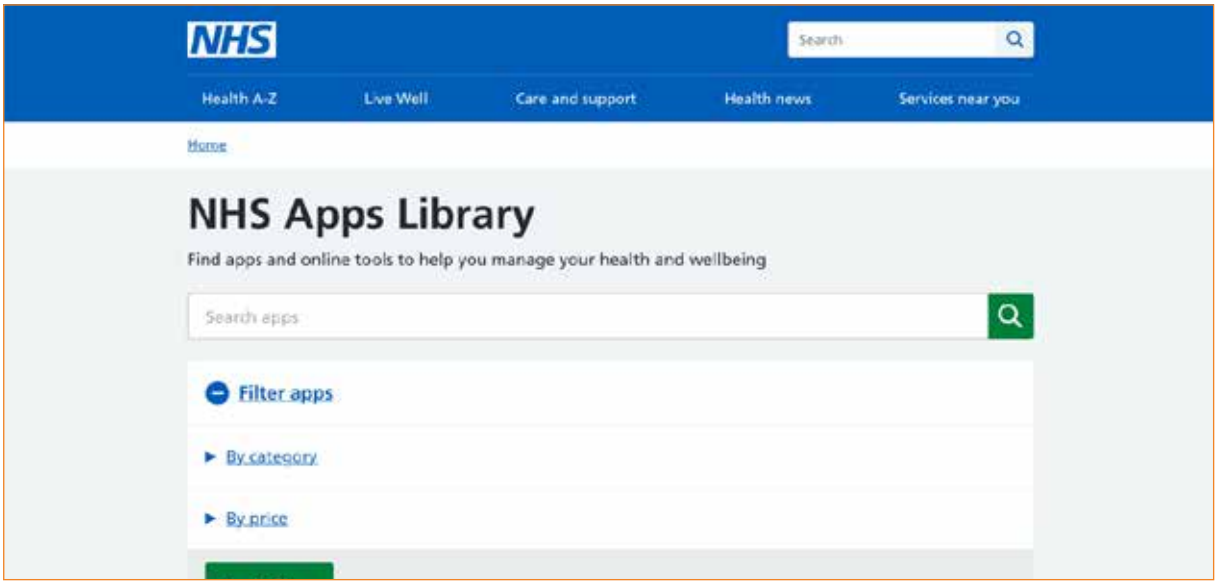
63. The pilot also identified that practice staff needed:

- knowledge of the support available for staff and patients
- awareness of the guidance around promoting the NHS App and the key functions
- guidance on best practice for naming appointments, awareness of how to change appointment names and modify appointment availability within their clinical systems
- a demonstration of the NHS App
- guidance on promoting the NHS App and other health apps that are available.

64. The cost effectiveness of the app was not assessed during the pilot phase.

65. People can also access a variety of information from the NHS website https://www.nhs.uk/ which allows people to find services such as GP practices, dentists and pharmacies as well as urgent care services. There is also a library of NHS approved applications that are available via the NHS applications library (Figure 12).

Figure 12: The NHS Applications Library



Source: https://www.nhs.uk/

Example 5e: ChatHealth

66. There are around 188,200 children and young people aged under 20 in Staffordshire who along with their families could benefit from ChatHealth. ChatHealth is a two-way web-based messaging platform that allows young people and parents to send text messages to their health visitor or school nurse safely and securely and provides an additional choice for receiving IAG.[37]

37. https://digital.nhs.uk/services/nhs-app/nhs-app-pilot-research-report

67. There is currently limited peer-reviewed evidence published by the developer, Leicestershire Partnership NHS Trust on outcomes to demonstrate clinical effectiveness although many services are now gathering their own data through monitoring and evaluation.[38]

Case Study 2: ChatHealth

A parent contacted ChatHealth regarding anxiety concerns about their nine year-old child. The child had not been attending school regularly and the parent reported that this was due to anxiety and distress, the majority of which centred around school. The parent liaised over two days through ChatHealth. They agreed to two referrals to support their child. The same professional went to the home to visit both parents and the child to complete the referrals. The majority of the referral documents were already completed from the information that had been shared through ChatHealth, which supported the parent to 'tell their story once'.

Whilst at the home the professional spent time explaining about anxiety and worry to both the parents and child at a level that the child could understand as well as providing strategies to help with attending school. The parents completed a satisfaction survey stating that she was very satisfied (scoring five out of five) and added further comment "***I have found this service very useful and the nurse was really friendly and helpful. She didn't rush anything and talked to my daughter appropriately - my daughter was very confident and open with her".***

The parent also texted ChatHealth the following day to share that her daughter had attended school the following day, and had stayed after lunch, something she had felt unable to do for a considerable time. Mum was 'so pleased' and thought that the service had been very useful and supportive.

Source: Staffordshire Families' Health and Wellbeing Service Activity Profile ChatHealth, October to December 2018

68. The costs of ChatHealth depends on the size of the team and training needs. For example, making ChatHealth available in a school nursing service involving up to 10 nurses would cost £6,000 per year. Ongoing licensing costs are £55.60 per staff user per month for up to four nurses.

69. Cost savings may arise from increased efficiency in the school nursing service and potential avoidance of health issues by improving access to the service. ChatHealth could also increase the reach of health visiting and school nursing services for children and young people.

70. Suffolk County Council, who offered ChatHealth to existing staff reported that using it for two years cost £57,300 which included implementation and licences for 50 nursing staff with three full training days. In comparison, a qualified school nurse would have cost £83,594 over the same period. To provide these additional interactions in such a large rural county using traditional services would have needed at least one extra nurse. However, these findings are not necessarily transferable to other areas.[39]

38. https://www.nice.org.uk/advice/mib130

39. https://journals.rcni.com/primary-health-care/evidence-and-practice/use-of-a-text-messaging-service-for-communication-with-parents-and-carers-phc.2019.e1472/full

71. The Families' Health and Wellbeing Service for 0-19s in Staffordshire started to use ChatHealth on 1 November 2018. The most common themes reported so far relate to: general health, medical issues, relationships, puberty and sexual health. A small number of young people have required signposting on to other services as a result of the text conversation.[40]

Example 5f: Staffordshire Connects

72. Staffordshire Connects is an online directory for all residents. It provides details on a range of wellbeing, support and care activities, clubs and community groups, and organisations across the county (Figure 13).[41] It provides IAG about topics such as:

- Health and wellbeing matters.
- Community activities.
- Equipment and technology.
- Care and support services.
- Children's services.
- Special educational needs and disabilities.

73. There are nearly 2,000 entries on Staffordshire Connects for health and care-related organisations and activities.

74. Some of the most significant issues that people ask about that don't require a formal care response are about being isolated, getting help at home with some daily tasks and issues around carers. Staffordshire Connects can help people identify the support they can access close to where they live.

Figure 13: Selected summary of Staffordshire Connects

	Places to go, things to do	Help at home	Carers
Cannock Chase	223	88	52
East Staffordshire	203	86	45
Lichfield	190	85	41
Newcastle-under-Lyme	191	89	46
South Staffordshire	211	84	51
Stafford	226	95	52
Staffordshire Moorlands	188	81	42
Tamworth	175	85	46
Staffordshire	**837**	**363**	**160**

Source: Staffordshire Connects

40. https://www.nice.org.uk/advice/mib130/chapter/costs-and-resource-use#case-study-suffolk-county-council
41. https://nhsaccelerator.com/health-visitors-go-digital-millennial-parents-support-chathealth/

75. During March 2019 there were almost 31,500 unique visitors to the site. Top search terms for adults included: 'volunteer', 'homecare', 'direct payments', 'lunch', 'meal', 'care homes', 'day centres', 'carer', 'care' and 'extra care'.

Figure 14: Staffordshire Connects

Source: https://www.staffordshireconnects.info/kb5/staffordshire/directory/home.page

5.4 Information, advice and guidance to help people to plan for older age

76. When planning for older age there are several things people could usefully consider:

- **How can I stay healthy for as long as possible?** Men in Staffordshire spend 16 years and women 19 years in poor health.
- **How can I ensure that I have financial security?** In Staffordshire 13% of older people live in poverty.
- **Have I got a plan for what I am going to do with my time?** In Staffordshire it is estimated that around 7% of people aged 50 and over feel lonely all the time and a further 24% feel lonely some of the time.[42]
- **What do I want in the event that I can no longer make decisions for myself? What are my wishes at the end of life?** People can make an advanced statement; whilst this is not legally binding it does outline your wishes at the end of life. An advance decision is legally binding and becomes relevant if there came a time when you were unable to make or communicate your own decisions.

77. It is good news that people are living longer, but we want people to live longer in good health. This means people taking greater responsibility for their health and wellbeing throughout their lifetimes, including into old age. Many of the digital technologies to promote healthier lifestyles discussed in Section 5.1 can be tailored for older people.

42. https://www.staffordshireconnects.info/kb5/staffordshire/directory/home.page

78. Whilst the NHS remains free at the point of access, this is not true of all public services or other essential utilities. Most people will have to pay either the whole cost or a contribution to the costs of any social care that they require. And everyone will need water, food, heating and lighting as they get older. It is important for people to plan their finances and not assume that these costs will be met by the state, either through free access to services or the state pension.[43]

79. A range of IAG is available to help people. Many have vested interests in influencing people to buy specific financial products, but a number are more impartial:

- Money saving expert: https://www.moneysavingexpert.com/savings/discount-pensions/
- Age UK: https://www.ageuk.org.uk/information-advice/money-legal/pensions/what-you-can-do-with-your-pension-pot/
- Saga: https://www.saga.co.uk/magazine/money/retirement)
- State pension: https://www.yourpension.gov.uk/
- Which: https://www.which.co.uk/money/pensions-and-retirement/state-pension/state-pension-age-calculator-asfz43c0xp8q

80. There are also government approved applications that offer pension planners and retirement calculators to show how much people need to save and how much they can expect to have to live on:

- https://www.yourpension.gov.uk/pension-calculator/
- https://www.gov.uk/plan-retirement-income
- https://www.moneyadviceservice.org.uk/en/tools/pension-calculator

81. There is IAG to support people to plan how they will spend their time following retirement:

- Age UK: https://www.ageuk.org.uk
- Retirement courses: http://www.retirement-courses.co.uk/
- Saga: https://www.saga.co.uk/magazine/relationships/family/adjusting-to-retirement

43. https://www.ageuk.org.uk/globalassets/age-uk/documents/reports-and-publications/reports-and-briefings/loneliness/loneliness-report_final_2409.pdf

82. And finally, there is IAG to support people at the 'end of life' which usually refers to the final year of a person's life. Support and IAG to help people to die with dignity, through good planning and good care is available from:

- Compassion in Dying - https://compassionindying.org.uk/choose-a-way-to-make-an-advance-decision-living-will/
- AgeUK - https://www.ageuk.org.uk/information-advice/money-legal/legal-issues/advance-decisions/ and https://www.ageuk.org.uk/information-advice/money-legal/legal-issues/power-of-attorney/
- NHS - https://www.nhs.uk/conditions/end-of-life-care/advance-decision-to-refuse-treatment/
- https://www.gov.uk/power-of-attorney

Conclusion:

Digital technologies can provide accessible and cost-effective information, advice and guidance that has the potential to offer benefits on a large scale. They may not be as effective as face-to-face interventions, however many applications are free or low cost to the user and therefore any changes that result - for example heathier lifestyles - could be achieved without significant investment being required. There are examples of NHS-approved applications for managing long-term conditions which have benefits for both the individual and the NHS with no adverse outcomes observed at relatively low cost.

Recommendations:

R5. Staffordshire County Council and Staffordshire NHS should promote digital IAG to support people to live healthier and longer lives. ORCHA should be used as a resource to help individuals and front-line staff to access a range of applications that have been graded for their suitability and effectiveness.

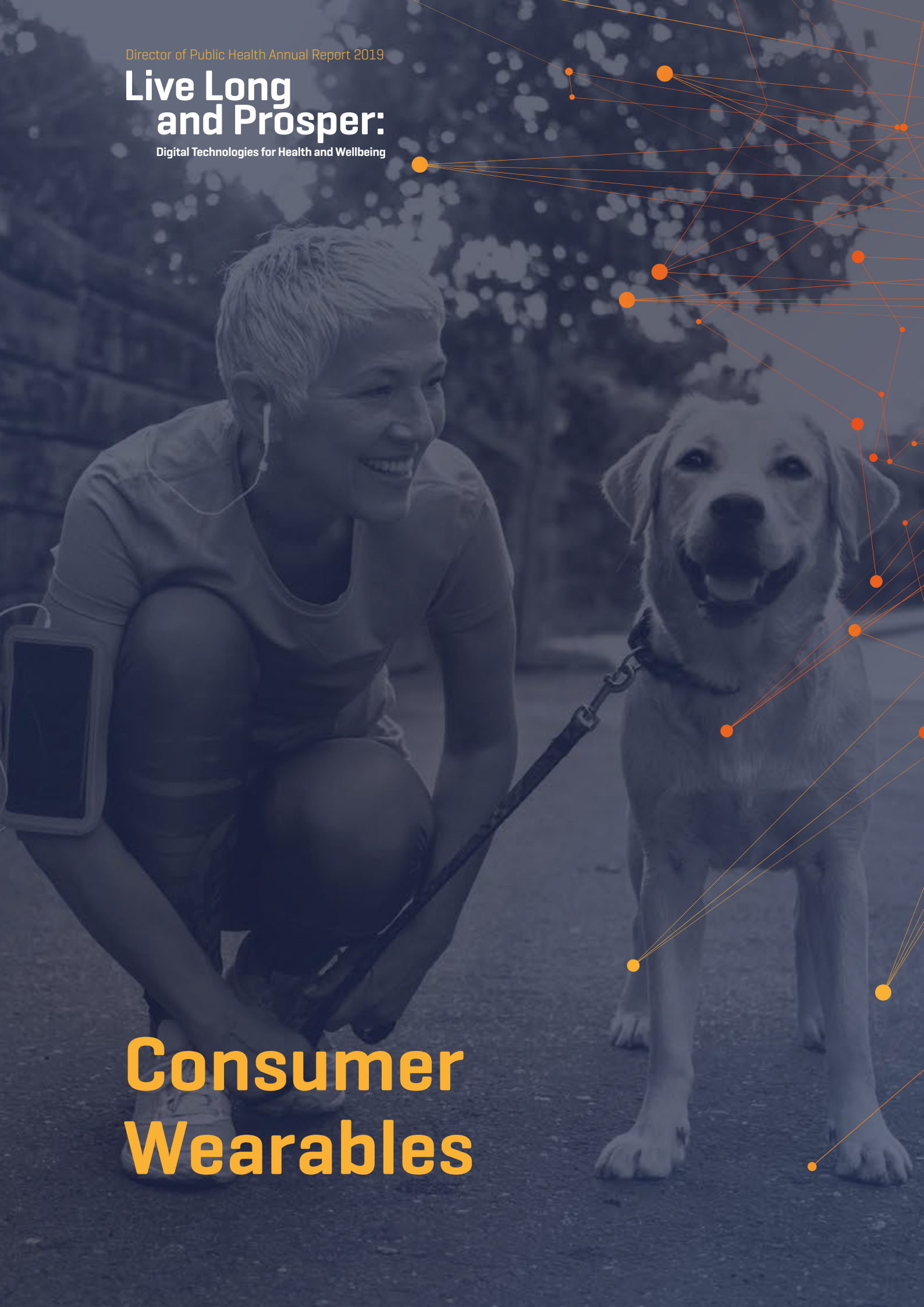
R6. Staffordshire NHS should promote use of the NHS app to help people manage their primary care online.

