



Future Care Capital

Report

Care Tech Landscape Review

Residential

Dr. Peter Bloomfield and Cristina Ruiz de Villa, December 2021



**Newmarket
Strategy**



About FCC

Future Care Capital is a charity which undertakes research to advance ideas that will help shape future health and social care policy and deliver better outcomes for individuals living in the UK. Beginning life as the National Nursery Examination Board in 1945, the charity has evolved throughout its 70-year history and we continue to have Her Majesty the Queen as our Royal Patron.

Newmarket Strategy is a specialist UK consultancy dedicated to improving access to healthcare innovation. Launched in March 2021 following the merger of three existing companies, the founders of Newmarket Strategy – Berkeley Greenwood, Ed Jones and James O’Shaughnessy – apply deep regulatory, policy and market entry expertise to supporting healthcare, life sciences and health tech companies drive uptake of their innovative products and services.

About the Authors

Dr Peter Bloomfield is Head of Policy and Research at Future Care Capital. He has extensive experience of clinical research, technology research & development and technology start-up acceleration.

Cristina Ruiz de Villa is a consultant at Newmarket Strategy. She has considerable experience of the changing reimbursement and access landscape in the UK, and is very familiar with the cultural, regulatory and policy barriers to innovation uptake in the NHS.

This research is © Copyright 2021 Future Care Capital. Company Registration: 2887166. Charity Registration: 1036232.

The start-ups, technologies and products described in this report are to inform the audience. Future Care Capital and Newmarket strategy are independent, neutral organisations that do not endorse any company or solution.

The Authors would also like to thank Professor Martin Green, Vic Rayner, Romney Gwynn and Claudia Forsyth for their work on this review.



Contents

Forewords	4
Key Findings	6
Technologies	6
Investment	7
Introduction	8
Defining residential care	8
Residential care workforce	9
Digital Technology in residential care	9
Inclusion/exclusion criteria	11
Case Studies	13
Discussion	14
Understanding the landscape	14
Technologies currently available	16
Gaps in the market	18
The innovator perspective	19
The Opportunity	20
Recommendations	22
Reference and appendices	23
Appendix 1 – Methodology	24
Appendix 2 – Glossary	25
Appendix 3 – Solution Provider List	27
References	29





Forewords



There are almost half a million people in residential care settings in England, yet the model of care delivery has not been re-examined for some time. With increasing levels of digitisation across social care there is an opportunity for reflection, not merely to return to old models of care: what could we be changing? What could we do better? And what are the real technologically-driven changes that can make a difference to carers, residents and their loved ones?

Currently, the residential care sector reflects where the money is available. Most technologies explored in this review are focused on carers and valued in terms of their efficiency. This is not necessarily a bad thing – saving time, resource and capacity is helpful. However, technology should also reflect resident needs beyond more established concerns such as fall prevention and UTI management. There is a disconnect between the ultimate beneficiaries (residents) and users (carers) of these technologies.

The experience of those in residential care homes has not been fully considered. We must ask technology developers to consider not just what will keep people safe, but how to make people feel more *comfortable*, and how to make them feel at *home*. Whether it's a VR-solution, or the ability to seamlessly change TV channels without relying on carers, there is an opportunity to create innovative technology that shifts the expectations of people in residential care settings. Demand signalling and consumer demand are massively underestimated drivers of progress in digital transformation. There is a powerful consumer-driven agenda around technology adoption.

Then, there is regulation. In contrast to other sectors, the coronavirus pandemic did not drive large amounts of technology development or investment by suppliers or commissioners. The burden and the onus of digitisation remain on carers to make it work. More support is needed to upskill carers, provide standards on assessing which technologies are best, cybersecure practices, and to cement the use of digital technology where it is helpful.

Finally, there are ICSs. Here, there is a strategic opportunity for health and social care to not just co-exist, but converse. ICSs are well placed to act as a place for real integrated thinking between health and social care. One can only hope that the integration agenda will succeed and bleed through to other areas of health and social care.

One thing is clear: digital technology has the potential to improve the quality of care for residents, and it is positive to see this recognised so strongly in the government's recent White Paper on the reform of Adult Social Care¹. This can mean different things to different people, and it is time that we embrace different definitions and wants for digital technology in residential care settings

Vic Rayner OBE

Chief Executive Officer, The National Care Forum





Care is a diverse sector made up of many different types of organisation and people. Many organisations are embracing technology and data, both of which are important and distinct. The sector overall is data poor, and that has held us back. Electronic care planning systems being put in place have been a useful step, and recently built medium sized care groups are now developed with more technology by default. Smaller providers often are not very advanced in relation to technology and need help with adoption.

The pandemic has accelerated the issue of technology adoption and data quality. We are now seeing tablet-based communication for residents and families, as well as virtual meetings for staff. Introducing the Capacity Tracker, linked to funding, has been crucial for improvements in data quality and has also resulted in novel datasets. Beyond the management of care homes during the pandemic, technology has also been so important in providing a connection for residents with their family. There are challenges ahead and with 40,000 deaths in care settings, many staff are experiencing forms of PTSD.

Going through the findings of the research, it is surprising that not many advertise or feature AI. It is also noteworthy how limited the pool of start-ups is and how many are focused on one problem or group of problems. The sector is not currently communicating its needs or challenges well enough. We need to get people in the care sector talking to designers and developers. If you clearly describe a challenge or problem, creative technology developers can design an appropriate solution. Adopting care technology can be initially burdensome, but we need to understand that implementing technology in care does improve things, making life easier in the longer term.

The workforce crisis in care is acute. There is a real opportunity for technology to deliver where people have left the sector. The more advanced we make the sector, the more attractive it will be to workers, especially younger people who can have career progression related to digital skills. The interaction between people is key for the quality of care. But technology doesn't need to erode the relationship between resident and carer. A narrative and whole story is needed to articulate what it means to be in care and how technology can enhance that. There is a clear opportunity for the regulator to develop new ways of approaching digitally-enabled care. Regulatory mechanisms which stimulate innovation and creativity are crucial and inspiration should be taken from other sectors and regulators, here I would highlight how aerospace and airlines operate. Cascading good practice throughout the sector is vital and the regulator can be a catalyst for this.

As integrated care systems (ICSs) are introduced, technology can help to drive integration. The sector is however in need of clearly defined approaches to measuring outcomes when it comes to digital technology. A range of expertise and creativity is needed for ICS boards to flourish. The independent sector is really looking at data capture and can make use of this for technology development. Creative and incentivised funding structures are needed to redress the balance between health and care, and taking inspiration from other sectors we can create huge beneficial changes.

Professor Martin Green OBE
Chief Executive Officer, Care England





Key Findings

This review is the fourth instalment in a series exploring the advanced digital technologies being developed for, and deployed to, the adult social care sector in England. We have previously explored home care technology, mental health care and learning disability technology. The present research provides an overview of residential care technology solutions and maps the technology companies providing solutions for people in residential settings. Through desk research and consultation with experts in residential care technology we explore how a larger number of appropriate solutions could be provided to the sector.

The research identified 58 companies developing digital technology solutions for the residential care market. The key findings below demonstrate the size of the market, locations of companies developing solutions and quantifies the available information about investment in solutions.

Technologies

Our research identified a group of start-ups developing residential care technology. Figure 1. shows the distribution of company headquarters across England and the function of technology in development. The main technologies being developed were: Apps (29), Platforms (37) and IoT (Internet of Things) technologies (16). While only 58 companies were found, a number had both Apps and Platforms, or IoT products in combination, as an example, of the 16 IoT companies, 8 were developing apps or platforms alongside the IoT objects for residential settings. Many solutions lend themselves to being developed further to incorporate AI (artificial intelligence), VR (virtual reality) or gamification functions, indeed a small number are already incorporating such features (8, 1, 1 respectively). Donut charts below demonstrate the breakdown of three main technology types being developed and the size of each company by number of employees:

