The South East Health Technologies Alliance was founded in 2005 to understand and meet the needs of small healthcare businesses. It has grown into one of the largest networks of individuals from Academia, Business and Care/Clinicians (over 1,300 members), with the purpose of creating and enabling opportunities that improve health and care as well as increase wealth. It does this by offering support on a one-to-one basis through its consultancy, and one-to-many through workshops, training and other events. SEHTA has a strategic partnership with the Kent Surrey Sussex Academic Health Science Network (KSS AHSN), to which it provides support on projects that enable companies to understand and access the NHS.

SEHTA has developed strong expertise in Digital Health (digital technologies applied to health, care, living and society), and particularly in Technology-Enabled Care Services (TECS, e.g. telecare, telehealth and telemedicine). Over the last 7 years the Company has attracted over 2 million Euros in UK and EU funding in support of digital health projects, including major initiatives with multinational electronics and IT companies and national charities. SEHTA has created a network of over 1,500 public and private sector contacts in TECS and a reputation for understanding the needs of clients (public and private sector) and assembling consortia who can meet those needs. It has a particular strength and knowledge of working alongside private-sector business. It is in this context that SEHTA started to work with the care sector, which is 90% privately owned in the UK. SEHTA worked with Surrey Care Association, several local authorities and key industry leaders who supply technology and services, to define the challenges of providing care in difficult economic environments and quickly recognised that TECS could play a major role in improving efficiency and effectiveness. This review is a distillation of the work that SEHTA has done over the past 7 years and in particular focuses on recent knowledge it accumulated working with the care home sector.

Executive Summary
Care homes (both residential and nursing) are an indispensable component of the portfolio of long-term care options available in the UK. However, the rising needs of our elderly population during this period of austerity are creating huge challenges for the industry. The greater use of ICT has for many years been proposed as a way of helping care homes provide high-quality services and improve their sustainability. Over this same period, SEHTA has been bringing care providers and technology suppliers together to help create sustainable ventures from its vantage point of independence from both. Coming from this background, this Review analyses the changing care environment and its impact on care homes and, from the large number of pilot projects and trials, identifies what will make a difference to a care home. The Review describes the process that SEHTA has developed for eliciting requirements and selecting solutions through rigorous analysis of care home needs and thorough analysis of the costs and benefits for implementing technologies to meet those needs. The conclusion is that the evidence is available and that now is the time for care home owners to implement appropriate technology to improve their efficiency and effectiveness.

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SEHTA would like to acknowledge those partners who have contributed to these studies and who helped with this Review.

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Introduction
This Review provides an analysis of the way that information and communication technology (ICT) applied to the care home sector has the potential to improve the efficiency and effectiveness of care provision. We define this enhanced care as Technology-Enabled Care (TEC), and the technology and supporting services as Technology-Enabled Care Services (TECS). When we refer to the care home sector in this report, we refer to both residential care homes and nursing homes.

The Review has been undertaken at a time when commentators describe health and care provision as being ‘a perfect storm’ of:

- rising costs - 3% increase in National Minimum Wage for adults and 17% for apprentices in 2015; the largest real increase since 2006
- rising demand - the number of people aged over 85 is projected to more than double between 2010 and 2035
- reduced funding - 17% real drop in social spending on the elderly since 2009/10

There is a growing body of research showing that TECS have the potential to reduce health and care costs, increase access and improve patient outcomes. However, there is also evidence that health and care practitioners and care home owners and managers have not embraced and benefitted from ICT in the way that many other sectors have, such as banking.

This Review will
1. Outline the Care Challenge - the scope and scale of the care home sector in the UK, and the size of its pressures
2. Outline the current use and potential opportunity of TECS
3. Describe the political and policy framework in support of TEC
4. Present the regulatory framework
5. Give detailed cost and benefit analyses for implementing examples of TECS
6. Provide more focussed evidence relating to the current needs of the care home sector and how TECS can help meet those needs
7. Offer selected case studies
8. Conclude with an informed glimpse into the future of TEC.

Footnotes:
1 https://www.gov.uk/national-minimum-wage-rates
THE CARE CHALLENGE

There are an estimated 5,153 nursing homes and 12,525 residential homes in the UK today providing accommodation for more than 426,000 people. A significant proportion of the UK’s elderly population is resident in these homes - around 4% of people aged 85 or over, and more than 16% of people aged 85 or over. Unless significant changes are made to our health and social care services, this provision of long-term care will be insufficient to meet the needs of our ageing population, which will see one in four people aged 65 or over by 2040, including more than 3.4 million people aged 85 or over (more than double today’s number). Further, the number of care home beds is decreasing; by 2020 it is predicted that there will be demand for 15% more beds, yet it is forecast that it will actually have 37,000 fewer care beds (almost 9% fewer) in England during 2015, but this trend is expected to accelerate dramatically as the financial pressures on care homes drive more and more of them into difficulties.

