



D3.3.1 and D3.3.2

CASCADE Baseline Review of Current Partner Technology Enabled Care Service (TECS) Initiatives and Proposal for a Collaborative Evaluation Strategy **ISBN 978-1-909067-85-1**

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In preparing this D3.3.1 and 3.3.2 report PP4 would like to thank PP2,3, 5,6 and 8 for their contributions to assembling this report. It should be noted that WP2 led by PP2 has no specific role for PP4 beyond this point in the application form.

Abbreviations

RVT – rust – en verzorgingstehuis □ a nursing home has a recognition for a certain number of RVT and / or ROB beds. RVT is for more intensive / higher care needs and support than ROB. A nursing home therefore gets a higher forfait for people in a RVT bed from the RIZIV than for people in a ROB bed.

ROB - rustoord voor bejaarden (see explanation RVT).

RIZIV – rijksdienst voor ziekte en invaliditeitsverzekering – federal institution for social security and is responsible for the governance of the social security for medical care and benefits.

GESCO – a phasing out employment measure for long term unemployed and disadvantaged groups.

NSSO – the NSSO collects and manages employer and employee social contributions used to finance the various branches of social security. It collects and distributes basic administrative data for other social security institutions.

C-team – staff responsible for cleaning and maintenance of the centrum of Ten Kerselaere. They also replace staff in the houses that is absent (e.g. because of illness).

KEELA team – physiotherapy, occupational therapy, speech therapy and animation.

CRA – coordinating and advising general practitioner – each nursing home in Belgium has a coordinating and advising general practitioner attached. Residents are free of choice of their GP (so they can consult their own GP). The CRA is responsible for the organisation and coordination of the medical care in relation with his colleague GP's. He also has a training and education task.

Bing – Bing research is an organisation who has experience with measuring perceptions of patients, residents, and staff.

1. Executive Summary

Globally there is an increasing acknowledgement that investment in new telemedicine/telehealth and smart technologies will help to support older people and people living with dementia (PLWD), their family^a, and caregivers in a variety of ways. These include provision of information and support resources online, wayfinding technology to support independent mobility, monitoring systems to alert caregivers to changes in the person and their environment, navigation devices to track PLWD, and telemedicine/telehealth services linking caregivers and PLWD with care providers and services.

This report covers **D 3.3.1** and **D3.3.2** of the CASCADE project providing a preliminary summary of existing telemedicine/telehealth technologies reported in the literature alongside an analysis of existing usage reported by partner sites PP2, 3, 5, 6 and 8. Partners were asked to provide information that addressed a series of questions summarised below.

1. What technology you are currently using and why?
2. When was the technology introduced and how is it being used with what kinds of populations of residents/patients/clients/staff including the reach (numbers)?
3. How much has this technology cost to be introduced (set up costs) and how much does it cost to run (running costs)?
4. What evidence has your organisation collected to date to show what beneficial impacts it is having and why?
5. What metrics does your organisation use to demonstrate the link between the technology and improvements in quality of life indicators for your client groups/staff groups (this may be Prezo/ Belrai/ InterRai data as well as staff wellbeing survey data) and feedback from relatives and families in satisfaction questionnaires?
6. What intentions, if any, do you have to expand or introduce new telemedicine/ e-health technologies?
7. What baseline financial figures do you have to support the introduction of the technology that you can share?

The report makes recommendations for the collaborative methods that could be used to inform a telemedicine/ telehealth evaluation strategy drawing on best practice from the literature.

Fundamentally the report concludes that partners 2, 3, 5, 6 and 8 need to agree their collaborative action plan for what aspect of telemedicine/ telehealth they plan to pilot and when so that PP4 has clarity around expectations for evaluation. Work package 2 is led by PP2.

^a We recognise that family might constitute friends, significant others or pets

2. Introduction

2.1 Telemedicine/telehealth Intentions of CASCADE project

The project plan states that CASCADE intends to provide a new approach to caring for older people and people living with dementia (PLWD) with their needs & social interaction at the heart of the model. Engagement of and being connected to the local community from a person's home is key to both the development & running of this model to enable people to continue to live meaningful lives that are valued and appreciated whilst reducing the risks associated with social isolation and loneliness. Telemedicine and new consumer e- technology (telehealth) will be used to support this aim to offer life changing empowerment to enable people to live well at home for longer. This innovative technology will be available in the guesthouses so people can trial cutting edge kit before installing it in their own homes. This will be the first time that consumer & medical technology have been combined to benefit people in this way ensuring that they are safe and well at home, keeping people out of hospital and enabling them to access appropriate professional support and treatment speedily. It is hoped through the project that such initiatives will reduce staffing costs and make efficiency savings.