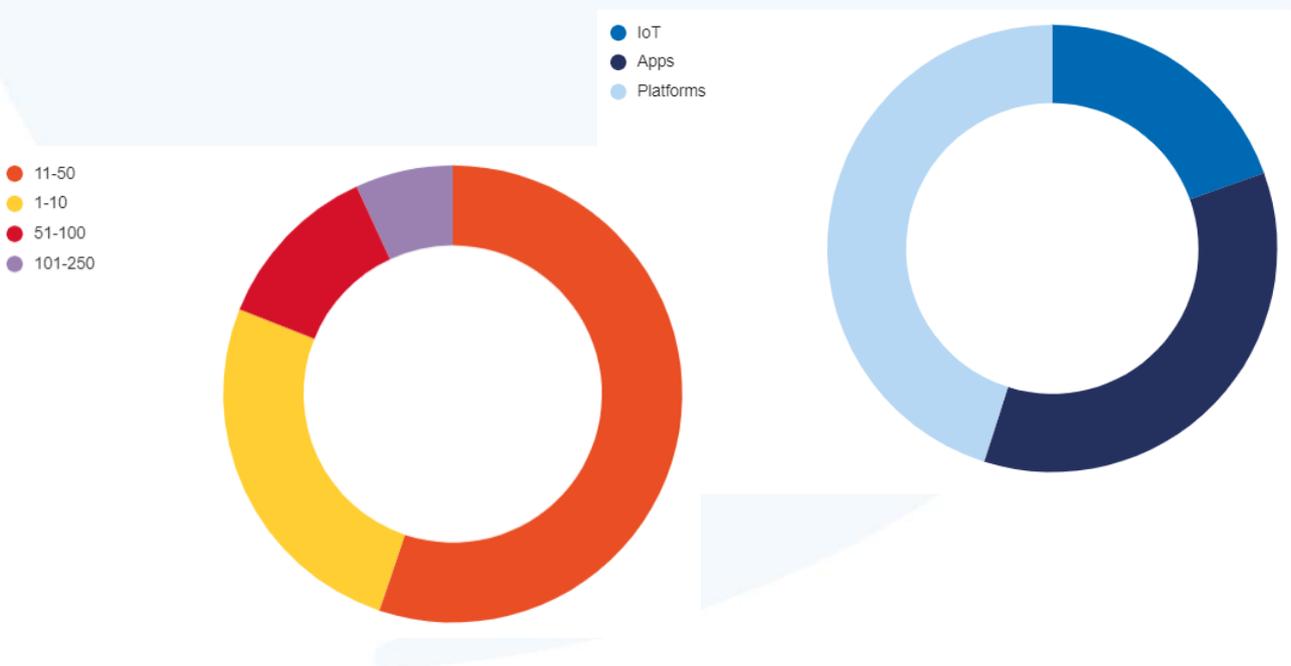


Chart 1. Breakdown of company size and technology deployed

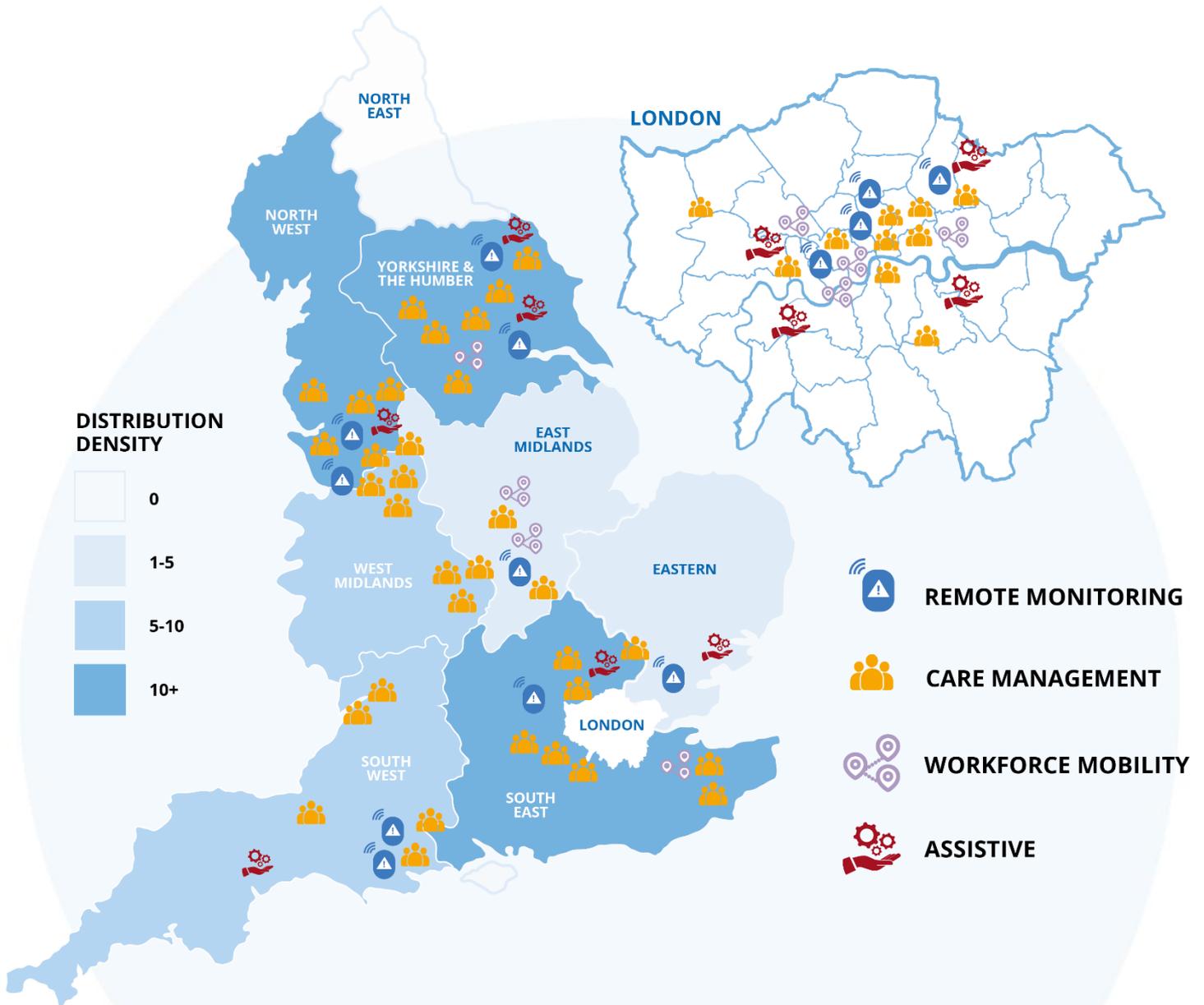


Figure 1. Where are the solution developers based?

Geographical spread of technology developers in England providing solutions to residential care homes. Functions of technologies include remote monitoring, care management, workforce mobility and assistive technology.

Investment

The investment received by these companies is comparable to similar companies in other sectors or sector niches (£4m). For example, companies developing mental healthcare technology solutions according to this review's criteria: £3.7m. For Home care technology companies in the first review we conducted, the average investment was £800k and learning disability technology was £400k.



Introduction

The residential care sector in the UK has a complex structure and is arranged between government funded, charity and privately funded care. Residential care homes cater for a range of scenarios, from children to young adults through to elderly care and hospice care. The COVID-19 pandemic has had a profound impact on the residential care sector. Vulnerable individuals in residential settings have suffered disproportionately through the pandemic, similarly the pandemic has had a significant impact on residential care workers. The true impact of the pandemic may not be fully realised for a number of years. It is already clear that residents and care workers have died at higher rates, mental health is on the decline and retention of care workers is more difficult than ever.

Defining Residential Care

Residential care can be provided through local councils, charity homes or privately. Table 1 shows the number of care homes, residents and size of the workforce in the UK and England (adapted from [2]).

	England	UK total
Care homes	15,009	17,598
Residents	418,710	490,326
Workforce	595,000	696,340

A substantial portion of these residential care homes are nursing homes (4,104 homes in England are nursing homes). A nursing home is a type of residential care home which always has a qualified nurse on site. Literature on the residential care sector largely focuses on elderly care. It is difficult to estimate the number of learning disability care homes in the UK, however searches on carehome.co.uk suggest more than 6,300 of residential homes in the UK are for learning disability care³. As defined in the first report in this series, alongside residential care with and without nursing, there is residential care for dementia, respite or short stay care, supported living and supported housing. With the exception of dementia care, all of these forms of residential care are considered as part of the present review. Interestingly, the CQC reports that size plays an important role in the quality of care. Smaller care home providers (1-10 beds) deliver better care for residents, presumably through more personalised care⁴. Technology could play an important role in bridging this quality gap in medium and larger care home providers.

Funding in the residential care sector is varied and at times care homes are in a precarious financial position⁵. The standard rates defined for different types of residential care also tend to be much lower than the reality of what is paid⁶. Financial sustainability and management of the sector through the pandemic and a subsequent recovery needs to be carefully considered and a tailored package of financial and strategic support for the sector is imminently needed, beyond the recently introduced levy⁷.



Many developed nations are progressing through to the later stages of demographic transition, exhibiting aging populations. Reduced birth and death rates are resulting in populations which live and work longer and require many more years of care throughout life. This has led to the emergence of a 'silver economy'. The European Commission estimates that by 2060, 1 in 3 Europeans will be over 65 and a ratio of 2:1 people of working age to those considered 'inactive' (currently 4:1)⁸. While many of the population will be economically active for longer, the funding and provision of care will need to be carefully managed to ensure stability and adequate provision for all.