These pressures are overwhelmingly financial pressures that drive homes to create a fees structure in which private residents cross-subsidise the 52% of care home residents and 61% of nursing home residents who receive either full or partial funding from their local authority. The average premium paid by private residents is estimated to be 43%.

The second source of financial pressure on care homes is rising costs, mostly caused by increases to the National Minimum Wage (3% for adults and 17% for apprentices in 2015 - the largest real increase since 2006). As about 60% of the average care home’s income is spent on staff, many of whom are paid the minimum amount, these wage increases will be felt particularly acutely by the care home industry.

The combination of these different pressures on care homes will mean that many more frail and vulnerable people will have no option but to move into inappropriate care. For this reason, the sustainability of our nation’s care homes is contingent on national policy, and this Review explores technology’s role to contribute to this sustainability.

As technology has moved on, so too have the definitions of the types of technology used by health and care services. For the purposes of this Review, we will use the following definitions:

- **Digital health** – convergence of digital and genomic revolutions with health, care, living and society
- **Electronic health (ehealth)** – transfer of health resources and health care by electronic means
- **Mobile health (mHealth)** – use of mobile phones or mobile-enabled solutions that deliver health care
- **Smartphone Apps** – a piece of software which runs on a mobile device (frequently a smartphone) relating to health
- **Technology Enabled Care Services** – the use of telehealth, telecare, telemedicine, telesupport, telecoaching and self-care in providing care for patients with long term conditions that is convenient, accessible and cost-effective
- **Telecare** – remote monitoring of alarms and alerts, often in the home, e.g. falls, fire, flood
- **Telehealth** – remote monitoring and management of physiological conditions, e.g. blood pressure, blood glucose
- **Telemedicine** – remote diagnosis, analysis and treatment of medical conditions
- **Wearable device** – sensor applied to the body which converts physiological signals, e.g. heart rate, and other physical signals, e.g. movement, into electrical signals that can be stored or broadcast.

The highly customisable and flexible nature of technology means that it is only the limits of our imagination that prevent us from being able to describe its potential for any sector or application. Nevertheless, uptake of TECs by care homes is years behind this potential: many of the relatively low-tech solutions now gaining significant traction in the health sector, such as electronic care records, telehealth and physical and mental rehabilitation enabled by video game consoles, are only just beginning to be seen in leading care homes. In fact, many of the UK’s care homes still stand to gain a lot from even the simplest and most commonly found technologies of relevance to any business, including accounting software, staff-rostering software, text messaging, social media and websites.

There have been few authoritative reports on the deployment of TECs, however most industry-sponsored work highlights its paucity within the residential care sector. For example, reports commissioned by Advanced Health and Care Partner Division showed that fewer than 33% of care organisations use TECs to deliver service-user information to staff, around 50% use TECs to monitor staff visits to service users and 35% use TECs to raise an alert if a visit is missed. Additionally, only...
48% of care staff use software capable of updating individual care records. The reports also showed that almost 80% of care organisations still use paper records.

SEHTA has collected more detailed information about the use of technology by care homes in South East of England, and this is presented in Boxes 1 and 2. Case studies 1 and 2 demonstrate that the potential benefits of TECS to care homes are very real.

Evidence of the benefits of TECS to the health sector is more extensive. Most notable were the results published in 2013 and 2014 from the ‘Whole System Demonstrator’ - a project run from 2010 which purported to be the largest telehealth trial in the world. A series of publications reported that there were significant reductions in emergency admissions, A&E attendance and length of stay in hospitals, but challenges with the design of the trial meant that cost-benefits were not significant. Without robust planning, the cost-benefits of deploying TECS in care homes can also be difficult to get right. According to a Quality Watch report, ‘Focus on Hospital Admissions from Care homes’ (Feb 2015), care home residents have 40-50% more emergency admissions and A&E attendances than the general population of over 75 year olds and they also have significantly more conditions. Reducing hospital admissions would positively affect health budgets, but the means to achieve this may come from social care budgets.