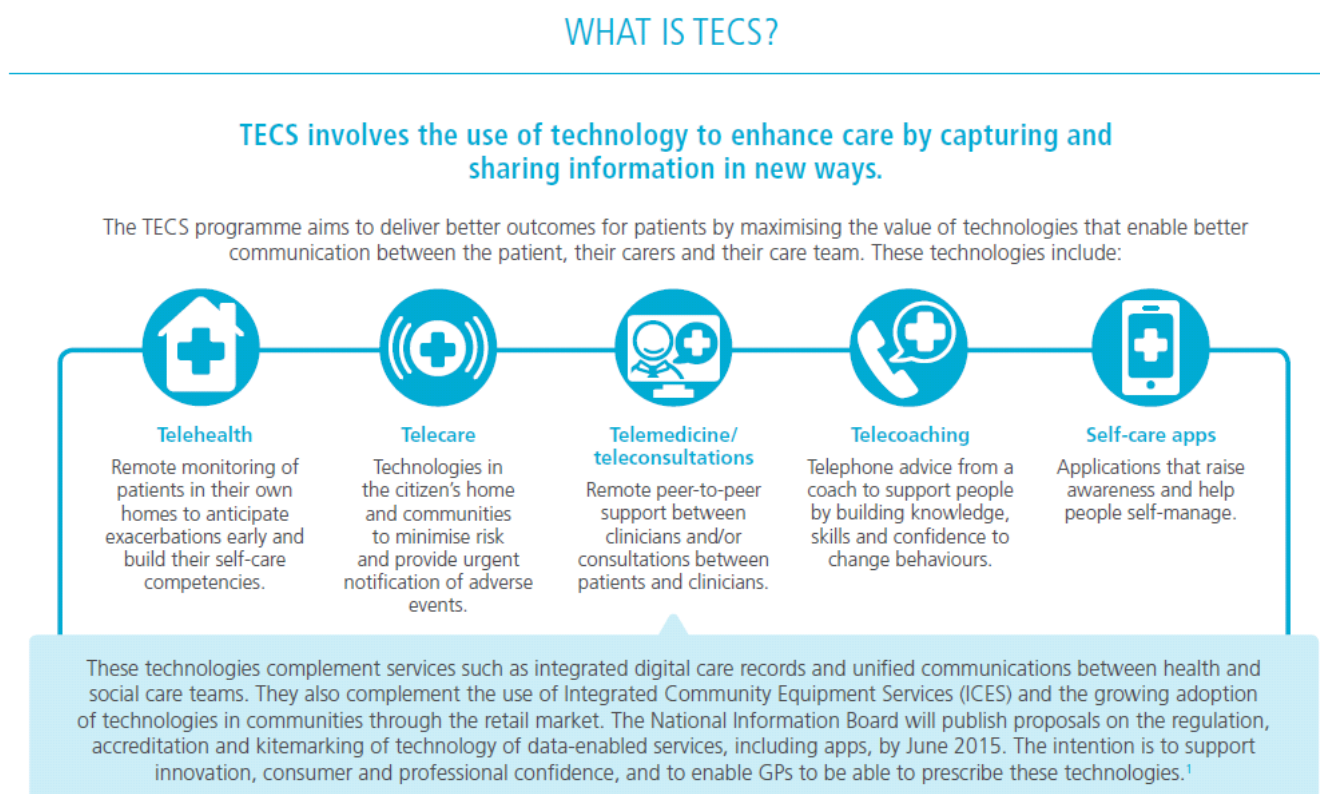
This report presents a brief summary firstly of telemedicine and telehealth technologies identified in the literature, hitherto described collectively as Technology Enabled Care Services. Following this the partner summaries of existing technologies currently in use is presented.