R7. Staffordshire NHS should promote the use of applications such as MyCOPD to help people manage long-term conditions where there is good evidence that they are effective - and invest in them where there is good evidence that they are cost saving.

Director of Public Health Annual Report 2019

Live Long and Prosper:

Digital Technologies for Health and Wellbeing



Consumer Wearables

83. Consumer wearables are devices that can be worn by individuals and provide real time feedback about health and wellbeing. There are many types of wearables; this chapter focuses on wearables for healthy people. Wearables for older people and chronic conditions are covered in the telecare section in Telecare and Assistive Technology.

84. Fitness trackers are the most common application. They are generally purchased by consumers and include smart wristbands, watches, clothing and cosmetic accessories. They include features such as goal-setting, self-monitoring and feedback about fitness-related metrics such as distance covered, calories consumed, and in some cases heart rate and sleep quality. They may also include coaching, rewards and social support. One in five UK households (20%) now own some kind of wearable digital technology with one in 10 actively using them to monitor their health.[44]

85. In the future, biometric data collected through wearable technology could be used at a population level, for example to create individual and population profiles to identify individual risk of developing conditions such as diabetes.

Example 6a: using wearables to increase activity levels

86. We know that physical activity is essential for physical and mental health and wellbeing. However, even though most of us understand the benefits, only one in five adults meets the physical activity guidelines of 150 minutes of aerobic exercise and two days of muscle strengthening exercise each week. Older adults and people from more deprived areas are typically less active and at increased risk for poor health and wellbeing as a result. The World Health Organisation maintains that a lack of regular exercise increases the risk of early death by 20-30%.

87. Based on a survey of adults aged 19 and over, around 23% of Staffordshire adults are inactive - around 162,500 people. A model developed by the Office for National Statistics allows us to see the impact of improvements of behaviour change on healthy life expectancy. The model does not state what the time lag of these likely impacts would be; however, it indicates that a one percentage point increase in activity levels could increase healthy life expectancy by five months for both men and women (Figure 15).

88. Making physical activity accessible and feasible for all groups is an important part of improving population health and wellbeing. This includes addressing real or perceived barriers to regular exercise in those groups who are typically less active. These include: environmental factors, such as not having access to places to exercise; time constraints, such as believing there is not enough time to exercise; and social limitations, such as not living in a community where physical activity is the norm.

44. https://www.staffordshire.gov.uk/health/care/Care-and-Support/Funding-The-Cost-Of-Care-And-Support/Charging/How-we-calculate.aspx

Figure 15: Impact of improving physical activity on healthy life expectancy (HLE) in Staffordshire

	Current prevalence	HLE (years)		Additional months HLE	
		Men	Women	Men	Women
2015-2017 actual	n/a	63.4	64.3	n/a	n/a
Physical activity (1% increase)	65% (2017/18)	63.8	64.7	5	5
Physical activity (2% increase)		64.2	65.2	10	11
Physical activity (5% increase)		65.4	66.5	25	27

Source: Healthy Life Expectancies, Office for National Statistics, https://www.ons.gov.uk/peoplepopulationandcommunity/healthandsocialcare/healthandlifeexpectancies/articles/whataffectsanareashealthylifeexpectancy/2018-01-18 and Public Health England

89. Wearables may have a role to play, however questions remain about how effective they are at promoting behaviour change and whether they produce sustainable benefits. The devices can have a very positive impact for people who are well motivated and technologically literate. It is less clear whether they could produce benefits for people who are less well motivated and/or less familiar with the technology, particularly those which don't include any behaviour change strategy.[45] There is also a suggestion that they may lose their appeal after 12-16 weeks.[46] Anecdotal evidence suggests that some wearables on the market may provide inaccurate sensor readings and generate false positives and unwarranted demand on health and care services.[47]

90. Wearables vary in price. While some are provided free with the purchase of a smartphone contract, others cost several hundred pounds. This means that they are likely to be least accessible to people who are least active. Without clear evidence of benefit it is also difficult to make a case for public funding.

Case Study 3: Using wearables to increase activity levels

J got a smartwatch for his birthday and uses it every day to track his step count.

By using the smartwatch, he has increased his target for walking from 6,000 steps to 11,000 every day and usually manages to achieve this. He parks further away from work and makes sure he gets up every morning to walk the dog. His smartphone provider sends him messages to encourage him to keep moving and he is in the top 4% of walkers for the number of steps he does for his gender and age group.

His smartwatch is connected to his smartphone and it also recognises when he goes for a bike ride or uses gym equipment. **J** also uses it to record his swimming sessions, which he does twice a week. This wearable technology motivates him to stay active and keep healthy.

45. https://www.ofcom.org.uk/__data/assets/pdf_file/0022/117256/CMR-2018-narrative-report.pdf

46. Sullivan AN, Lachman ME. Behaviour Change with Fitness Technology in Sedentary Adults: A Review of the Evidence for Increasing Physical Activity. Front Public Health. 2017;4:289. Published 2017 Jan 11. doi:10.3389/fpubh.2016.00289; https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5225122/ (Accessed 3 May 2019)

47. https://www.exertis.co.uk/public-sector/can-wearable-tech-keep-nhs-track/

Conclusion:

Consumer wearables are useful for monitoring personal wellbeing including activity levels. People who are self-motivated to improve their health are likely to already own wearables; however, their effectiveness with those who are not motivated is not known. They can have a high cost and there is insufficient evidence of cost effectiveness to justify roll-out at population level. The accuracy of some wearables is not known, and this may cause increased demand from the 'worried well' seeking advice from health and care professionals.

Director of Public Health Annual Report 2019

Live Long and Prosper:

Digital Technologies for Health and Wellbeing

Biometric monitoring and Implantable Drug Delivery

91. **Biometric monitoring** collects and reports data about people's unique physical characteristics. It can be used to monitor and detect changes in the body that people may not be aware are happening and help identify early warning signs. This allows health and care professionals to tailor treatment.

92 Data is typically collected by sensors that measure parameters such as blood glucose levels, blood pressure, temperament, motivation, temperature, skin conductance, posture, balance, heart rate and brain activity. They may be implanted, worn permanently or used as required. They are connected to readers that provide the results to the user and can be linked via the internet to health and care professionals.

93. There is good evidence that biometric monitoring improves control of long-term conditions such as diabetes and high blood pressure.[48] One study of 17,000 people who used a range of remote biometric monitoring at home showed a 25% reduction in hospital bed days and reduce their chances of being re-admitted to hospital by 19%.[49,50]

94. Research suggests that between a third and a half of all medication prescribed to people with long-term conditions is not taken as recommended.[51] Digital or smart **implantable drug delivery** systems can work in two ways:

- They can enable people to have medication released into their bloodstream continuously as their body requires. This can free people from having to be hospitalised to receive frequent injections or intravenous infusions of medication.
- By providing health care professionals with information about medication usage so that they can monitor prescribed drug regimes.

48. https://www.zdnet.com/article/smart-watches-fitness-trackers-and-the-nhs-are-wearables-just-what-the-doctor/

49. Kaambwa et al., (2014) Telemonitoring and self-management in the control of hypertension (TASMINH2): a cost-effectiveness analysis. European journal of preventive cardiology 21(12):1517-30

50. https://www.himss.org/department-veterans-affairs-mhealth-case-study

51. https://www.logisticare.com/blog/biometric-monitoring-is-going-to-change-health-care-keeping-people-healthy-and-in-their-communities-longer

95. An example is human parathyroid hormone fragment which is used for osteoporosis treatment. This requires daily injections which is often a barrier to compliance. An implantable microchip-based drug delivery device to treat osteoporosis has been trialed with a computer-based programmer operating a wireless link with the implant to schedule dosing and monitor proper operation. Whilst the trial was small (eight women over four months) early testing has been positive: bone marker evaluation indicated that daily release from the device increased bone formation. There were also no adverse events due to the device or drug with the women stating that the implant did not affect quality of life.[52]

96. In the future it is likely that implantable microchips will replace the conventional drug delivery systems. There is considerable research ongoing into developing implantable microchip devices with key consideration including; biocompatibility and size or shape to allow high enough dosage over a given period of time.[53]

97. Whilst there are many benefits of digital drug delivery systems, there are risks that could arise including technology failure and a lack of the patients understanding if something was to go wrong with the equipment. Systems may also be costly and each one should be assessed for both effectiveness and value for money.

98. Both biometric monitoring and digital drug delivery methods are potentially useful for people who require long-term therapy with conditions such as cardiovascular disease, diabetes, cancer and long-term pain management, as well as for people who find it difficult to adhere to medication regimes, for example people with mental ill health.

Example 7a: Flash glucose monitoring for diabetes

99. Diabetes is a long-term metabolic disease in which people cannot properly regulate their blood sugar levels because their body doesn't produce enough or is resistant to insulin. This leads to hyperglycemia (high blood sugar levels). Type 1 diabetes is a long-term autoimmune disease that can occur at any age, but it is most often diagnosed in children, teens, or young adults. In Type 1 diabetes, the body produces only a small amount of insulin; therefore, people require daily administration of insulin to survive.

100. Type 1 diabetes is less common than Type 2 and there are estimated to be around 3,700 people in Staffordshire living with this condition. Uncontrolled diabetes can lead to both short-term complications such as diabetic ketoacidosis as well as long-term complications such as blindness, kidney failure and heart disease. Data from the national diabetes audit in 2016/17 found that nationally only 8.5% of Type 1 diabetics met recommended glucose levels.[54]

52. https://www.nice.org.uk/guidance/cg76/evidence/full-guideline-242062957

53. Asafo-Adjei TA, Chen AJ, Najarzadeh A, Puleo DA. Advances in Controlled Drug Delivery for Treatment of Osteoporosis. Curr Osteoporos Rep. 2016;14(5):226–238. doi:10.1007/s11914-016-0321-4; https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5035217/ (Accessed 15 May 2019)

54. https://www.tandfonline.com/doi/full/10.3109/10717544.2014.903579

101. Currently, most people with diabetes depend on handheld blood sugar monitors for monitoring blood sugar levels. These devices rely on a single sampling of blood collected through finger pricks and are typically used only a few times a day (on average four to six times a day). There are many factors that can impact on an individual's blood sugar including what they eat, activity levels, dehydration, high temperatures, stress, and how much insulin they have taken.

102. A flash glucose monitor is a small sensor that is worn on the skin, usually on the upper arm, which measures interstitial fluid glucose levels. The sensor records glucose levels continuously and allows people to access them through a reader.

103. It avoids the pain caused by finger-prick sampling, which has been known to deter people with diabetes from taking regular measurements. As there is a short time lag between interstitial fluid and blood sugar levels, people are still required to do finger-prick checks occasionally.

104. The latest data suggests that overall flash glucose monitors are accurate in terms of their measures although there is little difference in average glycaemic levels amongst users to date. However, there was evidence that flash glucose monitors for up to 12 months reduced the number of hypoglycaemia events compared with self-monitoring of blood glucose using finger-prick tests. There is also increased satisfaction and acceptability amongst patients who use the sensor, particularly as it reduces the average number of finger-prick blood glucose tests needed.[55]

105. The gross cost is £32.47 for a disposable sensor (including VAT) that must be replaced every two weeks. There are additional charges for the reader, although there is a free mobile app that could replace it. This compares with test strips for blood glucose monitoring which cost between £12.21 and £37.03 for a fortnight, depending on the device used, and based on checking levels eight times a day.

106. NHS England have stated that from April 2019 they will reimburse CCGs for each set of flash glucose monitoring sensors prescribed for the 20% of people with Type 1 diabetes who are estimated to meet eligible criteria: those who require testing more than eight times a day; pregnant women; those with cystic fibrosis; those unable to routinely self-monitor blood glucose due to disability and require carers to support glucose monitoring and insulin management; and those with recurrent severe low blood sugar or impaired awareness of low blood sugar.

107. There are also other requirements for people who meet these criteria including having attended the diabetes structure education programme for Type 1 diabetes and agreeing to scan glucose levels at least eight times every day using the sensor more than 70% of the time.

55. https://www.nice.org.uk/Media/Default/About/what-we-do/Into-practice/measuring-uptake/ impact-diabetes.pdf

Case Study 4: Flash glucose monitoring

H is aged eight and has was Type 1 diabetes.

H's diabetes is initially managed through regular blood sugar tests, which requires a finger prick test and four insulin injections a day.

His parents are worried about night time when **H** is at risk of low blood sugars and falling into a coma. They look for information through applications and on the internet.

They discover online support and the latest information and research.

They also find information on new digital technologies such as flash glucose monitoring. Rather than numerous finger pricks, sensors are stuck to the skin and give readings by holding a reader close to the sensor. The sensor monitors blood glucose every five minutes and provides a rich source of data to help manage their son's diabetes more effectively.