In addition to misalignment of costs and benefits, the other barriers to care homes adopting TECS that SEHTA has come to learn include:

- Lack of awareness of what is available and possible
- Cost
- Short-term disruption for staff training
- Long-term difficulties integrating into standard practice
- Fear about confidentiality
- Concerns about using and relying on technology by relatives, care professionals and regulatory bodies.

CASE STUDY 1

Work reported by the Airedale NHS Trust showed that when a video consultation service was set up between more than 200 nursing and residential homes and the Airedale hospital, there was a 35% reduction in hospital admissions from these homes. Further, A&E usage by these adult nursing and care home populations fell by 53% and the number of hospital bed days were down by 59%.12

CASE STUDY 2

In 2013, Docobo, a telehealth and risk assessment company ran a trial of telehealth in a residential care setting, employing four Admission Avoidance Matrons to each manage, monitor and respond to telehealth data recorded from, on average, 23 residents from two residential homes with poor records for emergency admissions. The homes were supplied with Android Tablets, onto which Docobo’s software was downloaded and patient-specific parameters and thresholds set. The homes answered these patient-specific questions on regular intervals throughout a 5-day week for up to 8 months, with any breaches of thresholds being flagged to the matron on a dedicated website, for their response.

The outcomes of the trial were very encouraging: 23 patients (49%) had no admissions at all compared to the previous year, and there was a 75% reduction in admissions across all the patients involved. In addition, there was a 40% saving in nurse time and the feedback from residents and their families was very positive.

Unfortunately, as is often the case, this trial has not rolled into a longer term initiative because of misalignment of who pays (the social care sector) and who benefits (the health sector).13

BOX 2 - To gain a more up-to-date understanding of the current use of TECS by the care home sector, SEHTA surveyed 9 members of Surrey Care Association (http://www.surreycare.org.uk) and The Kent Integrated Care Alliance (http://www.kica.care) in 2014. The results were as follows:

Communication technologies:
- 100% of the respondents communicated via email
- 67% of the respondents had a website
- 22% of the respondents supported social networking
- 22% of the respondents used electronic care records

Technologies to support therapy and rehabilitation:
- 78% provided motion-capture video games consoles
- A small care home mentioned that it provided an audio-visual room
- A large chain of care homes provided remote physiotherapy

Telecare and environmental sensors:
- 67% of the respondents provided fall alarms
- 33% of the respondents used movement sensors to automatically turn lights on and off
- None of the respondents used location sensors to track clients or staff.

Telehealth:
- 44% of the respondents made use of some form of telehealth, ranging from NHS Apps for self-reporting of health and wellbeing, to remote physiological (including epilepsy) monitoring.

Telemedicine:
- Only one respondent used GP video conferencing and another used telephone conferencing.

Technologies for security:
- 56% of the respondents secured their property using digital locks, another used facial recognition technology, and another used CCTV.

Funding:
All of the respondents except for a large chain provider self-funded these technologies 100%. The large chain provider also received some funding from acute care Trusts.
The UK government has recently published a number of policies to accelerate the development of new, more efficient models of health and social care. The policies of most relevance to the care home sector are the NHS’s ‘Five Year Forward View’, the creation of the National Information Board and Technology Enabled Care Services, and the Care Act 2014.

The Five Year Forward View

In October 2014 NHS England published its ‘Five Year Forward View’. This guidance document described the seven new models of care that NHS England believes will need to become mainstream within the next five years to ensure that future demands for public healthcare in the UK can be met. One of these models is ‘Enhanced care in care homes - offering older people better, joined up health, care and rehabilitation services’, which is described as:

“The NHS will work in partnership with care home providers and local authority social services departments to develop new shared models of care and support, including medical reviews, medication reviews and rehabilitation services. These ... will draw on models that have been shown to improve quality of life, to reduce hospital bed use and to yield significant cost savings.”

In January 2015 the NHS invited care providers to become ‘vanguard’ sites for three of the seven new models of care, including ‘Enhanced care in care homes’. Since April 2015, NHS England’s New Care Models team has designed and delivered bespoke support packages to each of the 6 chosen vanguard care homes to implement their new models, including the Gateshead Care Home project, which aims to align GP practices and community nursing teams with care homes by co-commissioning all community-bed and home-based care, introducing a capitation-based payment system based on need, and developing outcome-based contracts. Airedale and Partners, will equip care homes with telemedicine services, providing their residents with a single point of access to all aspects of specialist health and care advice. It is hoped that the learning made by these vanguards will be used to develop new standards and inspire the nation’s 17,500 other care homes.