Residential Care Workforce

The workforce for care is critical to managing the needs of all age groups engaging with care services. Two thirds of adults in the UK can also expect to become unpaid carers in their lifetime and most carers are middle aged⁹. Workforce retention in formal care settings has been difficult for many years. There is an approximate deficit in the care workforce of more than 110,000 workers¹⁰ and a combination of COVID-19 and a post-Brexit political context is exacerbating an already difficult situation¹¹.

Digital Technology in Residential Care

Residential homes are distributed across the country, some in rural areas, although many are in urban areas. There are positives and negatives to each location, for example while urban settings may have better infrastructure and connectivity, air quality and pollution is much worse, often above recommended safe levels¹². Rural locations, while having better environmental qualities, suffer from a lower quality or availability of infrastructure. Of the residential homes in the UK, 7,016 reportedly have internet connectivity¹³. However recent reports have suggested 7000 homes are without any form of connectivity¹⁴. While these differences may be in part related to data availability, a substantial number of homes have a major barrier to widespread adoption of digital solutions. New infrastructure and connectivity technology (for example 5G¹⁵ and satellite technology¹⁶) has great potential for connecting rural and remote locations.

Similar to considerations about infrastructure, up to date, comprehensive data and insights about the sector is difficult to find. In many instances, information is out of date and an accurate understanding of the sector is difficult to achieve. Early in the COVID-19 pandemic, bed occupancy data was highlighted as crucial, however reporting systems have not been implemented seamlessly¹⁷. Work by FCC during the pandemic has highlighted gaps in data provision across the sector¹⁸ and on a local authority level¹⁹. The Draft National Data Strategy for Health and Care²⁰ is a step toward better systems and data insights for both health and care. However, the majority of focus is on healthcare and while care has a dedicated chapter, the final version would benefit from care being incorporated throughout²¹.

The COVID-19 pandemic has had a startling impact on the residential care sector and many systemic vulnerabilities have been highlighted. The human cost of the pandemic will be felt for many years. Improvements to data availability and an acceleration of digital technology adoption have both moved things forward substantially. The benefits are being felt in the



context of COVID-19, yet it is unclear how much of this momentum will be sustainable in the long-term. The current policy context for social care is continually shifting. The introduction of ICSs through the Health and Care Bill²² is attempting to change the boundaries between the NHS and care sector, the newly introduced 1.25% levy will deliver a modest amount of funding to social care. The recently published white paper (People at the Heart of Care²³) emphasises the role of technology and data in the delivery of care. The support through such policies is welcome, however there is much more that needs to be done to move from a state of crisis and maintenance to a more positive context of improvement.





Inclusion / Exclusion Criteria

To develop the following criteria, we considered solutions from the perspectives of residential care specificity, clinical or care function, and technical features. To reduce sample bias, the search terms and definitions used were validated by an expert in the field.

Specificity

The distinction between residential care and home care (domiciliary) is an important consideration for this review. The former takes place in a person's home, and the latter takes place in a formal communal setting. Many of technologies developed for home care could also be used in residential care. These were only included where there was publicly available evidence or case studies to support this usage. Similarly, technology developers deploying solutions across multiple health or non-health related sectors were included if at least one of their products was adapted (or at least, re-marketed) for use in residential care homes. Distinguishing technology by the environment in which it is applied was found to be a useful approach, though some technologies may have been omitted as a result.

As discussed in the introduction, technologies for the treatment of dementia were excluded. Dementia and neurodegenerative diseases are distinct markets requiring separate consideration, where defined programmes for technology already exist. There is an important distinction to be made between technologies supporting healthy ageing or clinical disorders of memory. Assistive technologies supporting healthy ageing, like memory aides, were included.

Scope

Residential care is largely associated with the elderly. However, there are a range of other types of residential care. In an effort to maximise the pool of technologies available, the following settings were included in the scope of this report: respite or convalescent care, rehabilitation, physiotherapy, hospice care, palliative care, and supported housing, including due to mental ill-health or disability. Technologies across mental health and learning disability were explored in the previous instalments of the Care Tech Landscape series.

For context, the PRISMA diagram (figure 4 in the methodology appendix) shows how many companies were included at different phases of review. Of the relevant companies examined, the vast majority (370/395) were excluded for not matching the criteria above, particularly for not being specific to residential care settings. However, it is interesting to consider that technology solutions currently deployed in health care, home care or other sectors could be adapted for use in residential care settings. Local authorities, CCGs (clinical commissioning groups) and care homes have run pilots and developed solutions in-house or with a range of technology partners. These were often excluded due to a lack of information to assess inclusion. This may have resulted in the omission of some useful technologies. The significance of this is explored further in the discussion.

In comparison to the previous three reviews, far fewer technologies were identified in the initial CrunchBase search. The report relied heavily on additional, targeted searches, which made up 33/58 of the total company list. It is interesting to consider why this may be the case, which will be explored further in the discussion.



Figure 2. Technology segmentation

Most technologies in residential care settings are focused on the provision of care. The development of the segmentation by function (figure 3 above) was relatively straightforward, and reflects that certain forms of technology solutions are fairly established in residential care settings. The most established technology functions, remote monitoring and care management, had the most solutions and displayed a broader spectrum of technical features than previous instalments in the Care Tech Landscape series. In contrast, newer forms of technology application, involving digital workforce mobility and clever assistive technology, had the fewest solutions.

Importantly, there is some overlap between the technical domains and functions of the technologies above, suggesting some multifunctional solutions are being developed. That is, some companies have developed technology solutions sitting across multiple functions, such as an app enabling both care management and workforce mobility. Further research is needed to understand whether users prefer a single technology with diverse functionality or multiple technology solutions, each focused on addressing separate problems²⁴.



Case Studies

Group 1 - Remote monitoring: This category includes technologies that are used to monitor the whereabouts, vital signs and environmental changes related to residents within a care home. These solutions are typically IoT-based and include cameras, acoustic monitors, vitals-tracking wearables and fall alarms. The passive data collected by these technologies is connected to software and apps, which carers, care home managers and residents' family members can access to assess the quality of care received and deliver timely interventions. By automating data collection, remote monitoring technologies can help care homes to understand and demonstrate the quality of care delivered to internal and external stakeholders, including regulators (CQC), and improve the efficiency of care



Group 2 – Care management: This group of technologies include a mixture of IoT, apps and software designed to make carers' jobs easier and faster. This was the largest technology group (38), suggesting there is considerable interest and need for efficiency-driving solutions. We included both care planning and care management solutions in this category; care planning entails the planning and recording of all elements of care, which is a legal requirement; care management includes all other elements of running a care home. This category includes electronic care records, eMAR (electronic medicine administration records), caseload management, task reminders, and digitised paperwork. Many technologies are also accessible by the family members of residents, allowing them to engage with residents' care plans.



Group 3 – Workforce mobility: Ongoing staff shortages and the strain of the coronavirus pandemic, has emphasised the need for a flexible care workforce. This group of technologies aims to address this by enabling carers to rapidly move between care settings to meet demand. Most technologies are apps or software, which are targeted at both carers (employees) and home care managers (employers). 5 technologies are included in this group. They facilitate all aspects of recruitment, from rostering and payroll to digital invoicing. The demand for such solutions is increasing, as shown by the introduction of a centralised solution for health workers in May 2020; the Digital Staff Passport, aimed to "*support the temporary movement of staff for COVID-19 response and the recovery of services*". No centralised equivalent exists for social care, perhaps contributing to the emergence of this technology group.



Group 4 – Assistive technology: This is an umbrella term that includes any technology that aims to improve or maintain an individuals independence. This category includes all of the technologies intended for residents, rather than carers. It encompasses physical aspects of care, such as a digital physiotherapy app for use in residential care homes; and the social aspects of wellbeing, including video calling apps allowing for communication and social interaction. Memory aides were the most common type of technology in this group. This was one of the smallest group of technologies (5). Affordability, accessibility, tech skills or sensory ability may be factors affecting the size of this group. It is also possible that residents are using generic technologies for leisure or assistive purposes instead, such as Alexa, Google home or tablets.





Understanding the landscape

This review is the final instalment of a four-part series examining the state of play for digital services across different branches of adult social care in England. It builds on previous research examining the digital transformation in residential care homes, including by The King's Fund²⁵ and Digital Social Care²⁶. Although there is some understanding on the quality and breadth of technology being used, the degree to which the care home sector, and social care as a whole, is digitised is poorly understood. Therefore, this review was guided by the available data and conversations with experts in the field. We are thankful to Tommy Henderson-Reay and Claire Sutton, Digital Transformation Leads at the National Care Forum, as well as Lee Omar, Founder and CEO at Safe Steps for their insights.