They also come across a range of information about how people have used this in conjunction with other technology to make it work better for them. They have adapted his flash glucose monitor and connected his sensor to technology in the home. This means he can now constantly track his blood glucose levels and the smart home will wake him up if his blood sugar levels fall.

108. In Staffordshire this means around 750 people with Type 1 diabetes could benefit from flash glucose monitoring. The cost of this to local CCGs would be around £625,000 (£840 per patient) of which £500,000 (£680 per patient) would be reimbursed by NHS England who take into account a proportion of the cost savings to CCGs from a reduced requirement to fund testing strips for finger-prick blood glucose monitoring.[56]

109. The wider cost benefits of the flash glucose monitor remain unknown with clinical trials underway. They will depend on the extent to which blood sugar control is improved and how this translates into fewer complications and reduced hospital admissions.

110. See flash glucose monitoring at:
https://www.youtube.com/watch?v=TMNjRRmP2yc&feature=youtu.be

https://www.youtube.com/watch?v=z7Xvrv_wN9M

56. https://www.nice.org.uk/advice/mib110/chapter/Summary

Example 7b: implantable drug delivery for diabetes

111. Most people with Type 1 diabetes depend on multiple daily injections of insulin to control their blood sugar levels. The standard implantable insulin pump is a small round disc with a catheter that is surgically implanted so that insulin is administered directly into the person's liver. The dose is set accordingly to finger-prick blood glucose levels. The insulin pump provides continuous delivery of short acting insulin all day long, replacing the need for multiple daily injections and improving blood sugar levels.

112. There is good evidence that insulin pump therapy (also known as continuous subcutaneous insulin infusion), has a valuable effect on blood glucose control and is cost-effective.[57,58] Data from the National Diabetes Audit in 2016/17 found that around 35% of people using a pump achieved a target of HbA1c below 58 mmol/mol, compared to 29% of people not using a pump.[59]

113. NICE recommends that insulin pump therapy is used for children aged over 12 and adults with Type 1 diabetes using multiple daily injections:

- Who have disabling low blood sugar - with episodes occurring frequently or without warning.
- Whose blood sugar remains high despite carefully trying to manage their diabetes.
- If treatment with multiple daily injections is not practical or is not considered appropriate.[60]

114. Clinical specialists and patient experts agree that the use of insulin pumps yields quality of life benefits, such as flexibility, autonomy, and improved sleep and socialisation. Observational studies reported significant decreases in the rate of severe hypoglycaemic episodes after starting pump therapy. For children the results were mixed with some studies showing reduced hypoglycaemic episodes whilst others showed no significant reduction.

Figure 16: Advantages and disadvantages of insulin pumps

Advantages	Disadvantages
■ Better control of your blood glucose levels with fewer highs and lows ■ Fewer injections ■ More flexibility in what, when and how much you can eat ■ Improved accuracy to bring down high blood sugar levels	■ Pump needs to be attached all the time other than small breaks ■ Infusion set can sometimes get blocked, so may need to change at short notice ■ Time needed to learn about your pump ■ Small risk of infection from the cannula ■ Have to be aware of what insulin you need, so still need to do finger pricks

Source: https://www.diabetes.org.uk/guide-to-diabetes/managing-your-diabetes/treating-your-diabetes/insulin-pumps

57. https://www.england.nhs.uk/publication/flash-glucose-monitoring-national-arrangements-for-funding-of-relevant-diabetes-patients/
58. Pickup et al., (2008). Severe hypoglycaemia and glycaemic control in Type 1 diabetes: meta-analysis of multiple daily insulin injections compared with continuous subcutaneous insulin infusion. Diabet Med 2008;25(7):765-74
59. Cummins et al., (2010) Clinical effectiveness and cost-effectiveness of continuous subcutaneous insulin infusion for diabetes: systematic review and economic evaluation. Health Technol Assess 14(11):iii-iv, xi-xvi, 1-181
60. https://digital.nhs.uk/data-and-information/publications/statistical/national-diabetes-audit/insulin-pump-report-2016-17

Case Study 5: Implantable insulin pump

"I've used an insulin pump for about eight years now. I had lost all hypoglycaemic awareness and was suffering from severe hypos that required third party help. These were happening without any warning signs and didn't give me any time to react and save myself. My life had become so frightening and I had lost confidence to go far from home and was only going out for short times. Until I lost all my inbuilt early warning hypo signals I did not realise how precious they were in helping me to remain safe and take timely action.

"Being able to use continuous glucose monitors with my pump has restored my confidence and given me reassurance that the system is guarding me against severe hypoglycaemia. I still have hypos but I haven't had a serious hypo for a long time. The system has provided me with a safety net so that I can feel safe in myself through the day and especially through the night.

"To me it is invaluable and has given me back the reassurance and confidence to get on with my life without being so fearful and has also opened up the world of my blood sugar enabling me to improve my control and HbA1c results."

Insulin pump user

Source: https://www.nice.org.uk/Media/Default/About/what-we-do/Into-practice/measuring-uptake/impact-diabetes.pdf

115. NICE states that decreasing the rate of severe low blood sugar episodes would improve the quality of life for those people who experience frequent and disabling episodes and who consequently live with fear of such episodes. However, the evidence also suggests that use of a pump is only likely to be cost effective when used appropriately, for example maintaining personal hygiene, testing blood glucose levels several times a day and estimating daily carbohydrate and calorie consumption.

116. A pump, which lasts between four to eight years, costs on average around £2,000 for each individual as well as pump consumables which cost about £1,500 every year. An insulin pump is available to patients who are having difficulties in controlling their blood glucose levels on the NHS as per the NICE guidelines.

117. There is evidence that the better control of glucose levels through pumps will naturally lead to fewer complications and therefore reduced acute care. However, there is no conclusive evidence about the actual reduced numbers through use of pumps; potential savings could include:[61,62]

- Around £165 per ambulance call avoided;
- Between around £60 and £320 per avoided Accident and Emergency Department attendance; and
- Between around £480 and £3,050 per avoided hospital admission for diabetes with hypoglycaemia-related disorders.

61 https://www.nice.org.uk/guidance/ta151

62. https://www.nice.org.uk/guidance/dg21/resources/resource-impact-report-pdf-2312936173

118. A new system - the MiniMed Paradigm Veo - combines continuous monitoring of blood glucose levels with an insulin pump.[63] The system measures glucose levels every few minutes and allows immediate real-time adjustment of insulin therapy. It also produces an alarm if glucose levels become too high or low, if levels are rapidly changing, or if the system predicts that levels will be too high or too low in the near future. NICE has recommended this system for "***managing blood glucose levels in people who experience frequent episodes of disabling hypoglycaemia despite optimal management with insulin pump therapy***" on the basis that Medtronic collects, analyses and publishes data on its use. Other similar systems have also been developed but have limited evidence so far to support their implementation.[64]

119. See the MiniMed 670G system at https://www.youtube.com/watch?v=Bpb4VkAMVpg

Example 7c: Biometric monitoring for congestive heart failure

120. Congestive heart failure affects around 8,000 residents in Staffordshire with around 1,300 unplanned hospital admissions during 2017/18 and around 60 people dying during 2017. Routine monitoring of patients with heart failure helps identify signs of deterioration in order to modify treatment if required and can help avoid admission to hospital.

121. For a person living with heart failure, their heart often does not pump blood well enough to effectively distribute the fluids in their body. This can lead to fluid on the lungs and swelling of the legs and feet. One of the warning signs of excess fluid accumulation is rapid weight gain. Digital technologies such as bluetooth bathroom scales can monitor weight gain and if connected to healthcare professionals allow for remote monitoring in real-time that can help manage an individual's congestive heart failure and reduce unplanned hospital admissions.[65]

122. Other biometric devices can provide continuous monitoring of heart rate, core temperature and breathing rate, particularly after a hospital admission when the risk of a complication is at its highest.

123. The CardioMEMS™ is a wireless pulmonary artery pressure (PAP) monitoring device. It is implanted into the pulmonary artery, continuously monitors PAP and transmits the data to a health provider supporting those with Class 3 heart failure who have had a hospital admission within the last 12 months. The CardioMEMS™ device has been trialed in the US with research findings showing that it reduced hospital admissions by 33% over an average of 18 months.[66,67,68] The device is currently being trialed in other countries including the UK.[69,70]

63. NHS Improvement and NHS England; 2018/19 National Tariff: currencies and prices

64. https://www.diabetes.org.uk/guide-to-diabetes/managing-your-diabetes/treating-your-diabetes/insulin-pumps/medtronic-670G

65. https://www.nice.org.uk/guidance/dg21/chapter/1-Recommendations

66. https://www.softworksgroup.com/synoptec-blog/biometric-devices-congestive-heart-failure-patients/

67. Mangi MA, Rehman H, Rafique M, Illovsky M. Ambulatory Heart Failure Monitoring: A Systemic Review. Cureus. 2017;9(4):e1174. Published 2017 Apr 18. doi:10.7759/cureus.1174; https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5436886/ (Accessed 10 May 2019)

68. http://www.uhs.nhs.uk/AboutTheTrust/Newsandpublications/Latestnews/2017/March-2017/Southampton-doctors-implant-coin-sized-heart-failure-monitor.aspx

69. https://bjcardio.co.uk/2018/01/news-from-the-british-society-for-heart-failure-2017/

70. https://clinicaltrials.gov/ct2/show/NCT02954341

124. See CardioMEMS™ at https://www.youtube.com/watch?v=eWcw6qSZv5M

125. A new monitoring system for patients with heart failure is the use of a toilet seat. This has recently been developed by researchers at the Rochester Institute of Technology. The toilet seats are equipped to measure: the electrical and mechanical activity of the heart, heart rate, blood pressure, blood oxygenation levels as well as the patient's weight and stroke volume, i.e. the amount of blood pumped out of the heart at every beat. They have been tested to show clinical accuracy against gold standards. The next stage is to combine the data with algorithms that can detect any deteriorating conditions and alert cardiology teams who can then determine if further intervention is required.[71]

126. There are some new innovative monitoring systems for heart failure which show promising signs of better management and reduced hospital admission rates for complex patients; however, these are undergoing extensive research trials and therefore the population benefits of these systems are currently unquantifiable.

Conclusion:

There are established benefits in terms of convenience for some individuals with diabetes from biometric monitoring devices as well as implantable drug delivery systems - although the impact on disease progression is less clear. These systems require little invasive intervention and involve use of everyday technologies like smartphones at minimum inconvenience to patients whilst improving medication compliance.

There are some promising developments for the use of innovative biometric technology for heart failure in the US. These systems are currently being trialled within the UK and as such the transferability of the cost benefits are unknown.

Digital technology is evolving rapidly and offers a great deal of promise although there may be some risks including technology failure. Each one should be individually reviewed for its benefits and risks.

Recommendations:

R8. Staffordshire NHS should roll out flash glucose monitors and insulin pumps for eligible diabetic people, in line with NHS policy and NICE guidelines.

R9. Staffordshire NHS through the STP digital workstream should keep abreast of developments with other biometric monitoring and implantable drug delivery devices and introduce these into clinical practice as evidence emerges to demonstrate their effectiveness and cost-effectiveness.

71. https://www.hra.nhs.uk/planning-and-improving-research/application-summaries/research-summaries/cardiomems-outside-us-study/

Director of Public Health Annual Report 2019

Live Long and Prosper:

Digital Technologies for Health and Wellbeing

Linking Electronic Records

127. Electronic records allow data linkage which can improve care, enable early intervention, and improve health and care policy.

128. Over our lifetime we access services provided by multiple public-sector organisations. Each time we do so, an electronic record is created by the organisation. Historically these records are maintained within each organisation rather than linked.

129. Data linkage is a process which brings together two or more sets of electronic records or survey data. For the public sector this has the potential to create a 'Big Data' set that includes large amounts of information about people's needs and how they use services. Data linkage must demonstrate ethical and secure use of data and data must be processed lawfully in line with the Data Protection Act 2018 and General Data Protection Regulation.[72]

130. In health and care, data linkage can be used to create an Integrated Care Record. This allows doctors, nurses, pharmacists, other health and care professionals, social care practitioners, managers and patients to appropriately access and securely share vital health and care information. This has the potential to:

a) Improve people's care, by allowing them to 'tell their story once' and ensuring that important details are not missed by any organisation.

b) Support population level risk stratification and target early intervention, by identifying people at risk of going on to develop certain conditions and giving public services the opportunity to intervene early on, before a condition gets worse.

c) Improve strategic planning and policy, by improving our understanding of population needs, enabling more accurate analysis of past trends and future forecasting, and assessing the effectiveness of services.

131. Randomised controlled trials remain the gold standard for assessing effectiveness but are not always feasible. Because of this, researchers have strongly advocated the use of data linkage by combining routinely available data sets to answer questions about the effectiveness of strategies and/or specific interventions.

132. In September 2018, the Office for Statistics Regulation reported the results of an investigation of the UK statistics system's ability to provide greater insight through data linkage and identified some important examples of questions successfully answered through this process including:

- Is Scotland's Out-of-Hospital Cardiac Arrest Strategy helping to save lives?
- How do students benefit from going to university?
- How do university student suicide rates in England and Wales compare with the general population?
- Do home energy efficiency measures in Wales improve health and wellbeing?

72. Conn NJ, Schwarz KQ, Borkholder DA, In-Home Cardiovascular Monitoring System for Heart Failure: Comparative Study; JMIR Mhealth Uhealth 2019;7(1):e12419, https://mhealth.jmir.org/2019/1/e12419/ (Accessed 10 May 2019)

133. The NHS in England, Scotland and Wales along with Health and Social Care Northern Ireland, NHS Digital, Genomics England, Health Data Research UK, Public Health England and Clinical Practice Research Datalink (CPRD) announced the launch of the UK Health Data Research Alliance in February 2019, which will be coordinated by Health Data Research UK. The Alliance will unite expertise to establish best practice in the stewardship of the UK's health data - including patient data from the NHS, genomic data and other molecular data - to enable faster, more efficient access for research at scale. The Alliance will help researchers to answer some of the most difficult questions and address the most important health challenges faced in the UK, using and evaluating new tools such as artificial intelligence and machine learning.[73]

134. Data linkage has also been shown to add value in public health by combining routinely available data sets to give a greater insight into issues such as:[74]

- Disease surveillance.
- Predicting risk.
- Targeting interventions.