2.2 Overview of Technology Enabled Care Services (TECS)

In the UK, Sir Bruce Keogh, National Medical Director of NHS England (2015) states that *“By capitalising on new and emerging technology we have the opportunity to provide a modern model of continuous, coordinated care centred on the individual, with professionals acting in partnership with the person to improve their health and wellbeing”* (https://www.england.nhs.uk/wp-content/uploads/2014/12/TECS_FinalDraft_0901.pdf).

The term ‘technology enabled care services’ (TECS) refers to technologies (such as telecare, telehealth, telemedicine/ teleconsultation and self-care apps) that help people to manage and control chronic illness and sustain independence. They enable the remote exchange of information, primarily between a patient or citizen and a health or care professional, to assist in diagnosing or monitoring health status or promoting good health. From a health provider perspective, being able to invest in virtual care delivery in the community using technology overcomes some of the limitations of face-to-face care delivery such as time constraints, geographical location and travel costs particularly for rural populations (Lewis et al 2010).

Figure 1 What is TECS? - NHS England (2015)



¹ Personalised Health and Care 2020: A Framework for Action

Whilst the impact of using such technologies in the community to support PLWD is not widely evaluated or reported in the literature currently, there are some important considerations that are key to their successful use:

- 1) identifying the cognitive support needs of older adults and PLWD and their family caregivers,
- 2) developing technological applications suitable for different types of environments and user abilities,
- 3) establishing training strategies for PLWD to use the technologies, and
- 4) providing appropriate technical support for PLWD, their families and caregivers (Armstrong et al 2010).

There have been several studies testing online resource and technologies for PLWD which focus on maintaining cognitive skills, learning new things, maintaining social interactions, and finding information (Rosenberg and Nygard 2011). These include electronic applications which provide reminders and prompts to take medication, online chat groups to support maintenance of social contact with friends and family, alarm systems and movement triggered lighting designed to promote a safe environment and devices to support daily activities (Rosenberg and Nygard 2011). In the main, cognitive stimulation activities are also often web or computer based.

The majority of TECS currently available are designed to support family caregivers. Two published systematic reviews emphasize the benefits of web-based caregiver support programs that provide training and education.(Godwin et al 2013). Finkel et al (2013) have piloted a customized computer–telephone integration system, called e-care, which provides a psychoeducational intervention that identifies resources and strategies to enhance safety, communication, self-care, social support, and management of problem behaviors in the community. Another type of in-home caregiver support links caregivers with expert guidance for managing challenging care situations using video monitoring. Caregivers are trained to capture behaviors that are a problem via computer video recording, which is then wirelessly uploaded for a team of experts to review and provide feedback. There is growing use and acceptance of video conferencing in both the diagnosis and monitoring in elderly medicine (Van den Berg et al 2012) and psychiatry (Barton et al 2011, Martin-Khan et al 2012, Munro et al 2014). The literature identifies that further large scale studies are needed by the existing research has established the reliability and validity for neurocognitive testing and neurological examinations via video telemedicine (Barton et al 2010, Munro Cullum et al 2014, Morgan et al 2011). The additional benefit of video conferencing is that enables local primary care professionals to link up with specialists for assessments, enhancing the application of standardized assessments and examinations and speeding up diagnosis for people living in rural and remote areas (Barton et al 2010, Martin-Khan et al 2011).

A systematic review undertaken by Peetom et al (2014) identified five categories of existing monitoring systems:

- 1) in-home passive infrared motion sensors,
- 2) body-worn sensors,
- 3) video monitoring,
- 4) pressure sensors, and
- 5) sound recognition integrated with multicomponent systems and “smart homes”.

For PLWD such technologies offer a simple way of monitoring motion through activity sequence awareness, presence and context awareness capabilities e.g. turning on lights, activating an alarm on exit or entre to a building (Mulvenna et al 2009).

Smart Technologies such as smart homes are an example of ambient assistive living (AAL) which brings together telecommunications, electronics, and computing to support people in carrying out their everyday life activities enabling them to live well and independently in their own homes. AAL uses remote network monitoring and exchange of data at a distance. AAL technologies can 1) monitor ambient temperatures, gases, and motion; 2) notify any problems that arise to remote users; and 3) enable family and health care providers to predict and intervene on impending incidents to ensure people are safe in their own environment (McKenzie et al 2013; Rantz et al 2013).