To contextualise the review's findings, it is useful to draw comparisons to the previous instalments in the series focused on home care²⁷, mental health care²⁸ and learning disability care²⁹. The number, types and geographical spread of technologies varies considerably. A dedicated sector review comparing and analysing the findings across the four markets will be made available in 2022.

This review identified 58 relevant technologies, which is comparable to mental health (56) and home care (43) and exactly three times more than in learning disability (19). We will consider why this is the case throughout the discussion. In contrast to the previous instalments, this review relied heavily on targeted, additional searches. Less than half of the companies were identified through CrunchBase, a platform focused on tracking private companies (particularly start-ups) and ventures deals data³⁰. The patchy coverage of companies may reflect variation in the commissioning landscape, which includes Government, local authorities and private-pay users. CrunchBase may be best suited to consumer technology, rather than public service markets.

It is possible that some technologies were omitted from this review as a result. In particular, technologies that are not marketed towards residential care but are regularly used in residential care settings may have been omitted from the research. This may include generic caseload management technologies or telehealth solutions, as well as home care technologies that are also used in residential care homes. Equally, large technology providers, which have dominated clinical settings and done some useful work in care, have been highlighted in previous research and were excluded from this review³¹. This review intentionally focused on SMEs and new flourishing technologies in adult care. Innovative and interesting technologies that are exclusive to foster homes or paediatric care settings, and often incorporate gamification elements, may have been omitted due to the adult care focus here.

Software-based technology, either by itself as a platform or combined with more specific apps and IoT devices, was the most common type of technology in the residential care market. In comparison, the technology in both mental health and learning disability was app-dominated. The home care market, which is most related to residential care, saw an even distribution of technologies. Differences in technology types can partially explained by the nature and maturity of the market niches, as well as the environments that they are used in. Though



technologies in mental health, learning disability and home care can be centrally commissioned, the solutions reviewed were overwhelmingly consumer-based. Here, the user and buyer of technology are usually the same. Instead, most of the residential care technologies explored are centrally commissioned, meaning that the buyer and user of the technology are distinct. As a result, residential care technology is most responsive to the former, and is overwhelmingly targeted towards carers and improving metrics of care delivery, such as driving efficiency, cost-savings or time-savings. In addition, residents in care home settings are more likely to experience mobility or dexterity issues preventing them from using technology, which may explain the smaller proportion of apps in the residential care technology market.

The location of companies developing technology in residential care is revealing. Although previous reviews have seen technology development evenly spread out across England, they were mostly developed around urban or innovation hubs, such as such as Cambridge, London and Oxford – the “Golden Triangle” within the greater South East of England³². In this review, 75% of residential care technology is seen outside of London, and most sits outside of major urban centres. This may partially be explained by demographic trends, as most recipients of care in residential homes are elderly; and populations in less densely populated areas tend to have a higher proportion of older people, mostly due to retirement trends³³. Delivering social care in rural settings is more expensive and presents different and specific challenges, both for the elderly and other groups in receipt of care in residential settings. As discussed in the introduction, care homes and their residents often have little or no access to digital connectivity, such as mobile signal or superfast broadband. This limits the implementation of improved approaches to care through innovation and technology. Dorset and Devon are examples of this dichotomy between elderly populations, with a high adult social care spend (£111.2m in 2020/21)³⁴, and rural infrastructure which is being upgraded to improve digital services³⁵.

Where data were available, average funding for residential care technology companies (£4m) is the highest in the series so far – mental health care (£3.7m), the average healthcare software company (£3.4m), home care (£800k), and learning disability (£400K) technology all attract lower levels of investment. However, there was only funding information available for 11/58 companies. Due to the small number of companies identified, there may be a greater relative amount of bias in the data. It is interesting to consider why home care, a closely related market to residential care – both use similar technology as found in an individual’s homes versus shared accommodation – is so underfunded in comparison. This may be partially explained by funding structures. The home care market is largely made up of consumer technology, which users pay for and purchase directly. On the other hand, the residential care market is commissioned by local authorities and care providers, and features longer and larger sales cycles. This may also be a result of cost barriers to entry for more formalised settings rather than the more consumer focused contexts of previous research. Further research is needed to understand the drivers of investment in residential care technology.

Of the 58 companies, 20 operated across multiple sectors, both related and independent. This



was not apparent in the previous reports. Of the 11 companies that have funding information, 5 are multi-sectorial, meaning the funding data is not entirely specific to residential care technology. Other sectors included healthcare, domiciliary care, hospitality and retail. This may partially explain the higher levels of funding found in this review, although the data are too limited to draw any conclusions. It also suggests a degree of commercial opportunism, with some companies expanding into social care, rather than developing bespoke products for the sector. Efficiency-focused digital technology may be more easily re-marketed or adapted for deployment in the “back office” of a care setting, than solutions designed for care delivery. According to our expert input, the coronavirus pandemic gave rise to an influx of companies looking to sell their products in social care settings.

The assortment of technology and levels of funding are proxies for the maturity of the residential care technology market. Our literature-based research suggests that there are a handful of large leading players which dominate and shape the residential care technology market, all of which are outside of the scope of this review³¹. There are also a variety of SMEs, which are in scope for this review, providing services at a local and regional level. Similar to other areas of care we have explored, residential care appears to be relatively fragmented, with innovation dispersed across many locations. However, large scale deployment, funding and adoption is complex, with multiple organisations involved and considerable variation across England³⁶. There have been a number of pilot programmes and initiatives in this area, such as the Social Care Digital Innovation Accelerator³⁷. However, levels of investment or innovation do not appear to be sufficient to make the most out of the considerable digital opportunity in the residential care home market, and more steps are needed to build on this progress.

Technologies Currently Available

Although the number of companies matching the criteria was comparable to previous reviews, we had originally expected far more companies to be deploying technology in this space due to the volume of users and more formal commissioning mechanisms in the market. In this sample, of the 58 technologies 5 are apps, 13 are software and 8 are IoT. The remaining solutions combine different technologies: 24 combine apps and software and 8 combine IoT and apps. These combinations are unsurprising due to the degree of remote monitoring and care management technologies used. Of the 58 technologies, less than 20% had augmented capabilities, such as AI (8), VR (1) and gamification (1). The technologies are almost exclusively focused on care provision and delivery; 25% of technologies provided overlapping services, or had technologies deployed in multiple categories, such as care management and workforce mobility solutions. Technologies which sit between lifestyle technology and care provision are not part of this review.

Most technologies were targeted to carers (53/58). The assistive technology segmentation (5/58) includes the only technologies intended for use by the resident, either for independent or guided use. There is a conflict in design between the main beneficiary (service users) and intended user (carer) of technology. This can be explained by a number of factors, such as lack of digital skills, concerns over technology use, and the fear of erosion of the carer-resident relationship.



Equally, the implementation of digital technology is not always straightforward. For care homes, piloting or integrating new technologies require changes in behaviour, which can be difficult to resource with a limited budget and workforce. Carers' primary focus is direct provision of care; the technical expertise to set up residential technology solutions (potentially a temporary requirement) is not something that is easily or quickly acquired. Cultural barriers, such as user's previous disappointment with technology or concerns that technology may displace carers, also exist. Throughout the course of our research, we also came across anecdotal evidence of carers who left the profession due to the implementation of digital. In this regard digital technology can be divisive. A balanced assessment will point that the use of technology can both result in staff shortages for those unfamiliar and uncomfortable with technology, as well as helping to attract and retain younger or tech-savvy workers. Ultimately, the push for digital and modernisation could help to neutralise workforce shortages and expedite the recovery from the pandemic. It was surprising to see no technologies focused on the mental health of carers themselves, who faced unprecedented pressure during the coronavirus pandemic. In particular, a GMB survey reported that carers in residential or disabled care homes reported lower mental health scores than other groups of carers³⁸.

Residential care encompasses a broad range of services, which has often been associated with the elderly. Although this review used a broader definition of 'residential care' including hospice, palliative care, respite care, or care for adults with learning disabilities and mental ill-health, tailored technologies (that fit the report's criteria) were not found. Readers are recommended to read instalments two and three of the Care Tech Landscape Review for more information about [mental health](#) and [learning disability](#) technology solutions respectively. With the increasing prevalence of long-term conditions, and an ageing population expected to increase from 18% in 2018³⁹ to 21.8% by 2030 in the UK³³, the focus on elderly residential homes may be profit- and growth-driven. Not only is this market expected to increase in size and value, but its users may be financially better off than those experiencing mental ill-health or living with disabilities, making it a more profitable market. Indeed, the Silver Economy research by the European Commission has examined how ageing populations can be drivers of economic growth⁴⁰.