135. Staffordshire STP is procuring an Integrated Care Record. Once fully implemented it will include:

- Regular data uploads from a range of different health and care systems with the ability for the information to be updated in near real-time.
- A central database of information drawn from a range of health and care systems.
- The capability to match and manage multiple sources of information into a single aggregated care record.
- A facility for professionals to view authorised elements from the care record, and for citizens to view their own care records – including appointments, letters and care plans.
- The ability for citizens to choose to share access with others (i.e. with their carers).
- The ability for citizens to add selected information into their own care records.
- Multi-Disciplinary Care Planning tools to electronically record and share care plans.

136. Longer term, the data held within the Integrated Care Record could be used to inform strategic planning by highlighting the trends and relationships between the way people use services and assessing the effectiveness of services.

73. Data linkage in Scotland, Scottish Government. https://www2.gov.scot/Topics/Statistics/datalinkageframework

74. Health Data Research UK, February 2019 https://www.hdruk.ac.uk/digital-innovation-hubs/uk-health-data-research-alliance/

137. However, whilst there are an increasing number of successes with data linkage, there remain concerns about the validity of the methodology and the costs.[75] Although routinely available data sets have many advantages, they also have important limitations - for example, because they do not allow randomised comparisons they are unable to control for confounding variables. The costs are related to the time and effort taken in linking data. NHS Digital apply charges to cover the cost of processing data through their Data Access Request Service (DARS): [76]

- Bespoke data linkage per dataset per dissemination: £2,060.
- Bridging files, such as Hospital Episode Statistics (HES) to ONS Mortality charged per number of actual files required and their frequency: £320 per year per dataset.
- Application per dissemination: £930.

Example 8a – London Ambulance Service

138. The London Ambulance Service conducted the Pre-Hospital Emergency Department Data Sharing Project, a two-year research project running from May 2015. It aimed to understand how information about patients could be best used by the ambulance trust, acute trusts and commissioners. Ambulance data was linked to hospital data to better understand what happens to people after ambulance staff leave them at the hospital's emergency department.

139. It was demonstrated that greater information-sharing can lead to significant patient benefits, without compromising confidentiality.[77] A series of work programmes looked at:

- Response times.
- How other healthcare professionals use ambulance services.
- Patient groups that are acutely unwell in the ambulance.
- Patient groups that are not acutely unwell in the ambulance.

75. Dolley S (2018) Big Data's Role in Precision Public Health. Front. Public Health 6:68. doi: 10.3389/fpubh.2018.00068

76. Office for Statistics Regulation. Systemic Review Programme. Joining Up Data for Better Statistics. September 2018 https://www.statisticsauthority.gov.uk/wp-content/uploads/2018/09/Data-Linkage-Joining-Up-Data.pdf

77. NHS Digital. Data Access Request Service (DARS) charges 2018/19 https://digital.nhs.uk/services/data-access-request-service-dars/data-access-request-service-dars- charges-2018-19

140. Five ways in which linking ambulance and A&E data were highlighted:[78]

a) It could help improve the accuracy of triage during 999 calls - currently triage is largely based on patient symptoms. Considering other factors, such as age, could help safely reduce urgent ambulance calls without compromising patient safety.

b) It could help to ensure acutely unwell patients are recognised and treated quickly. Data analysis suggested that respiratory distress, over other diagnoses, could be an early predictor of seriously unwell patients presenting to the ambulance service.

c) It could help with the identification of alternative places of care, reducing visits to A&E. Community initiatives may be identified to treat some patients without an emergency department visit.

d) It could help with service planning, showing how health care professionals use the emergency pathway. Understanding the pattern of health care professionals calls to the ambulance service helps the ambulance service and the emergency departments to work together, planning for a predictable influx of patients.

e) It could improve how we commission services, including implications for commissioning across the wider health care system such as public health and preventive health interventions.

Example 8b – Kent Integrated Dataset

141. The Kent Integrated Dataset (KID) aims to provide insight into system-wide health and care utilisation for the whole population of Kent and Medway. The KID uses pseudonymisation-at-source to link patient records from services including general practices, hospitals, community health services and social care. The design and governance of the dataset is led by local authorities, CCGs and NHS Trusts.

142. Example uses of KID:

a) Economic analysis of frailty. An electronic frailty index was used, applied to linked electronic health records to generate a frailty score for people aged 65 years and over. The score can be subdivided by severity. This approach has been extended to include costs of care, allowing economic comparison between frail and non-frail patients of similar age.

b) Estimating prevalence of rare conditions. The KID is being used to estimate the prevalence of conditions such as acute macular degeneration and autism spectrum disorders, supporting decisions about funding of specialist treatment.

c) Comparing the risk of non-elective hospital admission between general practices. Practices were grouped according to their age structure and deprivation to allow for valid comparisons. A relatively high risk of hospitalisation compared to peer practices may suggest a need to review community care for people with long-term conditions.

78. London Ambulance Service. Pre-Hospital Emergency Department Data Sharing. https://www.londonambulance.nhs.uk/about-us/research/pre-hospital-emergency-department-data-sharing/

143. Strengths and limitations of KID:

- Coverage – whole population registered with a GP.
- Covers multiple services – including community health, mental health and social care providers.
- All datasets include the cost of the episode, allowing for economic modelling.
- Data updated monthly, enabling rapid evaluation of service changes.
- Individuals can be tracked across services and primary care practices, providing insight into the paths that patients take across the health and social care system.
- Data quality varies across participating organisations.
- The KID is not linked to UK official mortality records.[79]

Example 8c: Clinical Practice Research Datalink

144. Clinical Practice Research Datalink (CPRD) is a research service supporting retrospective and prospective public health and clinical studies. CPRD is jointly sponsored by the Medicines and Healthcare Products Regulatory Agency and the National Institute for Health Research (NIHR), as part of the Department of Health and Social Care.

145. CPRD collects de-identified patient data from a network of GP practices across the UK. Primary care data are linked to a range of other health related data to provide a longitudinal, representative UK population health dataset. The data encompass over 35 million patient lives, including 11 million currently registered patients.[80] CPRD has informed over 2,000 peer-reviewed publications investigating drug safety, use of medicines, effectiveness of health policy, health care delivery and disease risk factors.

146. Research presented in April 2019 at the European Congress on Obesity in Glasgow looked at health, death and BMI data from more than 2.8 million adults between 2000 and July 2018 from the UK Clinical Practice Research Datalink. It showed people with the highest levels of obesity are running a high risk of a range of serious illnesses and premature death, including Type 2 diabetes, heart failure and sleep apnoea

79. Sophie Clarke, London Ambulance Service. Five ways linking ambulance and A&E data could help to improve care. The Health Foundation 27 Sept 2017. https://www.health.org.uk/blogs/five-ways-linking-ambulance-and-ae-data-could-help-to-improve-care

80. Lewer, D, Bourne, T, George, A, Abi-Aad, G, Taylor, C and George, J. Data Resource: the Kent Integrated Dataset (KID). International Journal of Population Data Science (2018) 3:6 https://ijpds.org/article/view/427/389

Conclusion:

Linking electronic records has the potential to improve care, assist early intervention and support strategic planning of services. However, it has yet to demonstrate improved outcomes on a large scale and it is not yet clear whether the benefits are commensurate with the costs. There are several examples from the UK where linking electronic records has been achieved and these could be used to inform similar developments in Staffordshire.

Recommendations:

R10. The Health and Wellbeing Board should ask for a report on the Staffordshire Integrated Care Record as it is rolled out to examine the benefits and costs.

Director of Public Health Annual Report 2019

Live Long and Prosper:

Digital Technologies for Health and Wellbeing

Telemedicine

147. Telemedicine is the provision of clinical care remotely using telecommunication and information technology, including text, audio and video consultation. It was originally developed to reach people in more remote locations or where there may have been a local shortage of clinical specialists. Telemedicine is required to deliver the same standard of care as face-to-face consultations.

148. Telemedicine may make use of static computers by the person and/or clinician and increasingly mobile and wireless devices such as smartphones and tablets. With technological advances and increased affordability and accessibility of basic tools including access to a computer or mobile devices, there is an increased appetite for live video telemedicine and virtual consultations through online applications such as Skype or Facetime.

149. There is the potential for telemedicine to be used across a wide variety of medical specialties. Some specialties such as radiology and dermatology were early adopters and have continually pushed use of telemedicine. It can also be used in general practice for minor ailments such as allergies, arthritic pain, asthma and other respiratory conditions, cellulitis, colds and flu, conjunctivitis, diarrhoea and vomiting, infections, insect bites and rashes, sprains and strains.

150. In social care there are also some examples of care homes connecting to clinicians who can make an assessment and offer advice in order to reduce hospital admissions.

Example 9a: Telemedicine for GP consultations

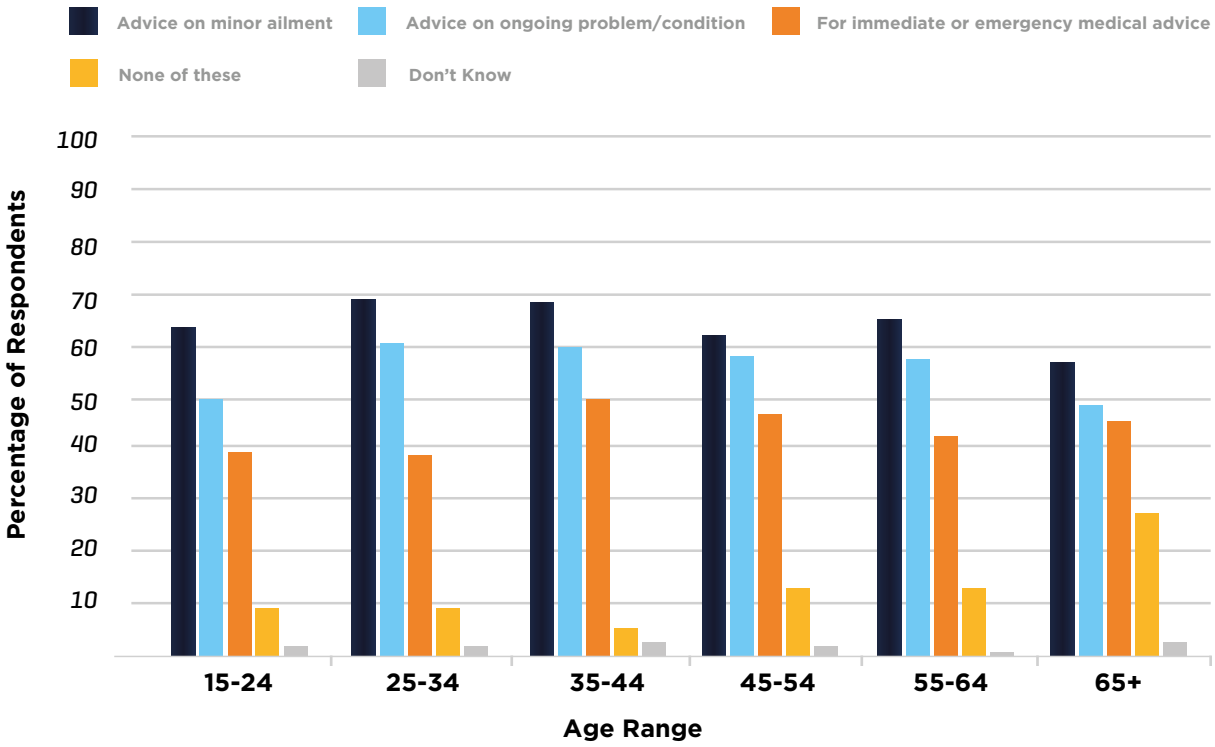
151. During February 2019, there were 145,000 GP consultations in Staffordshire. A national survey found that nearly two-thirds of people (63%) are willing to use a video consultation with their GP for advice on a minor ailment whilst over half (55%) would be prepared to have a video consultation for advice on an ongoing problem or condition. A smaller proportion (43%) are willing to use it for emergency medical advice. The same survey found that younger generations were more willing to embrace online consultations from GPs (Figure 17).

152. The private sector have offered online GP consultations for a few years (e.g. Babylon). The uptake by the NHS has to date been slower, however the NHS Long-Term Plan includes an aspiration that

"digital-first primary care will become a new option for every patient, improving fast access to convenient primary care."[81]

81. Clinical Practice Research Datalink https://www.cprd.com/

Figure 17: Public willingness to use video consultations with their own GP in the UK, 2018



"in which, if any, of the following circumstances would you be willing to use a video consultation with your GP."
n=2,083 UK Adults aged 15 and over

Source: Castle-Clarke S. What will new technology mean for the NHS and its patients? Four big technological trends. The Health Foundation, the Institute for Fiscal Studies, The King's Fund and the Nuffield Trust, 2018

153. The benefits of online consultation include convenience primarily for the patient in terms of the speed of the consultation/appointment, particularly in the private sector, less time travelling to and from the GP surgery and potentially less time off work. However online consultations are not appropriate for all patients, for example those with complex needs or dementia.

154. In March 2018, the Care Quality Commission (CQC) published a review into online GP consultations in the independent sector which found that 43% of the 35 providers they inspected were not providing safe care.[82] There were also some concerns about inappropriate prescribing of some medicines such as antibiotics as well as communication and sharing of information. It is currently unknown if the risks from the private sector are translated into NHS services.

82. https://www.longtermplan.nhs.uk/wp-content/uploads/2019/01/nhs-long-term-plan.pdf

155. The evidence base around the use of emerging and growing telemedicine for GP services to reduce demand is currently unknown; with data from the US showing this has increased demand and costs of services.[83,84,85] Some GPs have also expressed concerns about them saving time for example one GP said

"they don't really save many appointments as approximately half the time we still need to see the patient face-to-face to examine them."[86]

156. Of the 145,000 GP consultations in Staffordshire during February 2019, 13% were either telephone, video or online consultations which is lower than the national average of 20%. Proportions locally ranged from 7% in Cannock Chase CCG to 24% across Stafford and Surrounds CCG.[87] Across Staffordshire and Stoke-on-Trent there are 24 GP practices who are currently piloting e-consultation systems with the aim to reach 50% by Summer 2019.[88]

157. See Telemedicine for GP consultations at:

https://www.youtube.com/watch?v=c6AT1FLM8yk

https://www.youtube.com/watch?v=zNHq9gD2uqc

https://www.youtube.com/watch?v=CMD6B8h6Pzg

Example 9b: Teledermatology

158. During 2017/18 there were around 14,500 first out-patient appointments and 23,800 follow-up appointments for dermatology in Staffordshire costing £3.3 million.