In a separate initiative, in January 2016 the NHS announced the winning ‘test-bed’ sites comprising partnerships of NHS and care providers and innovative businesses tasked with deploying and evaluating new technologies and services that enable better integration of health and social care, and digital health innovations that improve patient outcomes, experience and cost-effectiveness. Several of the 7 winning test beds address the healthy ageing agenda and the opportunity for TECS, such as Lancashire and Cumbria Innovation Alliance (LCIA) test bed.

The National Information Board (NIB)

The purpose of the NIB is “to put data and technology safely to work for patients, service users, citizens and the caring professionals who serve them, to help ensure that health and care in this country is improving and sustainable”. In the NIB Policy Paper ‘Personalised health and care 2020: a framework of action’ published in November 2014, there are 7 proposals which aim to deliver change, including for citizens to be able to access their digitised care records, placing England as a leading digital health economy and supporting care professionals to make best use of data and technology.

Technology Enabled Care Services

NHS England’s Technology Enabled Care Services (TECS) project has been developed by NHS commissioners to help maximise the value of TECS for patients, carers, commissioners and the whole health economy. It is a collection of practical tools and resources that help to raise awareness of how the wide range of TECS can support commissioning intentions and benefit patients, commissioners, families, health and social care professionals and provider managers. It also addresses the demand from commissioners for information on how to commission, procure, implement and evaluate these types of solutions effectively.

The Care Act 2014

The Care Act places greater responsibility on local authorities for care, providing them with greater power to influence their local services. The potential of local authorities as drivers of innovation and service improvement in the care home sector is explored in further detail in Section 8.
The CQC inspects every care home at least once every two years, with homes that perform poorly being inspected up to every 6 months. TECS have the potential to maintain if not boost a care home’s rating, by directly supporting the delivery of the care they deliver, and by generating the robust evidence of the five key questions assessed by CQC inspectors (‘Key Lines of Enquiry’ - KLOEs, see Box 3 for examples of how technology might enable this):

The five KLOEs:
1. Safe? Are residents protected from abuse and avoidable harm?
2. Effective? Are residents supported to live the life that they choose and experience the best health and quality of life outcomes?
3. Caring? Are staff kind, compassionate and respectful?
4. Responsive? Are services well organised?
5. Well-led? Does management inspire high-quality and person-centred care and promote an open and fair culture?

There is pressure from CQC to push care homes towards improvement – this means that those with sufficient resources have a strong incentive to improve their status from Good to Outstanding, affording them the opportunity to charge more for their services. In order for a key question to be rated as Outstanding, a care home must demonstrate imaginative and innovative facilities, services and systems that adhere to best practices and demonstrate creative thinking, i.e. they go above and beyond expectations. The other requirements for achieving an Outstanding rating that could directly benefit from technology are:

- systems for continuously driving improvements, e.g. automatic scheduling of meetings between staff and management in response to complaints and incidents,
- opportunities for enabling autonomous care are actively sought, e.g. falls detectors and GPS alarms,
- staff are considered excellent, e.g. staff empowered by electronic care records, communication technologies and lone-worker security technologies.

There is, of course, a significant proportion of care homes that must improve otherwise they risk losing their registration, making it illegal for them to continue operations. These care homes stand to benefit the most from adopting technology. This is because key questions are often rated as Requires Improvement because of inconsistencies in services standards, or because formal evidence of Good care (such as low medication error rates) is unavailable. Technology has obvious potential to remedy these problems; inconsistencies can be greatly reduced through automated alerting and reminders of best practice and electronic recording can build up a body of evidence that meets regulatory standards. Despite these positive attributes to the uptake of technology, consideration must always be made that any technologies used to deliver Safe, Effective and Responsive care do not undermine Caring care, i.e. care homes must not become so heavily reliant on technologies that they end up providing task-led rather than caring care. From our surveying of care home owners, it is clear that confidence needs to be raised that the CQC truly supports the use of technology to enhance care.
Money is the fundamental issue behind many of the barriers to the adoption of TECs, including initial purchasing and set-up costs, and lack of funds to train staff and then allow them to adjust to new ways of working. Care home managers must therefore be reassured of the favourable cost-benefits of a new technology before they will consider purchasing it. The benefits that TECs should bring care homes have one thing in common: they should enable its longer term sustainability. There are three ways in which this can happen:

- Improving resource efficiencies, e.g. reducing staff workload by reducing incidences of falls and health exacerbations and improving outcomes.
- Improving rates of referrals, e.g. improving reputation by excelling in CQC and local authority inspections, e.g. improving compliance of care standards and generate supportive evidence, and reduce incidence of falls and health exacerbations.
- Improving by improving client experience, e.g. support client socialising, cater for client independence with managed risk, allow friends and family to access care records, and reduce incidence of falls and health exacerbations.
- Improving marketing through higher quality advertising and stronger recommendations and testimonials.