As a result, our research suggests that few tailored technologies are used across most forms of residential care. Where they do exist, they might be developed by foreign or larger providers, such as Tunstall, Appello, or Acacium Group, meaning they are out of scope for this review. For example, a technology that uses AI to assess pain in residents with dementia care (PainCheck) is used, but not developed, in England. While it is not the primary focus of the research, it is surprising to see so few technologies developed or marketed to mitigate the impact of the coronavirus pandemic by SMEs (larger tech providers were involved in trials^{41,42} or research⁴³); or targeted towards medical professionals. England is generally considered to be good at innovating⁴⁴, but this is not necessarily the case for all industries, such as the care sector. Ongoing research by NHSX, due to be launched in early 2022, will be helpful to understand how many technologies are used in residential care settings, and the broader social care sector, and may help to determine how many are developed elsewhere and imported into England⁴⁵.



55 out of 58 companies were for profit companies. This was surprising, given that the social care sector is known to be underfunded and resource-strained⁴⁶ and large portions of the sector operate on a not-for-profit basis. Through the course of our research, we found various examples of care homes or health systems deploying their own technology solutions. It is often unclear whether these technologies were developed in-house or in partnership with a third party. The development of the Care Home Companion app was supported by Southern Derbyshire CCG⁴⁷; Sanctuary Care developed a bespoke care planning app in-house named Kradle⁴⁸; and Abbots Care co-designed its own care wellbeing app⁴⁹. These technologies were removed for not meeting the report's criteria (or lack of information). It is interesting to see evidence of in-house technology development and deployment, which are reportedly developed in a more user-centric way. According to our expert input, it is not uncommon to see in-house technologies developed for specific residential care settings; however, they often struggle to achieve wider adoption. Having been developed for a particular setting, they often lack features enabling customisation or scale.

In contrast to previous reviews, residential care technology is not part of a consumer market. It is, funded in varying degrees by local authorities and users. FCC and the Office for National Statistics have published a useful guide on funding flows and routes to care⁵⁰, which estimates the self-funding population in care home settings is 36.7%⁵¹. The residential care market is independently regulated by the CQC, which inspects and rates care homes according to the standards of care delivery, but does not measure digitisation, evaluate technology, provide funding, or investigate individual complaints^{52,53}. This is noteworthy, because it does not provide central incentives or official metrics for care homes to be measured against.

In residential care there is a "*misalignment of who pays (the social care sector) and who benefits (the health sector)*" which permeates the whole technology development process^{54,55}. Reconciling this conflict will be key and the development of integrated care systems (ICSs) presents a unique opportunity to tackle this. However, it must be accompanied by wider reform and parity of esteem across health and social care. Funding disparities are a key contributing factor to the gap in levels of R&D and uptake of innovations. The social care levy will begin to address these issues, but long-term action will be required to upskill the workforce and cement the use of beneficial technology in residential care homes.

Gaps in the Market

Opportunities for existing technologies to be scaled and deployed nationally exist. The uptake of care managing and planning solution shows an appetite to take new technology enabled approaches; here, IoT combined with AI could play an important role through the automation of data input and processing. Accurate data collection is particularly important for technology developers to demonstrate the effectiveness and cost-savings of its products (i.e. make a business case); and for care homes to show evidence of the quality of care they deliver to regulators (CQC). Better data collection would allow for the development of more tailored technologies across the broad range of residential care settings, including hospice care. According to our expert input, sophisticated technology such as acoustic monitoring can be prohibitively expensive, particularly where residential rooms need to be reconfigured to integrate it.



In contrast to the previous three reviews, it is difficult to identify specific gaps in the market for residential care technology. Our literature-based research and conversations with experts pointed to two main areas where technology has the potential to be particularly helpful and beneficial:

Consumer-based technology: Changing expectations of care means that future generations of residents will expect to live in digitised environments, and have access to the same technologies as everybody else. This review found that there were few technology solutions empowering residents to continuously coordinate, influence and manage their own care, to the degree they are able to.

Green technology for care: the health and social care system must do its part in considering how to reduce the carbon footprint of technology-enabled care delivery, if nothing else, because climate is a determinant of population health⁵⁶. There is little evidence of green technology use in residential care settings; though demand for sustainable solutions is rising⁵⁷. The NHS already has a net zero carbon strategy⁵⁸, and similar policies in social care would be helpful and encouraging. FCC has published research into the usage of technology in the NHS, emissions and climate which could be a helpful starting point⁵⁹.

It is crucial that policymakers and technology developers align with users' expectations of digital technology, particularly as younger generations move into residential care settings.

In accordance with previous reports, there are opportunities for technology to go further than current service provision and be used to develop new improved models of care. The highly customisable nature of digital technology means that there are varied potential applications in residential care yet to be explored⁵⁴. Currently, the residential care technology market appears to be led by technology developers. Solutions are developed with a varying degree of consideration for user demands, with some products adapted from other markets and others developed in response to perceived needs in the sector. There is scope for better demand signalling, and for carers and residents to be more actively engaged in this process. Indeed, demand signalling, co-developing or piloting technologies are all part of the technology development and adoption pathway. The Nuffield Trust notes "*cash-strapped councils are often pushed to commission care by the minute – with no space for people's voices or choices*"³⁶. Residential care settings will need support, time and resource to further engage in this process, and importantly, progress initiatives to scale adoption.

The Innovator Perspective

There are encouraging examples of technology co-development, with subsequent market penetration in the residential care sector. During the course of our research, we interviewed Lee Omar, the CEO and Co-Founder of Safe Steps, who discussed his experience of launching a residential care technology solution in England.

Safe Steps' mission is to prevent falls in the ageing population. Having a background in technology, and as a part-time carer to his grandad, Lee developed an early prototype to



detects falls quickly in 2014⁶⁰. By 2016, Lee's technology had caught the eye of a local council with rising fall-related costs. The council funded a six-month co-development process for Lee's team to develop an application: Safe Steps. This process enabled the team to get their product tested by dozens of care homes, and become acquainted with the lived experience of carers and residents, whom Lee strongly advocates for. In contrast to the challenges flagged in this review, Lee has not seen demand signalling as an issue at a local level. Safe Steps has often been commissioned through a network of trusted partners (including councils and charities) which actively reached out to the team, partially due to their ability to tailor their products. However, market fragmentation, differing funding models and variation in operational practices has made achieving scale difficult. Lee has found NHS budgets are increasingly receptive to Safe Steps' value proposition since the coronavirus pandemic, as it reduces the strain on the NHS by keeping residents safer in care home settings.

The Opportunity

In this landscape review, we set out to find solution providers developing technology to support carers and recipients of care in residential home settings. We found a modest number of SMEs developing technologies, particularly in care planning and management for elderly populations. Few technologies were specifically targeted to other demographics in residential care settings, despite being included in the scope for the review. Residential care is thought of as a 'sleeping giant', with significant potential to grow. As new generations of tech-savvy residents enter care homes, expectations of care delivery will also shift; residents will expect to access the same technology they would in their own homes. The question remains to what degree Government and local authorities will cover the cost for assistive digital technology.

The opportunity in digital is tangible at multiple levels: for residents it can promote agency and independence, improving their quality of life. For the health and care workforce, it can drive efficiency, which could in turn improve morale and job retention⁶¹ and provide upskilling and progression opportunities, attracting young people into care jobs. For health and care systems it can be cost and resource saving, help organisations understand and improve the level of care they deliver, and provide the evidence that regulators (CQC and other health and care regulators) and decision makers (local authorities, private care providers, resident's family members) require. For the sector, digital, particularly data collection, is an opportunity to understand the national and regional picture in residential care homes, and convey it in a compelling way. The Capacity Tracker, which provided real time information on hospital discharges and available capacity in care homes during the coronavirus pandemic, is an example of how data has already been used for smarter planning in response to volatility in the social care sector⁶². However, the data collection burden of this system is currently substantial and could be reduced by automating data input.

Equally, comparative transparency, or benchmarking, is an underestimated driver of improvement⁶³. It is important for carers to understand where they stand in comparison to their peers, and the CQC has an important role to play in this process. Benchmarking is often understood as a reactive comparison of outcome indicators. However, there is also a forward-facing aspect to benchmarking. It ultimately aims to encourage active collaboration amongst organisations "to create a spirit of competition and to apply best practices" to support continuous



improvement⁶⁴. Through routine accurate data collection, and identifying areas for improvement, benchmarking can help to provide the evidence required for the residential care technology sector to make a case for more funding, stimuli or broader reform. There is a narrow window of opportunity to build on the progress achieved during the coronavirus pandemic to date, which policy makers and commissioners should take advantage of.

While digitally-enabled interventions have huge transformational potential, they are not the right solution in every context. Human interaction and continuity of care are important aspects of care, which digital technology should not erode. There are particular concerns about accessibility and digital inclusion for residents with mobility or dexterity issues, so the implementation of digital must be carefully considered. If done right, digitising will empower carers, family members and residents, and provide one more avenue to put individuals at the centre of their care.