159. Teledermatology is a sub-specialty of dermatology and one of the popular specialties of telemedicine. It can involve 'store-and-forward' methods where digital clinical photographs along with relevant clinical history are referred to a specialist for advice, or real-time consultation conducted through digital means such as videoconferencing. Photographs are very useful in conveying clinical information and capturing how conditions can change over time.

160. Overall there is good evidence to support the diagnosis of skin cancer using teledermatology based on GP to a specialist dermatologist (high sensitivity rates).[89] However, the diagnosis of benign lesions through teledermatology were more variable, with remote assessment more likely to recommend excision, referral or follow- up compared to face-to-face consultations.

83. https://www.cqc.org.uk/publications/major-report/state-care-independent-online-primary-health-services
84. https://www.kingsfund.org.uk/sites/default/files/2018-06/NHS_at_70_what_will_new_technology_mean_for_the_NHS_0.pdf
85. Cusack CM, Pan E, Hook JM, Vincent A, Kaelber DC, Bates DW, Middleton B (2007). The value of provider-to-provider telehealth technologies. Center for Information Technology Leadership
86. Pearl R (2014). Kaiser Permanente Northern California: current experiences with internet, mobile, and video technologies. Health Affairs, vol 33, no 2, pp 251–57
87. https://www.gponline.com/gp-practices-providing-online-consultations-doubled-12-months-survey-suggests/article/1521516
88. https://digital.nhs.uk/data-and-information/publications/statistical/appointments-in-general-practice/february-2019
89. https://www.twbstaffsandstoke.org.uk/news-and-events/94-making-online-gp-consultations-a-reality-in-staffordshire-and-stoke-on-trent

161. Most studies found that teledermatology was equivalent or more economical than conventional care. Whilst teledermatology consultations can take longer than face-to-face consultations they result in fewer specialist referrals. In addition, they are beneficial to patients in terms of reduced travel time, costs, and time away from work as well as potentially quicker diagnosis and treatment.[90]

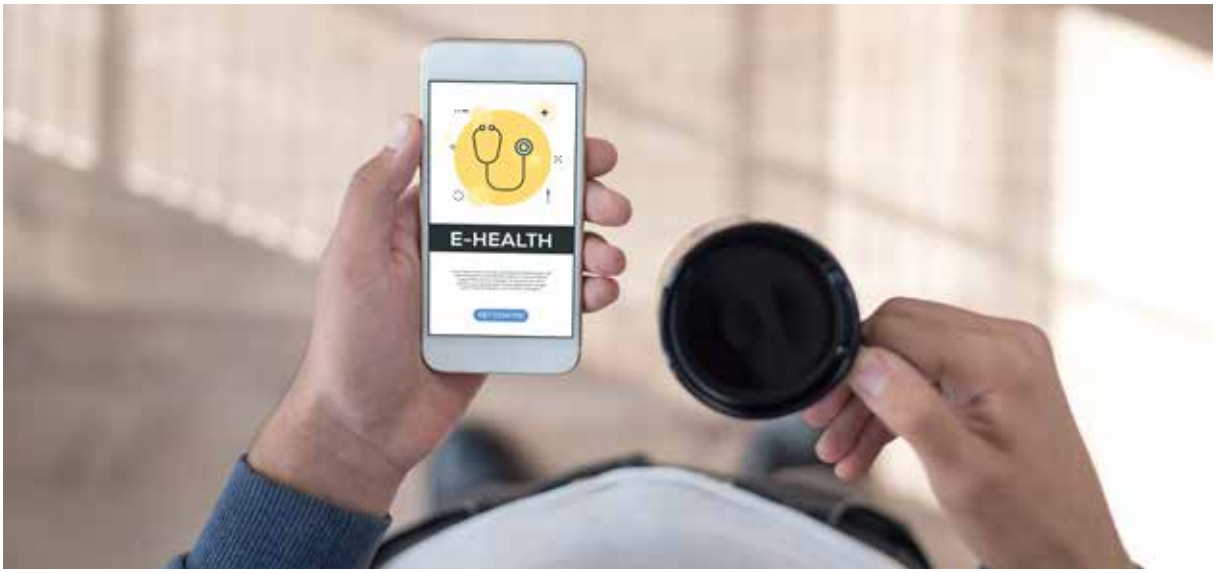
162. There are two main risks to consider in teledermatology:

- Poor quality images leading to inaccuracy in diagnosis or management.
- Risks to confidentiality and data protection if patient-identifiable images are inadvertently shared.[91]

163. Where medical illustration services are not available or practical due to access or convenience, mobile device photography could provide additional information for the patient record and improve patient care as long as the images are accurate and enable accurate diagnosis.

164. Surveys have found that over half of secondary care doctors have used their own personal mobile devices to take digital clinical photographs, with this practice also being widespread in primary care.[92,93] People generally are comfortable with this and are often themselves keen to share photographs taken on their own mobile devices, where they feel it will improve their care.[94]

165. Based on evidence from a small case study only 18% of actual teledermatology referrals required a face-to-face outpatient appointment. Only a very small number of current dermatology consultations in Staffordshire are currently thought to be carried out through teledermatology. This means that there may be potential savings from reduced number of face-to-face outpatient appointments.



90. Chuchu N, Dinnes J, Takwoingi Y, Matin RN, Bayliss SE, Davenport C, Moreau JF, Bassett O, Godfrey K, O'Sullivan C, Walter FM, Motley R, Deeks JJ, Williams HC. Teledermatology for diagnosing skin cancer in adults. Cochrane Database of Systematic Reviews 2018, Issue 12. Art. No.: CD013193. DOI: 10.1002/14651858.CD013193

91. Lee KJ, Finnane A, Soyer HP. Recent trends in teledermatology and teledermoscopy. Dermatol Pract Concept. 2018;8(3):214–223. Published 2018 Jul 31. doi:10.5826/dpc.0803a13

92. http://www.bad.org.uk/shared/get-file.ashx?itemtype=document&id=5818

93. DH (nd) The Common Law Duty of Confidentiality (http://bit.ly/2tMdlzX).

94. Data Protection Act (1998) London. HMSO. Available at http://bit.ly/18ErOgh;

Case Study 6: Teledermatology in Stockport: Headline achievements in 100 days

- Expanded teledermatology to five new GP practices.
- 68 referrals made in four-month period.
- 18% of referrals required an outpatient appointment.
- 99% of referrals were responded to in the same day (compared to a three- or four-month waiting list for a face-to-face outpatient appointment).
- Good quality images provided by GPs. Only 12% of referrals were rejected due to inadequate images. Three skin cancer patients were identified via teledermatology, who were then referred and treated urgently.

Source: https://www.england.nhs.uk/wp-content/uploads/2019/01/dermatology-elective-care-handbook-v1.pdf

166. There are also a number of websites and applications emerging that offer people the ability to upload digital clinical photographs captured on their own mobile devices. However, there is limited evidence so far of their safety and effectiveness, they are not supported by regulatory approval or clinical guidelines, and there have been some concerns about the quality of diagnosis and treatment.[95]

167. See teledermatology at: https://www.youtube.com/watch?v=PIuF_WC2j8Y

Example 9c: Teleradiology

168. The NHS relies on rapid access to, and interpretation of, clinical imaging examinations provided by radiology services. The 2018 radiology workforce census data highlighted

"***concerning trends of increased demand for medical interpretation of diagnostic images and interventional radiology services, increased workforce shortages and spiraling costs. The radiology workforce is showing signs of stress and burnout, and workforce shortages are negatively impacting patient care.***" [96]

168. During 2017/18 in Staffordshire, plain radiography was the most common imaging procedure with 363,700 X-rays, followed by diagnostic ultrasonography (147,200 ultrasounds), Computerized Axial Tomography (90,700 CT scans) and Magnetic Resonance Imaging (61,400 MRIs).

170. Teleradiology is the sharing of clinical images, such as X-rays, CT scans and MRIs through digital means between clinicians for a primary report or a secondary opinion from a specialist. Teleradiology allows the development of networks of radiological expertise and can also be used to support local radiology services by helping to provide cover for temporary local capacity gaps.[97]

95. PCC (2013) Quality Standards for Teledermatology: Using 'Store and Forward' Images. Available at http://bit.ly/2gSEJVo
96. Resneck JS, Abrouk M, Steuer M, et al. Choice, Transparency, Coordination, and Quality Among Direct-to-Consumer Telemedicine Websites and Applications Treating Skin Disease. JAMA Dermatol. 2016;152(7):768–775. doi:10.1001/jamadermatol.2016.1774
97. https://www.rcr.ac.uk/system/files/publication/field_publication_files/clinical-radiology-uk-workforce-census-report-2018.pdf

171. Although traditional radiology remains the gold standard, teleradiology can be beneficial in supporting early diagnosis through the quick turnaround of medical imaging scans provided they maintain quality standards set out by the Royal College of Radiologists.[98] Some of the pitfalls include:

- **Communication**. In conventional radiology departments this is much easier for example through multi-disciplinary meetings, direct discussions in the department or in clinics, telephone or local secretaries. There are fewer of these opportunities with teleradiology. .
- **Access to previous examinations**. Failure to review previous examinations has been shown to be a cause of error.
- **Quality control**. This is more difficult with teleradiology with errors more common. It may also be more difficult for teleradiology services to have proper feedback of the outcome and undertake satisfactory audits.
- **Legal issues**. Including confidentiality and ensuring consent has been obtained particularly if sending images outside of the UK.[99]

172. The NHS already spends several tens of millions of pounds annually on outsourcing to teleradiology companies.[100] Following a comprehensive review of NHS radiology services in England the Care Quality Commission (CQC) began inspecting and rating teleradiology companies during 2018/19.[101]

173. The NHS currently has 13 suppliers on the NHS Teleradiology Reporting Service Framework who can provide 'on demand' teleradiology services for routine, emergency, specialist and backlog reporting. This is thought to be a saving of 9-24% in total spend on NHS radiology due to variations in outsourcing costs as well as savings in time and money on local procurement processes.[102]

174. Staffordshire NHS is able to choose suppliers from the Framework to help meet their demand without going through a local procurement process in the knowledge that they already meet the necessary standards including trained and registered radiologists.

175. There is potential that in the future artificial intelligence and machine learning developments can offer support through reviewing and reporting of images.

176. See teleradiology at: https://www.youtube.com/watch?v=0H9BHEfWS6c

98. https://www.rcr.ac.uk/posts/teleradiology-position-statement
99. https://www.rcr.ac.uk/system/files/publication/field_publication_files/telerad_standards.pdf
100. https://www.myesr.org/sites/default/files/ESR_brochure_01_0.pdf
101. https://www.rcr.ac.uk/system/files/publication/field_publication_files/clinical-radiology-uk-workforce-census-report-2018.pdf
102. https://www.cqc.org.uk/sites/default/files/20180718-radiology-reporting-review-report-final-for-web.pdf

Conclusion:

Telemedicine is likely to play an increasing role in health and care services as people look for greater convenience, and to mitigate workforce shortages and reduce costs. Face-to-face consultation remains the gold standard and the benefits, risks and costs of telemedicine should be explored thoroughly before and during roll out - including whether telemedicine reduces or increases the demand for traditional services.

Recommendations:

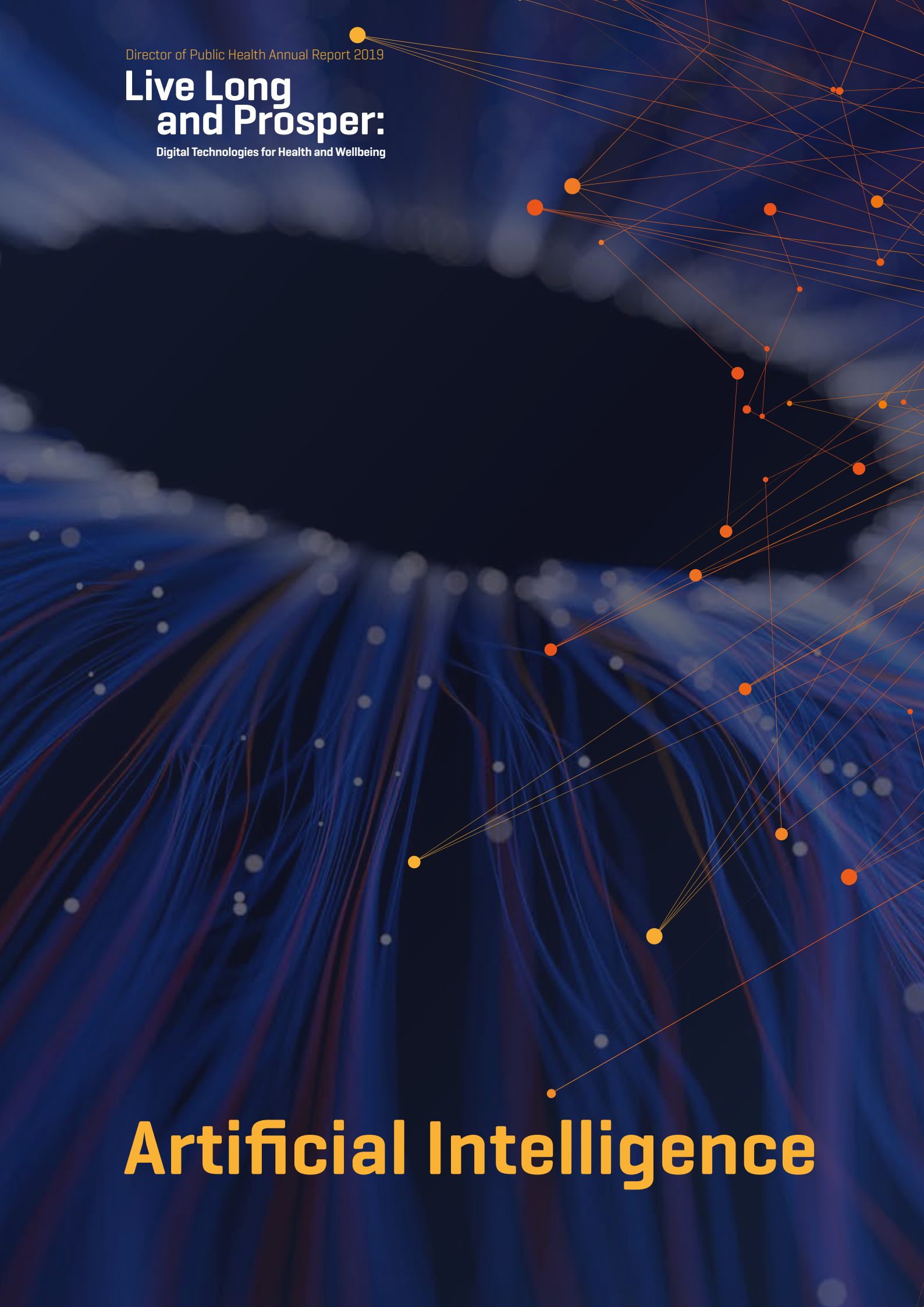
R11. Staffordshire NHS, through the STP digital workstream, should ensure that GP telemedicine is thoroughly evaluated as it is rolled out.