CARE HOME OWNERS TODAY

The issue of greatest concern to our surveying highlighted as being recruitment and retention, which ought to improve staff satisfaction, flexible staffing timetables. This in turn leads to a higher quality of care and more cost efficient levels, any ‘saving’ of staff time can be used in an efficient way.  One issue that care home owners today face considerably is the growing trend for GPs to be reluctant to visit care homes, even after current calibrated to calculate the costs of care home residents to different parts of the NHS, benefits of specific TECs reported from trials in care homes, etc., parts of the NHS, benefits of specific TECs costs-benefits calculator. This tool draws on the latest published in and statistics relating to staff costs and recommended levels, time spent by staff on different tasks, costs of care home residents to different parts of the NHS, benefits of specific TECs reported from trials in care homes, etc., to calculate the overall cost-benefit to the care home implementing the TECs, as well as the cost-benefit to the NHS. It is currently calibrated to calculate the costs and benefits for the average nursing home in the UK, but is easily customisable to calculate the costs-benefits for an individual care home.

As already mentioned, few care homes have adopted more than basic technology, i.e. management computers and broadband connectivity. Fewer of these still have evaluated these adoption, including their cost-benefits. Case Study 3 is a real life description of how one care home group reduced its staff costs by adopting management software technologies. Case Studies 4 and 5 are scenarios created by the authors to illustrate the financial benefits of two other kinds of technology using SEHTA’s costs-benefits calculator. This tool draws on the latest published in and statistics relating to staff costs and recommended levels, time spent by staff on different tasks, costs of care home residents to different parts of the NHS, benefits of specific TECs reported from trials in care homes, etc., to calculate the overall cost-benefit to the care home implementing the TECs, as well as the cost-benefit to the NHS. It is currently calibrated to calculate the costs and benefits for the average nursing home in the UK, but is easily customisable to calculate the costs-benefits for an individual care home.

One TEC with obvious applicability to care homes is the remote monitoring of physiological measurements, i.e. telehealth. This has been the subject of a number of trials, which have demonstrated very positive results, including 38% reduction in GP visits15, 70% reduction in emergency admissions13, and 30% reduction in hospital length-of-stay14. The potential benefits to care homes are increases in resident fees for a premium service, and savings in staff time (direct care, communications and medications management) as new illnesses and exacerbations that are more time-consuming to attend to are avoided or reduced. The benefits reach out beyond the care home too; with new illnesses or exacerbations being detected sooner, fewer emergency admissions will occur, hospital stays will be shortened, and fewer drugs will be prescribed.

Using SEHTA’s TECs costs-benefits calculator, calibrated for the average nursing home in the UK, the overall efficiency gain of voice-to-text technology for a care home already equipped with electronic care records would be more than +£4,700 in year 1 and more than +£7,700 in subsequent years. This estimate is based on a scenario in which handheld PCs are purchased for the maximum number of staff on any one shift, a third of which are replaced every year, and equipped with voice-to-text software that is updated every two years. These PCs can feed text directly into an electronic care record with an accuracy of 99%, not only improving and increasing the content that is recorded, but also raising the possibility for long- and short-term trends in resident health and wellbeing to be detected and, if necessary, alerts raised.

Despite being very nearly to nearly all of all the care home managers and commissioning officers surveyed, to SEHTA’s knowledge, it is not in use in any care home in the UK today. Solutions that may be fit-for-purpose are available already on the market, but it seems that the barrier to widespread adoption is that many care homes lack adequate IT infrastructure and electronic care records.

CASE STUDY 3: REAL-LIFE EXAMPLE

Beritaz Care, a nursing and residential care group based in Surrey and Hampshire, installed modular care home management software at a cost of about £200 a month but saving 5% of staff time. The staff management module alone saves approx. 3 hours per week of record keeping time while enhancing accuracy. This saving in staff time has allowed the care home manager to expand his homes without needing to take on more staff. The owner has also begun using medication management software at a cost of £1,000 per home, but saving him £8,400 per year in staff time.

CASE STUDY 4: VOICE-TO-TEXT

Voice-to-text technology is widely available, installed by default on most smartphones. However, the accuracy of these mass-market voice-to-text technologies when applied to specialised language, such as in healthcare, can be inadequate, especially when the content contains high amounts of medical jargon. And yet the efficiency gains that the technology could bring to care homes is significant, with medical staff reportedly able to complete documentation, such as electronic care records, 26% faster12.