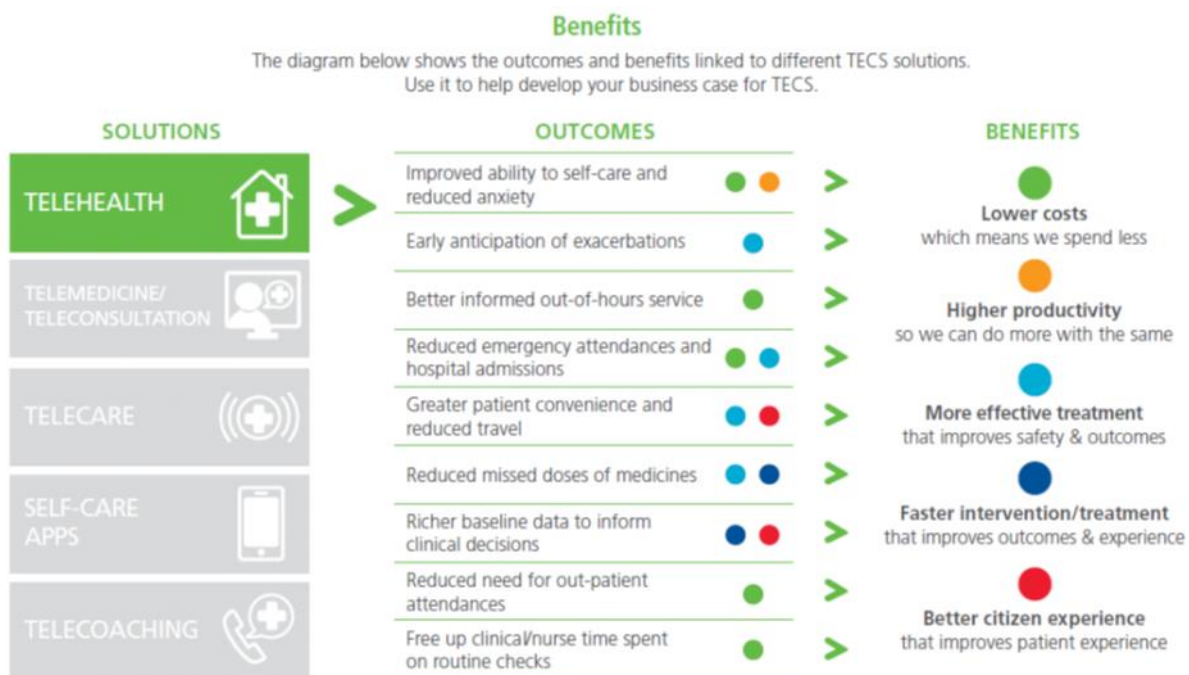
AAL is characterized by “*sensors and devices interconnected through a network ... which senses features of the users and their environment, then reasons about the accumulated data, and finally selects actions to take that will benefit the users in the environment*” (Cook, Augusto and, Jakkula p. 278). Complex AAL systems Bluetooth Low Energy, radiofrequency

identification, microchip implant, sensor technology, software agents (a software program that has some capacities of artificial intelligence), affective computing, and biometrics (some include nanotechnology). The ethics of implanting such technologies associated with inserting microchip technology needs to be explored further.

Tracking and wayfinding technologies has been designed as a means of supporting PLWD to live safely by providing prompts for independent mobility within a home and community.(Chang and Wang 2010). Wayfinding systems in the main use global positioning systems (GPS) that allow people in early stages of dementia go outdoors without fear of becoming lost (Korhonen 2012). Reminder signals may be visual, audio or tactile. The intention is to increase individual freedom, autonomy, and confidence, however there is potential for this technology to be exploited for tracking purposes. It makes the assumption for example that wandering or wonder walking is somehow an activity that needs to be controlled or stopped as an undesirable behaviour and as such it has the potential to be misused. Bossen et al (2015) report that in the United States, wearable garments with sensors, implantable (microcapsule devices that are swallowed), and microsystems are being developed and are available on a limited basis. They can be combined with tracking devices and are connected by wired or wireless networks to a service center that has monitoring and diagnostic capabilities capturing data from sounds, images, body motion, and ambient parameters (light, temperature, humidity), vital signs, sleep patterns and other health parameters, daily activities, and social interactions. Algorithms then compare data with an established profile of the user’s physical and physiological patterns and can provide alerts and assistance for emergency situations.