R12. Staffordshire NHS, through the STP digital workstream should explore opportunities to roll out teledermatology and teleradiology, within a properly regulated framework to ensure good standards of care.

Director of Public Health Annual Report 2019

Live Long and Prosper:

Digital Technologies for Health and Wellbeing



Artificial Intelligence

177. Artificial intelligence (AI) enables analysis of information and decision making by computer systems using visual perception, speech recognition and algorithms to make decisions, traditionally undertaken by humans.

178. We are seeing AI make impacts in real-world settings such as Tesla Autopilot and Google's Waymo which in December 2018 also became the first fully autonomous taxi service in the US.[103] There are different types of AI from low complexity to high complexity as shown in Figure 18. As the demand for health and care services rises due to an ageing population with increasingly complex needs there is an increased interest in using AI.[104]

Figure 18: Types of AI applications

High complexity	Medium complexity	Low complexity
Autonomous vehicle	Natural language to SNOMED code processing module	Deep learning module
Machine translation tool	Image processing module	Ensemble methods (e.g. Random Forest Models)
Care companion robot	Text to speech module	Neural networks
Chat bot	Knowledge-based or expert system module	Object segmentation algorithm
Surgical or pharmacy robot	Signal processing & classification module	Signal processing algorithm / filter
Mammogram interpretation system	Recommender module	Generative adversarial networks
ECG interpreter		Time series analysis
Diagnostic decision support system		Graphical models
Speech-driven radiology report tool with SNOMED coded output		Decision trees, rule induction e.g. CART
		Clustering algorithm
		Classification algorithm
		Regression – linear, multiple, logistic
		Inference engine for rules or frames
		Argumentation, temporal or spatial reasoner e.g. QSIM
		Text generator using DCGs
		Case-based reasoning algorithm

Source: http://ai.ahsnnetwork.com/about/complexity-scale/

179. There are benefits and risks of using AI in health and care. The benefits are that AI and machine learning can help health and care services with a range of tasks that are either repetitive or have high demand (e.g. radiology services). They can also help with diagnosis and monitoring of conditions and help spot emerging trends whilst potentially saving money.

180. The risks are related to the accuracy of the systems, data security and privacy, and public and workforce confidence. AI systems require robust testing against standard care to determine accuracy - ensuring both high sensitivity (the ability to identify disease accurately) as well as high rates of specificity (the ability to diagnose people without disease accurately) of diagnosis.

103. https://www.sbs.nhs.uk/fas-teleradiology-reporting-services

104. https://www.independent.co.uk/life-style/gadgets-and-tech/news/waymo-self-driving-taxi-service-google-alphabet-uber-robotaxi-launch-us-a8669466.html

181. The Department of Health and Social Care has recently updated the code of conduct for the use of the AI within the NHS for innovators and suppliers with the 10 principles being;[105]

- Understand users, their needs and the context.
- Define the outcome and how the technology will contribute to it.
- Use data that is in line with appropriate guidelines for the purpose for which it is being used.
- Be fair, transparent and accountable about what data is being used.
- Make use of open standards.
- Be transparent about the limitations of the data used and algorithms deployed.
- Show what type of algorithm is being developed or deployed, the ethical examination of how the data is used, how its performance will be validated and how it will be integrated into health and care provision.
- Generate evidence of effectiveness for the intended use and value for money.
- Make security integral to the design.
- Define the commercial strategy.

182. In her 2018 annual report, the Chief Medical Officer states that: "it is possible that highly sophisticated AI systems could replace the judgement of qualified medical professionals. If that happens, and AI systems begin taking decisions of legal (and moral) consequence, such as providing a medical diagnosis, then this will raise new questions of liability, ethics, and compensation that require due consideration in an appropriate regulatory framework."[106]

183. Examples of the use of AI within health and care include the **NHS 111 and NHS 111 online** which is also now available across England and acts to symptom check and as a triage system.

184. People visit www.111.nhs.uk and enter their age, sex, postcode and main symptom and are then asked a series of questions about their health problems. This then allows the app to help residents:

- Find out how to get the right healthcare in their area, including whether they need to see a GP or seek urgent care.
- Get advice on self-care.
- In most areas, get a call back from a nurse, doctor or other trained health professional if they need it.

185. People can also access 111 online through the new NHS App, which is being gradually rolled out across England. An independent evaluation of the impact of the 111 online service will take place during 2020.

105. https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/767549/Annual_report_of_the_Chief_Medical_Officer_2018_-_health_2040_-_better_health_within_reach.pdf

106. https://www.gov.uk/government/publications/code-of-conduct-for-data-driven-health-and-care-technology/initial-code-of-conduct-for-data-driven-health-and-care-technology

186. Other examples of AI technologies either in use or being tested include:

- **AskSara.** This provides personalised advice about assistive technology products.[107]
- **C the Signs**. This pilot uses an award-winning AI decision support tool to help GPs identify people at risk of cancer earlier. The AI uses the latest NICE guidelines and other evidence to provide GPs with the ability to check combinations of signs, symptoms and risk factors in an easy-to-use format. Accessible on desktop computers or mobile phones, GPs can access the tool during the consultation to identify which referrals and investigations patients need. This has led to improved GP consultations and a smoother referral process.[108]
- **Kheiron Medical Deep Learning for breast cancer screening.** This aims to serve as a second reader to support breast screening programmes and increase the accuracy of screening by reducing the number of false positives and false negatives, and hence the number of people getting unnecessary biopsies. The software is undergoing clinical trials in an NHS Test Bed. Evidence to date has been collected through retrospective outcomes analysis and is currently undergoing an economic analysis.[109]
- **Ask Oli.** Over the last two years Alder Hey Cognitive Hospital have been building a ChatBot called Ask Oli that is able to interactively respond to families with information on processes within the hospital - e.g. admission, clinic appointment and access to food as well as handling a number of low-level clinical questions such as fasting rules before day case surgery. It is accessible pre-admission, during admission and after discharge. Since launch, Ask Oli has received more than 5,000 questions which have been used to continually train the service. The service is currently applying for funding for a formal evaluation.[110]
- **Viz.ai.** Viz.ai uses AI to detect early signs of time-sensitive medical conditions on imaging. Its first product, which received Food and Drugs Administration (FDA) clearance in February 2018, is a software platform that analyses brain CT scans using deep learning for large vessel occlusions or strokes, notifying specialists within minutes. Its second FDA-approved product automates CT perfusion analysis, providing advanced brain imaging to help support treatment decisions.[111]

187. In Staffordshire an online social care assessment is being developed which will use algorithms to provisionally determine Care Act eligibility and either signpost people to support in the community or refer them for a full Care Act assessment. Safeguards are being built in to avoid missing people who have Care Act eligible needs.

107. https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/767549/Annual_report_of_the_Chief_Medical_Officer_2018_-_health_2040_-_better_health_within_reach.pdf

108. https://asksara.dlf.org.uk/?auth=sara5

109. https://www.england.nhs.uk/cancer/case-studies/c-the-signs-how-artificial-intelligence-ai-is-supporting-referrals/

110. http://ai.ahsnnetwork.com/kheiron-medical/

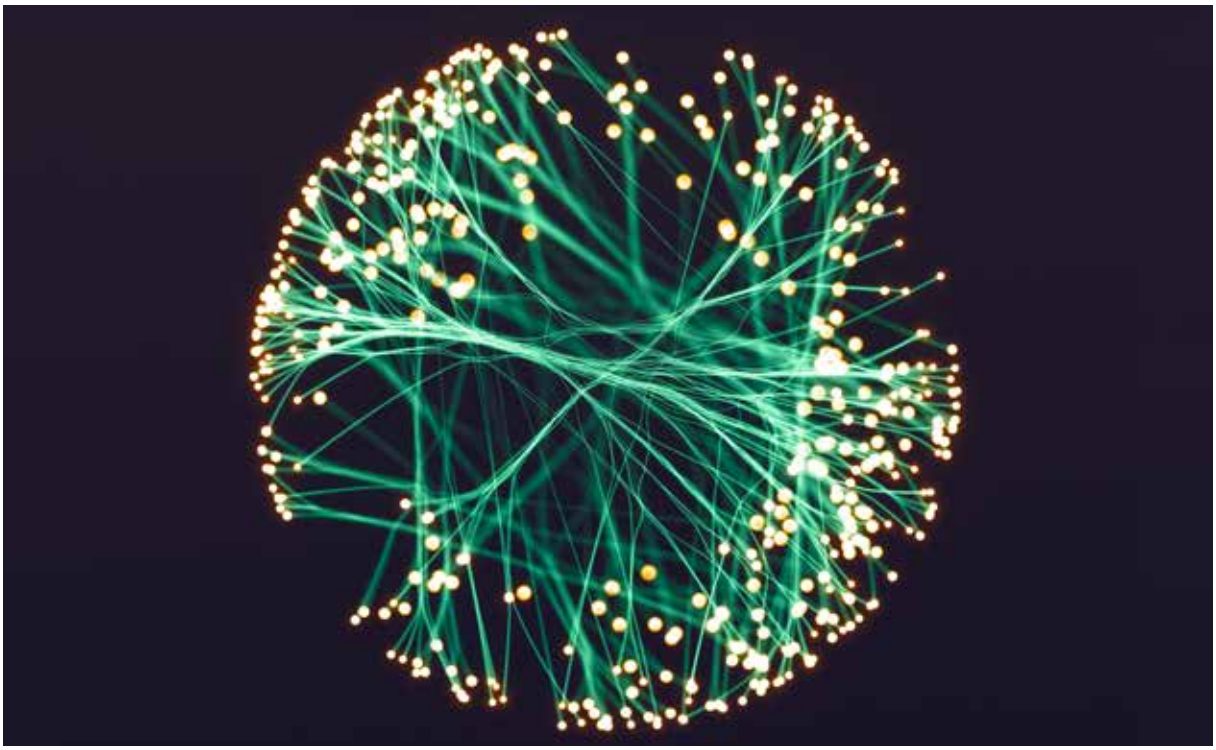
111. http://ai.ahsnnetwork.com/ask-oli-the-alder-hey-cognitive-hospital/

Example 10a: Online Cognitive Behaviour Therapy

188. The latest research suggests that around one in eight children and one in six adults have a mental health condition equating to 18,400 children and 116,200 adults in Staffordshire. The recorded prevalence of depression in Staffordshire is higher than the England average at 10% (almost 72,000 adults aged 18 and over).

189. Cognitive behaviour therapy (CBT) is a type of psychotherapy that supports people to prevent and alter negative patterns of thought about themselves and the world around them. It helps focus on how thoughts, beliefs and attitudes affect feelings and behaviour, and teaches coping skills for dealing with different problems. CBT can be used for a range of mental health conditions with NICE recommending it for the treatment of depression and anxiety and highlighting that it achieves improvements in 50% of people, a similar outcome to drug therapy.[112]

190. NICE recommends online CBT as one of the initial lines of treatment for depression, and in particular for those with mild to moderate depression depending on an individual's preference.[113] Computerised CBT (CCBT) is a generic term that is used to refer to a number of methods of delivering CBT via an interactive computer interface. It can be delivered on a personal computer, over the Internet or via the telephone using interactive voice response (IVR) systems. As with CBT, pre-therapy assessment is recommended to ensure that people are suitable for therapy, and individuals require ongoing monitoring and support. Several CCBT packages are currently available. Each has been developed for a specific target group or groups and uses different CCBT algorithms.



112. http://ai.ahsnnetwork.com/viz-ai/

113. https://www.nice.org.uk/guidance/ta97/documents/final-appraisal-determination-depression-and-anxiety-computerised-cognitive-behaviour-therapy-ccbt-review2

191. Beating the Blues was the first CCBT approved by NICE. The evidence suggests that it is effective and cost-effective with outcomes on par if not better than standard treatment. One randomised control trial reported the mean number of depression free days as 90 for Beating the Blues per individual compared with 61 days for standard care. [114] There are now a number of other CCBTs that have been approved by NICE as part of the Improving Access to Psychological Therapies Programme.[115,116]

192. Beating the Blues has a subscription fee of £50 for an individual which is cheaper than group CBT (£97), individual face-to-face therapy (£560) or anti-depression medication for six months (£110).[117,118] Implementing Beating the Blue to the Staffordshire population would cost around £87,000 and by doing so would double access to the number of individuals receiving CBT compared with group CBT.