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Surveying how care home needs can be met by TECS

Table 1: Average value scores for each of the 5 technology categories (1 - 5 scoring)

<table>
<thead>
<tr>
<th>Technology category</th>
<th>Residential</th>
<th>Nursing</th>
<th>Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>Facilities Operation</td>
<td>3.1</td>
<td>2.8</td>
<td>2.9</td>
</tr>
<tr>
<td>Staffing</td>
<td>3.8</td>
<td>3.7</td>
<td>3.8</td>
</tr>
<tr>
<td>Clinical and Care</td>
<td>3.2</td>
<td>3.7</td>
<td>3.5</td>
</tr>
<tr>
<td>Wellness and Leisure</td>
<td>4.2</td>
<td>4.0</td>
<td>4.1</td>
</tr>
<tr>
<td>External Relations</td>
<td>4.0</td>
<td>3.9</td>
<td>4.0</td>
</tr>
</tbody>
</table>

Table 2: Top priorities for each of the 5 technology categories (usually scoring over 4 with minimum range)

<table>
<thead>
<tr>
<th>Technology category</th>
<th>Specific need / technology</th>
</tr>
</thead>
<tbody>
<tr>
<td>Facilities Operation</td>
<td>Fall Alerting</td>
</tr>
<tr>
<td></td>
<td>Automated admin tasks, e.g. invoicing, billing</td>
</tr>
<tr>
<td></td>
<td>Staff location tracking</td>
</tr>
<tr>
<td>Staffing</td>
<td>Immediate access to staff experience, qualifications and competencies</td>
</tr>
<tr>
<td></td>
<td>Rota management</td>
</tr>
<tr>
<td></td>
<td>Automatic alerts to key staff dates</td>
</tr>
<tr>
<td>Clinical and Care</td>
<td>Handover documents</td>
</tr>
<tr>
<td></td>
<td>Fall Alerting</td>
</tr>
<tr>
<td></td>
<td>Symptoms management</td>
</tr>
<tr>
<td></td>
<td>Medication reminders</td>
</tr>
<tr>
<td>Wellness and Leisure</td>
<td>Hydration</td>
</tr>
<tr>
<td></td>
<td>Nutrition</td>
</tr>
<tr>
<td></td>
<td>Fall Alerting</td>
</tr>
<tr>
<td></td>
<td>Social networking, e-tools for community engagement</td>
</tr>
<tr>
<td>External Relations</td>
<td>Risk assessments</td>
</tr>
<tr>
<td></td>
<td>Health and safety records</td>
</tr>
<tr>
<td></td>
<td>Marketing of wellbeing and leisure opportunities</td>
</tr>
</tbody>
</table>

To stimulate care home providers and commissioners to articulate the challenges of their businesses, SEHTA devised a questionnaire that guided respondents to describe their high-level challenges, such as low referrals rates and high staff turnover, and then prompted them to identify the factors driving these high-level challenges, such as performance during CQC inspection, relationships with local authorities, marketing, advertising, and staff satisfaction. Technologies that might assist with these lower level challenges were then suggested, split into 5 categories: 

1. Facilities Operation, 2. Staffing, 3. Clinical and Care, 4. Wellness and Leisure, and 5. External relations. Respondents were requested to rate the potential value (on a scale of 1 to 5) that they believe these technologies could bring to their care home businesses, and these answers were validated in detailed one-to-one conversations.

The care home owners and managers and local authority commissioners who completed this questionnaire were found through long-standing contacts in the SEHTA network and via Surrey Care Association. They included two senior representatives of local authorities responsible for a population of more than 2 million, small, medium and large care home managers and owners responsible for over 1,000 clients, and a large national charity providing specialist residential care to over 2,500 clients.

The survey of care provider needs described in Section 6 has revealed that:

- Care home providers see particular value in enhancing a care home's capacity to support wellness and leisure, as this is a key differentiating factor between care homes today. External relations were also deemed very important, as CQC ratings and word-of-mouth recommendations are by far the key determinants for a care home to win private business.
- The specific technologies that seemed to excite care providers most were:
  - Falls detection (and, ideally, falls prevention)
  - Early warning systems to detect infections
  - Remote and continual monitoring of and assistance with hydration and nutrition
  - Electronic tools to speed up medication management and reduce the risk of errors
  - Electronic tools to promote and enable client independence without compromising on safety
  - Electronic marketing and advertising tools (to attract both clients and staff), such as websites and social networking

All of the care providers seemed to agree, however, that the ideal solution is a single platform into which all stakeholders, sensors and individual devices can feed and access data (with appropriate permissions), and which records and manages everything in a single environment.