Recommendations

1. More research is needed to explore the use of digital technologies in residential care settings for the development of new interventions or optimisation of care delivery. Here, a user-centric approach, in which technology developers meaningfully engage with residents, carers and family members, should deliver more usable, beneficial and scalable technologies.
2. Over the course of this report, consumer technology for resident use and green social care technology has come across as a significant 'gap' in the market. Research into the development of sustainable technology solutions that enable residents to manage their own care, to the degree they are able to, is recommended to future-proof the use of technology in residential care settings.
3. For R&D to be aligned to the needs of the sector, better demand signalling processes are needed. We recommend building on progress from NHSX's review into digital innovation and capability in social care⁶⁵, and explore the potential implementation of a formal demand-signalling mechanism (regional or national) with users. It would be advisable for this process to connect start-up companies with established brands, charities or commercial entities, that can support the process of technology co-development, and adoption, through trusted partnerships.
4. With a renewed interest in social care and new commitments in the Spending Review⁶⁶, there is an opportunity for the Government to build on current progress and develop appropriate incentives for the development, uptake and scale of beneficial technology. Interventions could include:
 - a. Ring-fenced funding to encourage technology development and scale.
 - b. A standardised way to capture the benefits of technology in residential care, and broader social care sector. It would be appropriate for the reorganised NHS England strategy function (previously NHSX and Digital)⁶⁷ to set realistic targets of digital transformation centrally and monitor the digitisation of care homes in England.
 - c. Parity of esteem between health and social care will underpin progress in this area. We encourage the health and social care leadership to seize the ICS opportunity to advance this agenda.

The implementation of digital technology relies on the users (most notably, carers) who will be required to use it daily. Access to a widespread digital upskilling programme for carers in residential settings would provide the technical capabilities for this behaviour change, as well as career development and progression opportunities. This, in turn, could increase job retention and attracting younger or tech-savvy workers to care jobs. A clear career path in digital care should be established and demonstrated to jobseekers



References and Appendices



Appendix 1 - Methodology

While undertaking this Residential Care Technology Landscape Review, we conducted a variety of searches, including in reports and company databases, to ensure we captured as many types of residential care technology and early-stage companies developing them as possible. Companies were discovered through an initial search on [Crunchbase.com](https://www.crunchbase.com), a platform which provides market information on registered companies relevant to keyword searches. It hosts information on investment, size, scope, description, location, and founding members. There are >92,500 companies based in the UK across 1055 industry labels, with 47 industry groups. Several iterative steps were taken to collect and clean the data: 395 eligible companies were initially identified, which after manual cleaning and matching against the criteria further reduced the cohort of 25. Through additional online searches and comparisons with the literature, NHS App store, google play store and App Store, this was increased to 58 companies in total (33 added).

An aggregate list of companies was de-duplicated and cleaned to ensure that company information demonstrated the following:

- Developing a form of digital technology
- Registered in England
- Deploying products or services specifically designed for the mental healthcare market (not well to being or clinical psychiatric markets)
- An early to stage company smaller than 250 employees

Data were then quality assured through a series of comparisons with the literature, online searches, and cross referencing with a range of start-up acceleration programmes. To ensure we identified the widest possible range of relevant companies, we constructed individual searches using the following terms: social care, residential care, elderly care, geriatric care, independent living, nursing home, dementia care, care homes, adult care, care provision, domiciliary care, nursing home, long term care, short stay care, respite care, supported care, supported housing, 24 hour care, live-in care, convalescent care, hospice care, palliative care, rehabilitation, rehab, fall alarms, remote monitoring, care platform, telehealth, space management



Appendix 2 - Glossary

Digital Platform

A digital platform serves to facilitate interactions between two or more distinct but interdependent sets of users. These can be either organisations or individuals who interact on the platform via the internet. Fundamentally, the platform provides a service⁴⁰, and in the realm of learning disability care technology, this can look like a website or software where clinicians can access information inputted from another user for analysis and understanding purposes.

Internet of Things (IoT)

The IoT is a concept which underpins a “smart” and connected environment. This can be in the home, or part of a range of different public and private spaces. This category of technology relies heavily on connectivity and storage described below and is typically embedded in the infrastructure of a given setting, be that walls, furniture, or street level architecture. IoT is made up of networked objects and devices which can provide information from a location in the form of a live data stream, these devices are IoT sensors. IoT objects, known as actuators, in an environment can also be used to make changes to an environment, for example if a temperature sensor detects a drop in temperature, the actuator would increase the temperature. Depending on the connectivity available IoT cameras, speakers and interactive devices or assistants can be deployed. The richer the data, the better connectivity will be needed. For example, a string of numbers is easy to manage, whereas high resolution video would need a considerable amount of infrastructure. IoT technologies do not typically have computational power built into the device or object, so the analysis of data would generally occur on a separate computing device or remotely in the cloud, we discuss this more in the analysis and informed decision-making section.

Personal devices

Alongside the devices and objects making up IoT technology, there are numerous apps and platforms being developed to run on personal computers, tablets, and mobile phones. The more analytical forms will be discussed later from the perspective of care provision and coordination, however here we will focus on more personal, care recipient focused deployments. These devices can be used to interact with care providers, or family members as well as managing home delivery services, entertainment, lifestyle products and enabling different ways for people to work remotely. Several start-ups are also developing personal dashboards which allow users to monitor their environment, in conjunction with IoT objects.

Virtual Reality

Virtual Reality (VR) are in their early stages and, to date, are being used overwhelmingly for gaming or entertainment purposes. VR makes use of headsets to provide an immersive, fully virtual environment. VR can be combined with multisensory stimulation or haptic feedback. In this research found start-ups developing different technical realities for learning disability healthcare apps. The products focus on transporting the user to stress free environments, or using the VR headset to allow the user to express their emotions in a visual way.



Analysis and informed decision to making

The objects, devices, interfaces and forms of connectivity described above have the capacity to produce and store large quantities of data which can be analysed and used to better inform care and improve care quality. This data can be used in a variety of ways, from relatively simple statistical analysis, to much more advanced modelling techniques providing predictive insights. The outputs of this analysis can be used very effectively to detect anomalies, suggest better care options and pathways, and help with lifestyle to based scheduling, monitoring and choices.

Artificial intelligence, machine learning and data analytics

Data centric technology is advancing at a rapid pace and the emergence of machine learning (ML), artificial intelligence (AI) and analysis of vast quantities of data have provided new possibilities for machines to augment human practice. Current “AI” techniques can provide accurate predictions and analyse or categorise huge quantities of data which at times would be beyond the abilities of a human. They are good at “narrow” apps, where they are designed and implemented for a very specific task, often requiring large amounts of computational power to process data. For example, by monitoring the heart rate of an individual with learning disabilities, an AI algorithm can collect the data overtime, create a personal profile of the individual, and predict distress and anxiety. This information can be relayed to either family or carers, who can step in pre-emptively, whilst the distress is rising, to calm the individual down and prevent potentially harmful outbursts.

Connectivity and Storage

Fundamental to the deployment of the technologies described here is the underlying infrastructure which enables connectivity, communication, and storage. This is crucial for device operation and interactions between recipients of care and care providers, but also is of great importance for the collection, storage and processing of data, which we will explore in a later section. In the home, Wi to Fi and mobile connectivity are some of the most familiar forms of connectivity. Through this connectivity recipients of care can interact with loved ones, healthcare professionals, as well as manage deliveries and a range of services.