193. There are also a number of other CCBTs available such as MoodGYM which is provided free and uncontrolled, through a standard web-browser. The availability of free access to MoodGYM means some people may choose to use it before seeking help from healthcare professionals. There is some suggestion that there may be a risk of individuals then acquiring a set of misunderstandings about the nature of CBT, which might hinder the progress of their treatment. How best to support practitioners in responding to this situation is an open question, especially in the context of an ever-increasing range of technologies that claim to offer benefits to health, but which carry the potential to be damaging or misleading if poorly designed.[119]

194. See Beating the Blues at: https://www.youtube.com/watch?v=jQgKl-hK80k

114. https://www.nice.org.uk/guidance/cg90/chapter/Key-priorities-for-implementation

115. McCrone, P, Knapp, M, Proudfoot, J, Ryden, C, Cavanagh, K, Shapiro, D, Ilson, S, Gray, J, Goldberg, D, Mann, A, Marks, IM & Everitt, B (2004) Cost-effectiveness of Computerised Cognitive Behavioural Therapy for Anxiety and Depression in Primary Care. British Journal of Psychiatry. 185, 55-62

116. https://www.nice.org.uk/about/what-we-do/our-programmes/nice-advice/improving-access-to-psychological-therapies--iapt-/submitting-a-product-to-iapt#published-IABs

117. https://www.nice.org.uk/Media/Default/About/what-we-do/Into-practice/measuring-uptake/NICEimpact-mental-health.pdf

118. National Institute for Clinical Excellence. Depression in adults (update). NICE Clinical Guideline 90. Available on: http://publications.nice.org.uk/depression-cg90

119. https://www.nice.org.uk/Media/Default/About/what-we-do/NICE-advice/IAPT/IAB-space-from-depression.pdf

Case Study 7: Beating the Blues

A middle-aged lady whose feelings of anxiety started in early adulthood resurfaced. She had experienced panic attacks in her late teens but felt part of the problem was that "I belong to a stoic generation that doesn't like to say 'no'. "I'd get really anxious, lose focus on tasks and suffered from sore heads."

Following her retirement from a successful career the absence of a routine led her to feel very uptight and anxious again – feelings which became particularly pronounced during the darker, winter months. The GP referred her to the Beating the Blues online programme and it's been a tremendous help in managing those feelings.

"The modules have also been supported by the text messaging service and it brings you a sense of comfort that you are not alone."

"The texts reminding you to complete an online module or offering encouragement have been timely prompts for me."

"I've never been one to make a fuss and the anonymity of the digital therapy has been good. And having the text support is having an encouraging, non-judgemental friend in your corner through dark times."

Source: https://sctt.org.uk/wp-content/uploads/2018/07/TEC-HMHM-National-Resources-V1-2.pdf

Example 10b: Breastfeeding Friend

195. Public Health England recommends exclusive breastfeeding for the first six months. Breastfeeding boosts a baby's ability to fight illness and infection, and babies who are not breastfed are more likely to get diarrhoea and chest infections. Breastfeeding also lowers a mother's risk of breast cancer and may reduce the risk of ovarian cancer.

196. In England almost three-quarters of women start breastfeeding when their child is born, however by six to eight weeks this drops to just 43% making England's breastfeeding rates one of the lowest in the world.[120] In Staffordshire the latest prevalence of breastfeeding at six to eight weeks is even lower at 34% (around 2,900 mothers breastfeeding). Many mothers can find breastfeeding challenging and this may cause them to give up.

197. A survey of 1,000 mothers of young children commissioned by Public Health England revealed that in hindsight, mothers wished they had been better prepared for breastfeeding. Before the birth of their first child, mothers' biggest priorities were:[121]

- Buying baby equipment (66%)
- Preparing for labour (49%)
- Buying baby clothes (40%)

120. https://www.bmj.com/content/351/bmj.h5627/rr-10
121.Public Health England, Breastfeeding prevalence statistics 2017/18

198. However, post birth, nearly a quarter (24%) wished they had read about and were more prepared for breastfeeding and one in four (26%) of those who had given breast milk to their first child wished they had known that asking for help can make a real difference. The survey also highlighted that almost a third (31%) of mothers felt embarrassed about asking for help with breastfeeding from healthcare professionals.

199. It also found that almost two thirds (64%) felt that access to 24 hours a day, seven days a week breastfeeding support, such as a phoneline, website or chatbot, would make new mothers:

- More likely to have a positive experience of breastfeeding
- More likely to decide to try breastfeeding (59%)
- Breastfeed for longer (58%)

200. The survey highlighted that of those who ever gave breastmilk to their first child, younger mums were more likely than older mums to use online sources (42% of 18 to 34 years compared to 30% of 35 to 50 years) when researching or starting to breastfeed.

201. Evidence shows the right support helps mothers to breastfeed for longer. Public Health England has created the Breastfeeding Friend to encourage parents to adopt healthy behaviours. It is available for free on a range of platforms, including via chatbot on Facebook Messenger, Google Assistant and Amazon Alexa's voice service. All the information provided by the Breastfeeding Friend is NHS-approved and is based on questions asked by thousands of new mums.

202. Mothers can ask Alexa a variety of questions about breastfeeding and the answers will be provided tailored to the age of the baby. This means that they can get helpful advice even when their hands are full.

Case Study 8: Breastfeeding Friend from Start4Life on Amazon Alexa [122,123]

Public Health England's Start4Life and Amazon Alexa is helping mothers to breastfeed for longer. Once enabled it can be opened by simply saying 'Alexa, open Breastfeeding Friend' and five key features can then be explored:

1. Listen to the breastfeeding support guide for help with:

- Knowing your baby is getting enough milk
- How to help your baby latch on
- Dealing with nipple pain/scabs/blisters
- Dealing with painful breasts
- Increasing your supply
- Breastfeeding in public
- Expressing milk

2. Ask Breastfeeding Friend a direct question about breastfeeding, for example:

- "Alexa, ask Breastfeeding Friend how do I breastfeed?"
- "Alexa, ask Breastfeeding Friend is my baby getting enough milk?"
- "Alexa, ask Breastfeeding Friend why is my baby feeding all the time?"
- "Alexa, ask Breastfeeding Friend how will I know if I have milk?"
- "Alexa, ask Breastfeeding Friend why is my baby crying?"
- "Alexa, ask Breastfeeding Friend when should I stop breastfeeding?"

3. Log your feeds and hear them back:

- "Alexa, ask Breastfeeding Friend to log a feed"
- "Alexa, ask Breastfeeding Friend to hear my log"

4. Listen to music whilst you feed:

- "Alexa, tell Breastfeeding Friend I'm feeding now"

5. Listen to quick breastfeeding tips on things like:

- Comforting your newborn
- Feeding frequency
- What to do if your baby cries during feeds

122. https://www.gov.uk/government/news/new-technology-supports-new-mums-to-breastfeed
123. https://www.nhs.uk/start4life/baby/breastfeeding/

203. Breastfeeding prevalence in England increased from 43% in 2017/18 to 46% during the first three quarters in 2018/19. However, it is not known whether this is attributable to the Breastfeeding Friend which was launched in March 2018, as evaluation of the technology has not yet been completed.

Conclusion:

Artificial intelligence is likely to play an increasing role in health and care services as people look for greater convenience to mitigate workforce shortages and reduce costs. A number of systems have already been introduced or are being piloted. It is vital that systems are accurate and that they safeguard data security and privacy.

Recommendations:

R13. Staffordshire NHS should roll out online CBT to expand access for people with depression and anxiety in line with NICE guidelines.

R14. Staffordshire maternity services and health visitors should promote the use of Breastfeeding Friend to support women to initiate and sustain breastfeeding.

Director of Public Health Annual Report 2019

Live Long and Prosper:

Digital Technologies for Health and Wellbeing

Telecare and Assistive Technology

Telecare

204. Telecare is a combination of alarms, sensors and other equipment to help people live independently. This is done by monitoring activity changes over time and raising an alert in emergency situations, such as a fall, fire or a flood.[124] Telecare is often used to help older and frail people maintain their independence and remain at home.

205. Between 2019 and 2029, there will be an additional 11,200 people aged 85 and over in Staffordshire. By the time people reach 65 most will have developed at least one long-term condition such as diabetes or hypertension, and large numbers will have developed two or three long-term conditions. Telecare may be able to play a role in helping to support larger numbers of older and frail people and controlling demand for health and care support services.

206. Community alarms are one type of telecare, and over one and a half million people use them.[125] Alarms are one of the most common types of telecare and they can be either smart, wi-fi enabled devices linked to mobile phones and tablets, or they can be connected to a hub or control centre.[126] These devices are most useful for older people who may be frail and unsteady on their feet, or older people with dementia especially if they display confused or erratic behaviour.

207. The alarms tend to be either, on the person; in the form of a wristband or pendant, or fixed in a home, with a pull cord that the resident can use to call for assistance. Some alarm centres will send out a member of staff to investigate, although it is more usual for then to contact a carer or family member who can attend.

208. This form of telecare has two distinct advantages; firstly it can provide quick response if a person falls or gets lost; secondly it can provide reassurance, that enable users to have more confidence to stay living independently at home.

209. The range of telecare devices and providers is extensive and includes sensors, alarms, GPS trackers, flood detectors, carbon monoxide, temperature and door sensors as well as automatic medication dispensers.

124. https://www.amazon.co.uk/dp/B079RM2JF7/

125. https://webarchive.nationalarchives.gov.uk/20130104235033/ http://www.dh.gov.uk/prod_consum_dh/groups/dh_digitalassets/documents/digitalasset/dh_100947.pdf

126. https://www.ridc.org.uk/content/community-alarms

Case Study 9: Using telecare to remain at home

Background:	A customer of Stafford & Rural Homes was a 92 year-old female, residing in her own property, diagnosed with early onset dementia. A neighbour and family friend would visit her regularly and had power of attorney; concerns were raised by the family to the friend that she may have started wandering around the house at night or sleeping at the kitchen table. The family wanted their mum to go into a care home.
Assessment:	The lady was fiercely independent and anxious about the idea of being moved to residential care. There was already a home care package in place, but it was felt that additional support might help to keep her at home, which was her wish.
Equipment:	A basic package of a lifeline unit and personal trigger were agreed, in case further assistance was needed, and a Canary System was also fitted. The Canary System monitors movements in different rooms and can be used to establish routines and patterns. This could be used to show whether or not she was indeed wandering at night.
Outcomes:	After several weeks it was apparent that the lady went to bed following the carers visit and remained in her room until the carers arrived in the morning. She did occasionally go into the bathroom, but always returned to bed. During the day her recorded movements showed that she regularly used the bathroom, visited the kitchen and appropriately heated her home. The evidence was enough to reassure everyone that there was adequate support and she could safely remain in her home.

210. Based on findings from the Whole System Demonstrator pilot, telecare was supported by carers and staff. However, there was no significant difference in health and care service use such as GP consultations, hospital admissions and admission to care homes or mortality rates between telecare and usual care over a 12-month period. The study also suggested little or no improvement in cost effectiveness.[127]

211. It is likely that studies to show the benefits of telecare need to be undertaken over a much longer time scale, particularly in terms of assessing the reduction in admissions to nursing and care homes and mortality rates, which over a 12-month period is probably too short.

212. See telecare at https://www.nhs.uk/video/Pages/Telecare-traceys-story.aspx

127. https://www.which.co.uk/later-life-care/home-care/technology-to-keep-you-safe/telecare-an4ul6z1bvnl

Assistive technology

213. Assistive technology includes assistive, adaptive, and rehabilitative devices for people with disabilities or older people. Traditionally this has included items such as wheelchairs, devices for opening jars, and hearing aids. Emerging digital assistive technologies such as Alexa or Google Home can be used to control aspects of the home, and remind people to take medication or that a carer is due to visit.[128] Assistive technology is easy and cheap to obtain: items can be bought on the high street or over the internet for small sums of money - a list of these can be found here.

214. There are 185,900 people living in Staffordshire aged over 65, nearly 45,000 lone pensioner households and 104,000 people aged over 65 with a long-term limiting illness. The potential demand for a wide range of simple devices that make daily tasks easier, and which enable people to maintain their independence and remain at home is significant.

215. At present the evidence base for assistive technology is limited, and research into this field is not extensive. With regard to assistive technology or people growing old with learning disabilities NICE states that

"there is no evidence from studies published later than 2005 about the effectiveness and cost effectiveness of care and support models for people growing older with learning disabilities living in the family home, or about their experiences of that support. For example, we did not identify any evidence on the effectiveness and cost effectiveness of assistive technology for supporting older people with learning disabilities and their ageing family carers".[129]

Case Study 10: Use of Alexa and elderly parents

D is a 46 year-old who lives about eight miles away from his father. His father was bereaved a couple of years ago and has a number of chronic conditions but is able to manage on his own. He has an extensive list of medication that he has to take every day. D was concerned about his father forgetting to take his medicine, feeling isolated and his lack of mobility to do tasks around the house. He installed an Alexa so that he could keep in touch and so that he could set it to remind his dad to take his medication at set times of day.

D linked the Alexa to security cameras and an internal camera and is able to monitor his father to check that he hasn't had a fall, and to monitor comings and goings at the house. His father loves the Alexa because he can ask it to play music, turn on some house lights, check who is at the front door, call his family and he has even used it to order a pizza.

D is planning to link the Alexa to the central heating, but the main benefit has been to give him peace of mind that his frail father is ok and to enable his father to keep in touch with all his family around the country.

128. http://openaccess.city.ac.uk/3790/1/Effect%20of%20telecare%20on%20use%20of%20health%20and%20social%20care%20services%3A%20findings%20from%20the%20Whole%20Systems%20Demonstrator%20cluster%20randomised%20trial..pdf

129. https://en.wikipedia.org/wiki/Assistive_technology

216. For smart home technology see:
https://www.youtube.com/watch?v=qQtG7859LzY

https://www.youtube.com/watch?v=45AsHcW7XGI

Conclusion:

Telecare and assistive technology have the potential to improve quality of life and maintain people's independence, allowing them to remain at home safely. They may prevent hospital admissions and the need for long-term care. More evidence is needed to ascertain their effectiveness and cost effectiveness before a clear case could be made for state funding at population scale, however they are unlikely to do harm.

Recommendations:

R15. The Health and Wellbeing Board should promote telecare and assistive technology and signpost people to useful devices as a self-help tool.

R16. The Health and Wellbeing Board should monitor the national evidence base for assistive technology and telecare and encourage local providers to participate in evaluation of telecare and assistive technology.