In summary the intended outcomes and benefits of TECS solutions is summarised in this Figure 2 by NHS England (2015)

Figure 2 Outcomes and Benefits of TECS solutions NHS England (2015)



The literature identifies four key barriers that limit the adoption and use of TECS by PLWD, their families and caregivers, including 1) ethical considerations; 2) user perspectives; 3) access to, and reimbursement for, technology; and 4) privacy (Bossen et al 2015).

The whole issue of privacy is a major concern especially when TECS use recorded video and audio as this exposes already vulnerable people and their caregivers to sharing sensitive, personally identifiable data. There is the potential for technology used in the home to reduce autonomy rather than enhance it particularly if it becomes an opportunity to exert control on others and violate their privacy. Instead of being helpful, very advanced technology which is too complicated can become frustrating and dehumanizing (van Hoof et al 2011; Zwijsen, Niemeijer and Hertogh 2011). This in turn may cause potential apprehension, embarrassment and anxiety for the family, caregiver or PLWD and reinforce stigma in an already value-laden world. Devices should be designed to minimize attracting attention and alarms should not be too loud because the features of the device should be designed to alert the caregiver but prevent agitation and avoid frightening the PWLD (Alzheimer's Association, 2014).

Whilst the intention of TECS is to increase independence there is a concern that its use may result in loss of human contact thereby increasing the risk of social isolation and loneliness. (Zwijsen, Niemeijer and Hertogh 2011). They should not be a substitute for human care contact (Rashidi and Mihailidis 2013).

A crucial factor in the adoption of TECS is ease of use (Karmer 2013) and this may be challenging for older caregivers and family members who are not confident with new technologies. There is a risk that older adults may feel frustrated if they frequently fail in using devices, and they may find technology use as another burdensome caregiving task.

Finally the adoption of technologies are impacted by socioeconomic barriers such as cost, internet access (variable download speeds across rural and urban populations impacting data storage), and in some countries personal health insurance coverage. People are less likely to use new technology to support dementia care if they have to afford it themselves.

2.3 What is needed in the future to support adoption of TECS?

The literature identifies the following considerations:

1. TECS need to be designed for ease of use in order to be functional and accepted, involving PLWD and their family care givers in the design and piloting process.
2. Sufficient training for PLWD, their family and caregivers is critical based on the user's needs, their preferred learning style and their technological competence and confidence.
3. Ongoing technology support and resources for troubleshooting that are readily accessible are needed to help people overcome issues with use in the home.
4. The skill set of care providers needs to flex to enable practitioners to screen, analyze, and interpret data and respond. Providing care through e-health and other technologies will require new skills across the workforce to support people to live well at home.

5. There are ethical principles to consider to protect PLWD from the potential negative aspects of technology use such as data collection and storage, so that vulnerable people are not exploited. Mahoney et al-(2007) have developed a list of ethical principles and guidelines for gero-technology which focus on how to maintain respect, autonomy, beneficence, justice and distributional fairness, privacy and confidentiality. They call for very strict regulation for data collection, de-identification, data storage, distribution of study findings, as well as secondary data use. All data collected by technology should have a clear purpose that will benefit the user.

3. Partner Site Telemedicine/Telehealth Usage

This section fulfils **D 3.3.1** providing a summary of current TECS used by partners involved in the CASCADE project as reported in May 2018, year 1 of the project starting with the UK partners.

3.1 PP2 East Kent Hospitals University NHS Foundation Trust (UK)

3.1.1 Contribution to the CASCADE Project Outcomes

PP2 is a provider of acute hospital services at the forefront of dealing with the demands placed on healthcare services by an ageing population in Kent. The organisation has expertise in all areas of geriatric medicine. Its services currently have day to day experience of the effects of the inadequacy of the current approaches to elderly care in the region.