Appendix 3 – Solution Provider List

Company	Short Tech Focus	Employees	Headquarters Location
Abyss System	Software/App	11-50	Cheadle
Alcove	IOT/App	11-50	London
Ally	IOT/App	11-50	London
Antser	IOT	1-10	Birmingham
ARC Health	IOT	11-50	London
Autumn Care	Software/App	11-50	Handforth
Brain in Hand	App	11-50	Exeter, Devon
Care Control Systems	Software/App	11-50	Devon
Care Hires	Software/App	1-10	Leicester
Care Line Live	Software/App	11-50	West Sussex
Care Vision	Software/App	51-100	London
Carebeans Limited	Software/App	1-10	Cheshire
Caredocs	Software	11-50	Bristol
CHS Healthcare	Software	201-250	Sutton Coldfield
CoolCare	Software	11-50	Leeds
Credentially	Software/App	11-50	London
Docobo	IOT/App	11-50	Leatherhead
DoLSpro	Software	11-50	Pocklington,
easyLog	Software/App	1-10	Kent
everyLIFE Technologies	Software/App	51-100	Farnborough
Fastroi	Software/App	51-100	West Lancashire
Feebris	IOT/App	11-50	Essex
Florence	Software/App	51-100	London
Health & Social eCare Solutions	Software	1-10	Harrow
iMOSPHERE	Software	11-50	Nottingham
Inhealthcare	Software/App	11-50	Harrogate
Invatech Health	IOT	11-50	Bristol
IoT Solutions Group	IOT	1-10	Bournemouth
Jontek	IOT/App	11-50	Stockport
KareInn	Software	11-50	London
Konnektis	Software/App	1-10	Sawbridgeworth
Liquidlogic	Software	101-250	Leeds



MED e-care Healthcare Solutions	Software	1-10	Manchester
Memory Tracks	App	1-10	London
MiiCare	IOT	11-50	London
MIRA Rehab	IOT	1-10	London
nourish	Software/App	11-50	Bournemouth
Nurse Call Systems	IOT	11-50	Bournemouth
OnCare	Software/App	1-10	London
Outt.com	App	11-50	London
Oxehealth	IOT	11-50	Oxford
Pando	App	11-50	London
PCLHealth	IOT /App	51-100	London
Person Centred Software	Software/App	51-100	Guildford, Surrey
Quality Care Systems	Software	11-50	Guildford, Surrey
Qunote	Software	1-10	Stowting, Kent
Radar Healthcare	Software	11-50	Leeds
ReMeLife w/RemindMecare	Software/App	1-10	Teddington
Safe steps	Software/App	1-10	Liverpool
Sekoia	Software/App	11-50	London
Social Care Network	Software	101-250	Manchester
Sona	App	11-50	London
Spirit Digital	IOT/App	11-50	Leicester
Tagtronics	Software/App	11-50	Lancashire
Unieke	Software/App	1-10	London
Unique IQ	Software/App	11-50	Redditch
Vcare	Software/App	11-50	Watford
Whzan Digital Health	IOT/App	1-10	Sunderland



References

- ¹ Department of Health and Social Care 2021, People at the Heart of Care: adult social care reform white paper, viewed 1 December 2021**
<https://www.gov.uk/government/publications/people-at-the-heart-of-care-adult-social-care-reform-white-paper>
- ² Care Home 2021, Care home stats: number of settings, population & workforce, viewed 2 December 2021**
<https://www.carehome.co.uk/advice/care-home-stats-number-of-settings-population-workforce>
- ³ Care Home 2021, learning disability search, viewed 2 December 2021**
https://www.carehome.co.uk/care_search_results.cfm/searchcountry/uk/searchchtype/learning-disability
- ⁴ Care Home 2017, Size matters in care homes with small doing better than large, says CQC, viewed 25 November 2021**
<https://www.carehome.co.uk/news/article.cfm/id/1586130/Size-matters-in-care-homes-and-home-care-with-too-many-people-getting-care-thats-not-good-enough>
- ⁵ Future Care Capital 2019, Data That Cares, viewed 2 December 2021**
<https://futurecarecapital.org.uk/research/data-that-cares/>
- ⁶ Future Care Capital 2019, Analysing local authority spend on residential social care provision for adults, viewed 2 December 2021**
<https://futurecarecapital.org.uk/research/analysing-local-authority-spend-on-residential-social-care-provision-for-adults/>
- ⁷ HM Revenue & Customs 2021, Health and Social Care Levy, viewed 2 December 2021**
<https://www.gov.uk/government/publications/health-and-social-care-levy/health-and-social-care-levy>
- ⁸ European Commission 2019, THE SILVER ECONOMY, viewed 2 December 2021**
<https://silvereconomyforum.eu/wp-content/uploads/2019/07/Silver-Economy-Brochure.pdf>
- ⁹ Carers UK 2019, Will I care? The likelihood of being a carer in adult life viewed 2 December 2021**
http://www.carersuk.org/images/News_campaigns/CarersRightsDay_Nov19_FINAL.pdf
- ¹⁰ Skills for Care 2021, The state of the adult social care sector and workforce in England, viewed 2 December 2021**
<https://www.skillsforcare.org.uk/adult-social-care-workforce-data/Workforce-intelligence/publications/national-information/The-state-of-the-adult-social-care-sector-and-workforce-in-England.aspx>
- ¹¹ Personal Social Services Research Unit 2020, Recruitment and retention of the social care workforce: longstanding and emerging challenges during the COVID-19 pandemic, viewed 2 December 2021**
https://www.pssru.ac.uk/resscw/files/2021/04/RESSCW_Policy_Brief_revised_final2.pdf
- ¹² BBC News 2021, Toxic air puts six million at risk of lung damage, viewed 2 December 2021**
<https://www.bbc.co.uk/news/science-environment-56013240>
- ¹³ Care Home 2021, Internet access search, viewed 2 December 2021**
https://www.carehome.co.uk/care_search_results.cfm/searchcountry/uk/searchchtype/internet-access
- ¹⁴ Digital Social Care 2020, Offers from internet providers to get care homes connected during COVID-19, viewed 2 December 2021**
<https://www.digitalsocialcare.co.uk/offers-from-internet-providers-to-get-care-homes-connected-during-covid-19/>
- ¹⁵ UK5G events 2020, Connected Care: Enabling rural care through 5G and tech infrastructure, viewed 2 December 2021**
<https://uk5g.org/attend/connected-care-enabling-rural-care-through-5g-and-/>



16 Osoro & Oughton 2021, A Techno-Economic Framework for Satellite Networks Applied to Low Earth Orbit Constellations: Assessing Starlink, OneWeb and Kuiper, viewed 2 December 2021

<https://ieeexplore.ieee.org/document/9568932?denied=>

17 CQC 2021, Data collection from adult social care providers during the coronavirus pandemic, viewed 2 December 2021

<https://www.cqc.org.uk/guidance-providers/adult-social-care/data-collection-adult-social-care-providers-during-coronavirus>

18 Future Care Capital 2020, Social Care Data Finder, viewed 2 December 2021

<https://futurecarecapital.org.uk/research/social-care-data-finder/>

19 Future Care Capital 2020, Social Care Data Finder 2, viewed 2 December 2021

<https://futurecarecapital.org.uk/latest/social-care-data-finder-2/>

20 NHSX 2021, Data Saves Lives, viewed 2 December 2021 <https://www.nhsx.nhs.uk/key-tools-and-info/data-saves-lives/>

21 Future Care Capital 2021, National Data Strategy – FCC and NCF joint response, viewed 2 December 2021

<https://futurecarecapital.org.uk/policy/national-data-strategy-response/>

22 Department of Health and Social Care 2021, Health and Care Bill, viewed 2 December 2021

<https://bills.parliament.uk/bills/3022>

23 Department of Health and Social Care 2021, People at the Heart of Care: adult social care reform white paper, viewed 2 December 2021

<https://www.gov.uk/government/publications/people-at-the-heart-of-care-adult-social-care-reform-white-paper>

24 Epidemiology and Psychiatric Sciences 2020, Multiple uses of app instead of using multiple apps – a case for rethinking the digital health technology toolbox, viewed 25 November 2021

https://www.researchgate.net/publication/338938621_Multiple_uses_of_app_instead_of_using_multiple_apps_-_a_case_for_rethinking_the_digital_health_technology_toolbox

25 The Kings Fund 2018, Digital change in health and social care, viewed 25 November 2021

https://www.kingsfund.org.uk/sites/default/files/2018-06/Digital_change_health_care_Kings_Fund_June_2018.pdf

26 Digital Social Care 2021, NHSX care home iPads, viewed 25 November 2021

<https://www.digitalsocialcare.co.uk/social-care-technology/nhsx-care-home-ipads/>

27 Future Care Capital 2021, Care Tech Landscape Review, viewed 25 November 2021

<https://futurecarecapital.org.uk/research/care-tech-landscape-review/>

28 Future Care Capital 2021, Mental Health Tech Landscape Review, viewed 25 November 2021

<https://futurecarecapital.org.uk/research/mental-health-tech-landscape-review/>

29 Future Care Capital 2021, Learning Disability Tech Landscape Review, viewed 25 November 2021

<https://futurecarecapital.org.uk/research/learning-disability-tech-landscape-review/>

30 TrustRadius, Crunchbase Reviews, viewed 25 November 2021

<https://www.trustradius.com/products/crunchbase/reviews>

31 Tele Care Aware 2019, Care technology landscape review, viewed 25 November 2021

<https://telecareaware.com/wp-content/uploads/2019/07/Care-Technology-Landscape-Review-Socitm-June-2019-Report-for-Essex-CC.pdf>