Director of Public Health Annual Report 2019

Live Long and Prosper:

Digital Technologies for Health and Wellbeing

Care Robots

217. The use of advanced robotic technology is showing promise for use in healthcare whilst the public are also warming to the idea. Findings from a YouGov survey in 2016 found 39% of UK respondents were willing to engage with AI and robotics for their health care needs, around 36% were willing to have minor or less invasive surgery such as cataract or laser eye surgery performed by a robot instead of a doctor and 27% were willing to have major or invasive surgery such as hip or knee replacement, removing a tumour or heart surgery performed by a robot if the evidence for outcomes were equivalent or better.[130]

218. Care providers, academics and charities are also showing increasing interest in using robots to support **provision of care** to both improve quality of care and reduce costs in the face of rising demand.[131] Care robots can provide three types of assistance: physical, social, and cognitive.

219. **Physically assistive robots (PARs)** perform discrete tasks, such as lifting and carrying, to support people who use care services. They may assist with feeding, washing or walking. Some are designed to be used by people independently, whilst others have been designed to help care workers fulfil their role.

220. Physically assistive robots may include increasingly sophisticated wheelchairs or robotic limbs, helping to improve the lives of paraplegics and amputees.

Figure 19: Examples of physically assistive robots

Obj	A robotic arm which helps people with physical disabilities to feed themselves. Particularly suitable for those with Motor Neurone Disease, Cerebral Palsy, Muscular Dystrophy, Multiple Sclerosis, Parkinson's Disease and Spinal Cord Injury.
ROBEAR	An experimental nursing care robot which can transfer people between beds and wheelchairs.
CHIRON	Prototype modular system named 'JUVA'. Juva's various components can be mixed and matched to assist with a wide range of domestic tasks.

Source: Consilium Research and Consultancy (2018). Scoping study on the emerging use of Artificial Intelligence (AI) and robotics in social care. Skills for Care

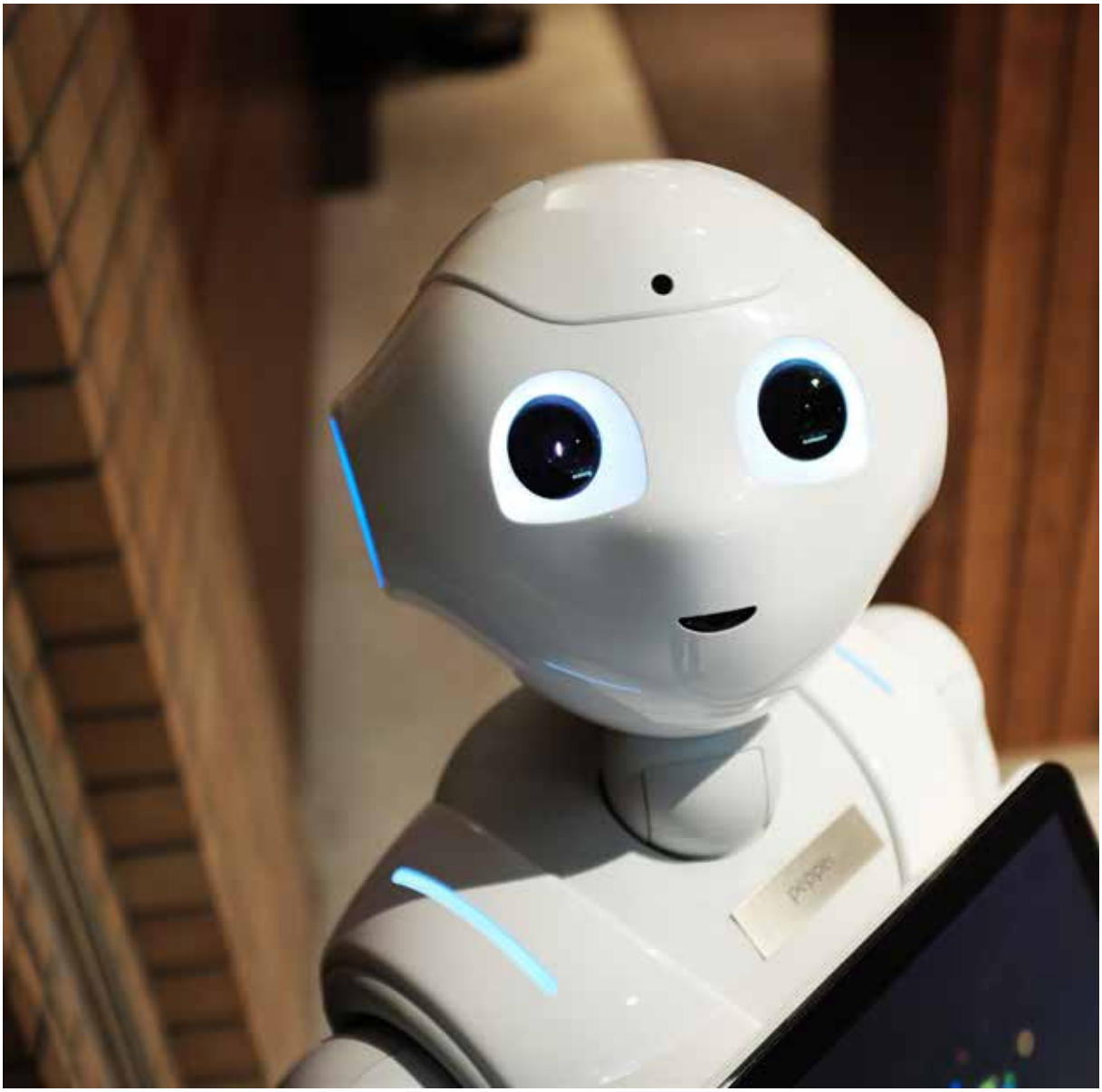
130. https://www.nice.org.uk/guidance/ng96/resources/care-and-support-of-people-growing-older-with-learning-disabilities-pdf-1837758519493

131. https://www.pwc.com/gx/en/industries/healthcare/publications/ai-robotics-new-health/ai-robotics-new-health.pdf

221. **Socially assistive robots (SARs)** aim to help people through individual non-contact assistance in convalescence, rehabilitation, training and education. They can be classed as 'service robots' helping with activities of daily living, such as reminding people to take their medicines, or they can be classed as 'companion robots' which aim to help improve people's psychological status and overall wellbeing.

222. A review published in 2018 identified five roles of SAR:[132]

- Affective therapy.
- Social facilitator.
- Companionship.
- Physiological therapy.
- Cognitive training.



132. Houses of Parliament. Parliamentary Office of Science and Technology. POSTNOTE 591 December 2018 Robotics in Social Care

Figure 20: Examples of socially assistive robots

Mobiserv	A robot companion for older adults that can remind them about eating, drinking and taking medicines, offer structure throughout the day, and help people to stay active by suggesting a variety of activities.
Paro	An advanced interactive robot developed by AIST, a leading Japanese industrial automation pioneer. It allows the benefits of animal therapy to be brought to patients in a hospital environment, where live animals would not be permitted.
Pepper	The first humanoid robot capable of recognising the principal human emotions and adapting his behaviour appropriately. Yet to be used extensively with people using care services in England but several research trials are planned.
Care-O-Bot	A mobile robot assistant designed to support humans in a domestic environment. This robot is not designed specifically for a care setting and is currently in use in a range of environments e.g. a mobile information point.
Dinsow	A service robot developed in Thailand for the hospitality sector. An elderly care robot was launched in 2005 helping people remember to take their pills and tracking their health.
HOBBIT	A research project that helps seniors and old people at home. The main task of the robot is fall prevention and detection. To achieve this, the robot will clean the floor from all objects and thus reduce the risk of falling. It can also detect emergency situations and call for help if required.

Source: Consilium Research and Consultancy (2018). Scoping study on the emerging use of Artificial Intelligence (AI) and robotics in social care. Skills for Care

223. **Cognitive assistance robots (CARs)** is an emerging area of work which uses SARs to support people performing cognitive tasks, with a potential to help people suffering with cognitive impairments such as dementia or Alzheimer's disease.[133]

133. Abdi J, Al-Hindawi A, Ng T, Vizcaychipi MP. Scoping review on the use of socially assistive robot technology in elderly care. BMJ Open. 2018;8(2):e018815. Published 2018 Feb 12. doi:10.1136/bmjopen-2017-018815

Figure 21: Examples of cognitive assistive robots

MARIO	MARIO addresses the challenges of loneliness, isolation and dementia in older people through multi-faceted inventions delivered by service robots. The project is still ongoing but reports to have established that companion robots can have a positive impact on older people living with dementia.
Companionable	The Companionable EU-funded FP7 integrated project, led by a team from the University of Reading, has linked intelligent home systems with Hector, a fully autonomous robot designed to play the role of a companion for elderly people (especially those living alone, or spending many hours of the day alone).
Woebot	Woebot is an automated conversational agent (chatbot) who helps people monitor their mood. Woebot draws from the CBT framework and asks people how they're feeling and what is going on in their lives in the format of brief daily conversations. It also sends them videos and other useful tools depending on their mood and needs at that moment.

Source: Consilium Research and Consultancy (2018). Scoping study on the emerging use of Artificial Intelligence (AI) and robotics in social care. Skills for Care

224. There are some ethical issues:

- Humanity: concerns that if robots replace human carers they would be unable to fulfil people's social or emotional needs.
- Autonomy: focus groups have identified concerns about the degree to which robots could prevent people from engaging in risky behaviors.
- Consent: the extent to which robots could make people do something they did not wish to - like take scheduled medication.
- Independence: the potential that users may become dependent on robots.
- Security: robots with poor security could be vulnerable to hacking, and could, potentially, be controlled remotely by an attacker.

225. The evidence base for the effectiveness of robots in supporting provision of care within the UK is still relatively under-developed with many of the robotic technologies yet to move from concept and early prototype stage to wider application within the care sector.[134]

226. A review of the evidence for selected robotic technologies reports positive findings such as reductions in depression and agitation scores, loneliness and increases in quality of life scores. These are based on a number of global research trials although the majority were from Japan or the US. There were also methodological issues with many of the trials; many of the studies focused on dementia patients and within nursing home settings. Therefore, it is not known is these results would be transferable to the UK.[135]

227. There are other notable absences in the robotic technology evidence base; understanding user experience and acceptance, implications for carers and wider social care workforce including potential training needs and an understanding of how these technologies may be cost-effectively marketed, scaled or rolled out to individuals.

228. See: care robot, RIBA II, lifting patients at https://www.youtube.com/watch?v=wOzw71j4b78

and care robot, Pepper, supporting dementia patients at https://www.youtube.com/watch?v=sZWdV7qnopE

Conclusion

There is potential for robots to contribute to the provision of care, alongside human carers. The technology is developing rapidly, although there remain some practical and ethical issues.

Recommendations:

R17. Staffordshire County Council and Staffordshire NHS should consider the role that robots might play in provision of care and should future-proof new facilities so that robots can be introduced as the technology matures.

134. Consilium Research and Consultancy (2018). Scoping study on the emerging use of Artificial Intelligence (AI) and robotics in social care. Skills for Care.

135. Consilium Research and Consultancy (2018). Scoping study on the emerging use of Artificial Intelligence (AI) and robotics in social care. Skills for Care

136. Abdi J, Al-Hindawi A, Ng T, Vizcaychipi MP. Scoping review on the use of socially assistive robot technology in elderly care. BMJ Open. 2018;8(2):e018815. Published 2018 Feb 12. doi:10.1136/bmjopen-2017-018815

Director of Public Health Annual Report 2018

Live Long and Prosper:

Digital Technologies for Health and Wellbeing

Summary of Recommendations

R1. Superfast Staffordshire should continue to expand physical infrastructure such as access to broadband.

R2. Staffordshire County Council, alongside relevant adult education and skills partners promote awareness of education and training opportunities to help residents develop basic digital skills.

R3. Staffordshire Health and Wellbeing Board should take a lead in increasing public awareness of health and care digital technologies to help them improve health and wellbeing or better self-manage their condition.

R4. Staffordshire NHS and Staffordshire County Council should provide continuous learning and tools for the health and care workforce to enable them to develop the skills and knowledge to 'digitally prescribe' where there is a good evidence base.

R5. Staffordshire County Council and Staffordshire NHS should promote digital IAG to support people to live healthier and longer lives. ORCHA should be used as a resource to help individuals and front-line staff to access a range of applications that have been graded for their suitability and effectiveness.

R6. Staffordshire NHS should promote use of the NHS App to help people manage their primary care online.

R7. Staffordshire NHS should promote the use of applications such as MyCOPD to help people manage long-term conditions where there is good evidence that they are effective and invest in them where there is good evidence that they are cost saving.

R8. Staffordshire NHS should roll out flash glucose monitors and insulin pumps for eligible diabetic people, in line with NHS policy and NICE guidelines.

R9. Staffordshire NHS through the STP digital workstream should keep abreast of developments with other biometric monitoring and implantable drug delivery devices and introduce these into clinical practice as evidence emerges to demonstrate their effectiveness and cost-effectiveness.

R10. The Health and Wellbeing Board should ask for a report on the Staffordshire Integrated Care Record as it is rolled out to examine the benefits and costs.

R11. Staffordshire NHS, through the STP digital workstream, should ensure that GP telemedicine is thoroughly evaluated as it is rolled out.

R12. Staffordshire NHS, through the STP digital workstream should explore opportunities to roll out teledermatology and teleradiology, within a properly regulated framework to ensure good standards of care.

R13. Staffordshire NHS should roll out online CBT to expand access for people with depression and anxiety in line with NICE guidelines.

R14. Staffordshire maternity services and health visitors should promote the use of Breastfeeding Friend to support women to initiate and sustain breastfeeding.

R15. The Health and Wellbeing Board should promote telecare and assistive technology and signpost people to useful devices.

R16. The Health and Wellbeing Board should monitor the national evidence base for assistive technology and telecare and encourage local providers to participate in evaluation of telecare and assistive technology.

R17. Staffordshire County Council and Staffordshire NHS should consider the role that robots might play in provision of care and should future-proof new facilities so that robots can be introduced as the technology matures.