- The cost-benefit analysis (see Section 5) is absolutely critical: for a technology to be attractive to care providers, it must create an efficiency gain.

The key insight made from the analysis of the commissioner responses is that commissioners are most interested in care homes to adopt technologies that:

- free up staff time to provide more human-centric care
- improve resident wellbeing, such as social integration, sleep, hydration and nutrition.

In summary, SEHTA's needs analysis has revealed that, once care home owners are made aware of the potential of technologies to assist with the key challenges that keep them awake at night and threaten the sustainability of their businesses, they have significant appetite for them. Boxes 5, 6, 7 and 8 describe some of these solutions, and Case Study 6 describes how technology has already been adopted by one chain of care homes in South East England.
**BOX 6 - MEDICATION MANAGEMENT**

Medication management presents care homes with a number of logistical, staffing and quality of care issues. Its mismanagement can have very severe consequences for an “offending” staff member or anyone who contributed to or should have prevented the mismanagement. It is for these reasons that medication management merits all care home managers’ serious attention.

There are a myriad ways in which technology can already assist with each step of the medication management cycle, including:

- intelligent stock management with automatic requests for repeats being sent to pharmacy websites and alerting when a medicine is reaching its expiration date
- electronic devices with Medication Administrations Records (MAR) software for nurses to timestamp when they deliver a medicine to a resident and record a missed or erroneous administration
- automatic reminder alarms to next time of administration
- electronic tools for doctors to communicate with care home nurses about the medicines they have prescribed to residents
- electronic tools for helping nurses to calculate medication dosages
- electronic devices for keeping medicines safe and secure, e.g. electronic pill dispensers and intelligent medicine cabinets.

**BOX 7 - FALLS**

Although falls are not a daily occurrence in a care home, they do happen relatively frequently, with about a third of all people aged over 65 falling each year and rates in female care home residents estimated as high as 50.8 hip fractures per 1000 person-years. The consequences of a fall can be disastrous for the fallen resident, with only half of those with hip fracture ever regaining their former level of function and one in five dying within three months. Falls are estimated to be the primary cause of ten deaths in the UK’s 65 and over population every day. Equally, care homes must not only respond to, manage and supervise the immediate medical response to a fall, which could easily absorb the full time of a staff member on shift, but also provide much more intensive care in the long term. Immediately available technologies assist with fall detection and response. These solutions range from pet-IDs worn around the neck, to wristwatch-type devices, to devices clipped to clothes or worn as a belt. They generally use accelerometers to detect impacts, which in turn activate communication channels between the person who has fallen and a call operator, to assess the most suitable response (in-house care staff, the emergency services, or friends and family).

The Meath Epilepsy charity is a care organisation that offers residential and day services to those with Epilepsy and associated disabilities. The Charity has installed very sensitive microphones in their residential bedrooms to alert staff to seizures and falls. They are now keen to add a remote element to this system so that they can detect seizures and falls in various other environments. They wish to extend this system by adding other functional sensors to measure, for instance, oxygen levels and heart rate - key indicators that a seizure is imminent.

Continuing the thinking about how other technologies could complement today’s standard fall detectors to help reduce the incidence and consequences of falls in care homes, there ought to be a role for technologies that help to mitigate or reduce the risk factors of falls, such as physiological monitoring for early detection of urinary tract infections, and technologies to prevent poor hydration and nutrition (see Box 8). Technology may even one day have a role to play in directly preventing falls or their consequences, for example continually updated falls-risk analysis (on continual gait analysis and physiological measurements), and intelligent triggering of cushioning devices around hips.

**CASE STUDY 7: GRAHAM CARE GROUP**

Graham Care Group has a reputation as being an industry leader when it comes to adopting technology to enhance quality of care and improve transparency and accountability. It develops and builds much of its technology in-house. Its newest venture is voice-activated technology, in which audio recording in clients’ rooms is activated by voice. This allows client friends and family to listen to clips of the interactions that their loved one has had with staff that day, and generating evidence should any complaints against staff or the home be made.

Always looking for new services to enhance its care home offering, Graham Care Group is now trialling step-down virtual-ward care. This new model of ‘acute’ care delivered in the community (in this case at Hawkinge House nursing home in Kent) could benefit a lot from the flexibility, efficiency and effectiveness afforded by technology, as described in more detail in Section 8.