- ³² **London and Partners 2020, Innovation in life sciences, viewed 25 November 2021**
<https://www.business.london/invest/sectors/innovation-in-life-sciences>
- ³³ **AgeUK 2019, Later Life in the United Kingdom, viewed 25 November 2021**
https://www.ageuk.org.uk/globalassets/age-uk/documents/reports-and-publications/later_life_uk_factsheet.pdf
- ³⁴ **Dorset Council 2020, Dorset Council to increase funding for adult social care and children's services, viewed 25 November 2021**
<https://news.dorsetcouncil.gov.uk/2020/01/03/dorset-council-to-increase-funding-for-adult-social-care-and-childrens-services/>
- ³⁵ **Dorset Local Enterprise Partnership, Inward Investment Opportunity In Dorset, viewed 25 November 2021**
https://www.dorsetlep.co.uk/userfiles/files/IID/Brochures/Ecosystems_revisedInsert_digital2.pdf
- ³⁶ **Nuffield Trust 2021, The value of investing in social care; What are the benefits of further funding for reform to adult social care in England?, viewed 25 November 2021**
<https://www.nuffieldtrust.org.uk/files/2021-10/social-care-briefing-final.pdf>
- ³⁷ **Local Government Association 2020/21, Social Care Digital Innovation Accelerator (SCDIA), viewed 25 November 2021**
<https://www.local.gov.uk/our-support/our-improvement-offer/care-and-health-improvement/informatics/local-investment-programme/accelerator>
- ³⁸ **GMB Union 2021, Three quarters of care workers' mental health has worsened during pandemic, viewed 25 November 2021**
<https://www.gmb.org.uk/news/three-quarters-care-workers-mental-health-has-worsened-during-pandemic>
- ³⁹ **Office for National Statistics 2019, Living longer: is age 70 the new age 65?, viewed 25 November 2021**
<https://www.ons.gov.uk/peoplepopulationandcommunity/birthsdeathsandmarriages/ageing/articles/livinglongerisage70thenewage65/2019-11-19>
- ⁴⁰ **European Union 2017, Shaping Europe's digital future, 25 November 2021**
<https://wayback.archive-it.org/12090/20210303030119/https://ec.europa.eu/digital-single-market/en/news/growing-silver-economy-europe>
- ⁴¹ **Digital Health.net 2021, Care homes in South East London deploy remote diagnostic tech, viewed 25 November 2021**
<https://www.digitalhealth.net/2021/05/care-homes-in-south-east-london-deploy-remote-diagnostic-tech/>
- ⁴² **Care England 2021, Nursing home remains Covid free thanks to cutting edge technology, viewed 25 November 2021**
<https://www.careengland.org.uk/news/nursing-home-remains-covid-free-thanks-cutting-edge-technology>
- ⁴³ **IOTm2mCouncil 2020, Researchers test wearables for reducing Covid-19 in care homes, viewed 25 November 2021**
<https://www.iotm2mcouncil.org/iot-library/news/connected-health-news/researchers-test-wearables-for-reducing-covid-19-in-care-homes/>
- ⁴⁴ **Department for International Trade, UK innovation, viewed 25 November 2021**
<https://www.great.gov.uk/international/content/investment/why-invest-in-the-uk/uk-innovation/>
- ⁴⁵ **IPSOS Mori 2021, NHSX reviews on digital technology innovation and digital capabilities in Adult Social Care, viewed 25 November 2021**
<https://www.ipsos.com/ipsos-mori/en-uk/nhsx-reviews-digital-technology-innovation-and-digital-capabilities-adult-social-care>



46 Care Home Professional 2021, Social care underfunded and urgently in need of reform, say MPs, viewed 25 November 2021

<https://www.carehomeprofessional.com/social-care-underfunded-and-urgently-in-need-of-reform-say-mps/>

47 Care Home Companion 2017, Care Home Companion, viewed 25 November 2021

<https://carehomecompanion.uk>

48 Sanctuary Care, Enriching lives through technology, viewed 25 November 2021

<https://www.sanctuary-care.co.uk/enriching-lives/technology>

49 Home Care Insight 2021, Abbots Care launches app to support care worker wellbeing, viewed 25 November 2021

<https://www.homecareinsight.co.uk/abbots-care-launches-app-to-support-care-worker-wellbeing/>

50 Office for National Statistics 2021, Social care: Estimating the size of the self-funding population, viewed 25 November 2021

<https://blog.ons.gov.uk/2021/02/03/social-care-estimating-the-size-of-the-self-funding-population/>

51 Office for National Statistics 2021, Care homes and estimating the self-funding population, England: 2019 to 2020, viewed 25 November 2021

<https://www.ons.gov.uk/peoplepopulationandcommunity/healthandsocialcare/socialcare/articles/carehomesandestimatingtheselffundingpopulationengland/2019to2020#self-funding-population-of-care-home-residents>

52 Citizens Advice, Problems with NHS and adult social care - complaining to the Care Quality Commission, viewed 25 November 2021

<https://www.citizensadvice.org.uk/health/nhs-and-social-care-complaints/complaining-about-social-care-services/who-you-can-go-to-when-you-have-a-problem-with-an-adult-social-care-service/problems-with-nhs-and-adult-social-care-complaining-to-the-care-quality-commission/>

53 Care Quality Commission, What we do, viewed 25 November 2021

<https://www.cqc.org.uk/what-we-do>

54 SEHTA, Technology and Innovation in Care Homes, viewed 25 November 2021

<https://www.sehta.co.uk/cms-data/depot/sehta/Technology-Innovation-in-Care-Homes-The-SEHTA-Review.pdf>

55 Sussex Community NHS Trust 2014, Docoboweb Pilot Evaluation Report, viewed 25 November 2021

<http://www.sussexcommunity.nhs.uk/Downloads/news/docoboweb-pilot-evaluation-report.pdf>

56 World Health Organisation 2021, Climate change and health, viewed 25 November 2021

<https://www.who.int/news-room/fact-sheets/detail/climate-change-and-health>

57 Forbes 2021, Empowered Consumers Call For Sustainability Transformation, viewed 25 November 2021

<https://www.forbes.com/sites/forrester/2021/01/21/empowered-consumers-call-for-sustainability-transformation/>

58 NHS England, Delivering a net zero NHS, viewed 25 November 2021

<https://www.england.nhs.uk/greenernhs/a-net-zero-nhs/>

59 The Journal of Climate Change and Health 2021, Artificial Intelligence in the NHS: Climate and Emissions, viewed 25 November 2021

<https://www.sciencedirect.com/science/article/pii/S2667278221000535>

60 SafeSteps, viewed 25 November 2021

<https://safesteps.tech>



- ⁶¹ **Nuffield Trust, Developing the digital skills of the social care workforce: Evidence from the Care City test bed, 25 November 2021**
<https://www.nuffieldtrust.org.uk/files/2021-09/workforce-research-summary-final.pdf>
- ⁶² **The Care Provider Alliance 2021, Capacity Tracker Q&A: CPA briefing for social care providers, viewed 25 November 2021**
<https://careprovideralliance.org.uk/assets/pdfs/capacity-tracker-q-and-a.pdf>
- ⁶³ **Top Business Tech 2021, Why firms need Digital Twin Organization (DTO) and benchmarking processes to drive digital transformation, viewed 25 November 2021**
<https://tbttech.co/blockchain/security-and-data/why-firms-need-digital-twin-organization-dto-and-benchmarking-processes-to-drive-digital-transformation/>
- ⁶⁴ **Healthcare Policy 2012, Benchmarking: A Method for Continuous Quality Improvement in Health, viewed 25 November 2021**
<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3359088/>
- ⁶⁵ **NHSX 2021, Building the evidence base for digital innovation and capability in adult social care, viewed 25 November 2021**
<https://www.nhs.uk/blogs/building-the-evidence-base-for-digital-innovation-and-capability-in-adult-social-care/>
- ⁶⁶ **HM Treasury 2021, Autumn Budget and Spending Review 2021: documents, viewed 25 November 2021**
<https://www.gov.uk/government/publications/autumn-budget-and-spending-review-2021-documents>
- ⁶⁷ **HSJ 2021, NHS Digital to merge with NHS England in major tech overhaul, viewed 25 November 2021**
<https://www.hsj.co.uk/technology-and-innovation/nhs-digital-to-merge-with-nhs-england-in-major-tech-overhaul/7031386.article>
- ⁶⁸ **Business Models INC, Online platforms, 4 things you need to know, viewed 25 November 2021**
<https://www.businessmodelsinc.com/online-platforms-4-things-you-need-to-know/>



Future Care Capital

INFORM. CONNECT. TRANSFORM.



Further Information

For further details about us, our mission and values, the Board of Trustees and the Executive Team, please visit our website or follow us on social.

 futurecarecapital.org.uk

 @FCC_UK

 Future Care Capital

FB FutureCareCapitalOrg

Royal Patron: Her Majesty The Queen

Office address: Gillingham House, 38-44 Gillingham Street, London, SW1V 1HU