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17 Epidemiology of Falls, Age and Ageing, Mixed and Morris, 2001
18 Prevention of falls in nursing homes: subgroup analyses of a randomized fall prevention trial, Krap et al., 2008
19 Reducing falls and resulting hip fractures among older women, Siewers and Olson, 2000
20 Reducing falls and resulting hip fractures among older women, Siewers and Olson, 2000
21 Reducing falls and resulting hip fractures among older women, Siewers and Olson, 2000
22 Death Registrations Summary Statistics, England and Wales in 2013, Table 2. Office for National Statistics, 2014
23 Literature Review: the use effectiveness of assistive technology in supporting people with dementia, Brown, Dawson and Greasley-Adams, 2013
24 How iPads can support people with dementia living in care homes, Evans, Bray and Evans, 2015
OUR VISION FOR THE FUTURE

Our observations are that care budgets will continue to be restricted in the immediate future and priorities will continually have to be re-assessed; the private payer will become more important to the sustainability of the care home; and the use of technology, particularly to maintain social inclusion and family connections for residents, will contribute to differentiating between care homes.

Despite the immense financial obstacles facing local authorities that try to stimulate innovation in their local social care services, the Care Act 2014 has bestowed greater powers on them to shape these services. It is within their control, for example, to demand higher or new standards of care that could be most easily achieved using a specific technology, in order for a care home to receive state-funded care home records, and needing only to see evidence that quality-assured mechanisms are in place, CQC and local authority inspection routines could be much more efficient. What is more, by making sources of inspection evidence more robust, local authorities will become more confident in CQC ratings and therefore more likely to base their commissioning decisions on these ratings alone, rather than carrying out their own inspections. This in turn could create savings that are put to better use, e.g. to support care homes to improve, or to widen public access to financial support. It is suggested, therefore, that the CQC be more encouraging of the use of technology in care homes.

A more consistent message from regulators and commissioners about the use of technology by care homes will become all the more important as care homes provide step-down virtual-ward care in response to the NHS’s ‘Five Year Forward View’ aim for a shift in investment from expensive reactive acute care to more cost-effective preventative primary and community services. Virtual care stands to gain more from technology than traditional forms of care, as systems that allow risk to be assessed and managed remotely have the potential to hugely reduce costs and increase its quality. Deploying appropriate TECS will help the care home sector become a sustainable, if not growing, industry in the face of continual tightening of public-sector purses and mandatory increases in staff wages. And there is no better time than now for care homes to make this transition to more innovative ways of working, as the rapid pace of technological advancements globally is widening the gap between what is possible and what is actually being used by care homes.

In undertaking this work with care home providers, SEHTA has become more acutely aware that many of the opportunities for technology solutions apply to other care settings. As well as working with care home managers and owners to understand technology solutions to care challenges in support of driving towards more efficiency and effectiveness, we will be investigating the opportunities to transfer the learning and experience to other care settings, including domiciliary care.

CONCLUSIONS

This Review has made a convincing case for the potential of technology to reduce the impact of the impending long-term care crisis by on-the-ground surveying of care home needs, thorough research of the technologies available to meet those needs, and first-hand experience of trying to implement these technologies in real care homes. The case studies provide reassurance that, although there are challenges to care homes adopting technologies, they can increase the efficiency and effectiveness of staff and care home facilities, improve a care home’s CQC rating, and raise client satisfaction—the most important ways for a care home to reduce its costs and increase its quality of care. Adopting appropriate TECS will help the care home sector become a sustainable, if not growing, industry in the face of continual tightening of public-sector purses and mandatory increases in staff wages. And there is no better time than now for care homes to make this transition to more innovative ways of working, as the rapid pace of technological advancements globally is widening the gap between what is possible and what is actually being used by care homes.
**Who is SEHTA?**

South East Health Technologies Alliance (SEHTA) is one of the largest healthcare technology networking organisations in the UK with 1,300 members from 20 different countries and a database of more than 7,000 contacts spanning academia, industry, clinicians, the NHS and wider health and social care providers, local government, policy-makers, research councils and funding bodies.

**Who do we help?**

- **Academia** (Universities and research organisations)
- **Business** (healthcare, pharma, private health & care sector, healthcare consultancies, product/service solution providers)
- **Clinicians/Care** (local authorities, CCGs, NHS Trusts, AHSNs, care procurers and providers)

**What can we do for you?**

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