Within the CASCADE project PP2 has responsibility for developing a new model for the provision of dementia & elderly care which will include demonstration rooms giving dementia patients the possibility of receiving step up/down respite care on their journey between their normal home setting and hospital. This will be combined with the provision of therapeutic convalescence for this target group. Neither service exists at present in isolation or combined in the one structure. PP2 will be combining this with a residential facility creating a fully integrated solution and a dementia Centre of Excellence, a unique cross border facility providing training & expertise via telemedicine. No facility of this kind exists at present. The participation in this project, the model CASCADE produces will be freely available to any interested organisation in both public and private sectors. Beds in the facility will be offered to NHS organisations and expected to have an 85% occupancy rate. The remaining 15% will be available to private paying patients so income will be generated but at a low percentage overall. Facilities will improve flow of elderly and dementia patients through acute hospital beds, increasing efficiency and reducing costs for the health economy. There will be closer integration with primary care and community services to the benefit of patients, carers and providers. Having access to a cross border network of expertise in elderly and dementia care will allow this expertise to be used to improve systems and models of care.

By 2021, PP2 will host a Centre of Excellence for Dementia which will include a guesthouse, long-term residential care, training & development facilities & an expert telemedicine hub enabling, for the first time, there to be a single location providing every aspect of dementia service for the 2Seas community.

3.1.2 Current Practices

The Trust currently uses VitalPAC for electronic recording of observations and decision support for observations and other aspects of care. The system was chosen as best of breed with a proven track record in improving outcomes for the deteriorating patient. Pre-VitalPAC, local findings showed that whilst staff recorded observations, there was an inconsistent approach in recording a full set of observations nor total the MEWT score as was used at this time. There were also improvements to be made in the escalation of concerns regarding deteriorating patients.

VitalPAC was first introduced into the Trust in March 2012 with a rollout over 4 months for the recording of standard observations on all adult inpatient wards. Using the track and trigger system of NEWS, it is currently used in 57 areas for the recording of observations and other aspects of care for approximately 1000 patients. These additional aspects, include the insertion, checking and removal of indwelling devices, VTE risk assessments, nutritional assessments and early alerting to the Infection Control team of potential and confirmed cases of infection.

The technology costs £350,000 per year supplier cost plus an internal team to run it. The investment in the system was greater than £1 million.

Early data from critical care post VitalPAC implementation showed an increase in L2 admissions from the Clinical Decision Making Unit and overall an increase in L2 patients to critical care and reduction in L3. Reports from system use show >99% compliance in the recording of full sets of observations and the Early Warning Score (EWS) is generated automatically from the readings entered. The use of VitalPAC has enabled the Trust to report on patient outcomes related to the EWS and the significance an increase in EWS has on outcome. This has led to teaching programmes for staff responsible for recording this information with a focus on the deteriorating patient.

The use of the system has enabled a greater transparency Trust wide to the information collected. The frequency of repeat observations is determined by the EWS of the patient and not the historic practice of the ward routine which has led to an increase in the number of observations recorded overnight. Reports show the timeliness of observations and other aspects of care with work being undertaken with ward teams to improve this.

Reports from the system show an improved compliance with the completion of VTE risk assessments.

The use of the VitalPAC module for the Infection Control team was introduced in September / October 2013. For the team and organisation as a whole the Trust now has real time intelligence about prevalence of vomiting and diarrhoea and is able to identify “symptomatic” patients and ensure their optimum management, isolation & treatment. This has led to improved prevention of cross infection/outbreaks with significant reductions in Clostridium Difficile and norovirus cases post implementation. There are no current metrics that show improvements in Quality of Life indicators for client or staff groups reported for use with this technology. There are no plans to expand or introduce new technologies reported.

3.2 PP3 Medway Community Health Care

PP3 is a provider of inpatient and community dementia services in Medway, Kent working in collaboration with a range of partner organisations to provide holistic person centred care to ensure quality of life for older people and PLWD both at home and within a nursing home setting.

Their involvement in the CASCADE project involves exploring the benefits of operating a dementia respite facility, not currently in existence within Medway. The project will demonstrate commitment to social innovation, efficiency and effectiveness in terms of dementia care. CASCADE will enable the provision of respite care beds for people with dementia and the provision of a training hub which will be accessible to all service users and staff across Medway & the wider area. PP3 will be involved in developing a new model for the provision of dementia & elderly care which will include demonstration rooms giving PLWD the possibility of receiving step up/down respite care on their journey between their normal home setting and hospital. This will be combined with the provision of therapeutic convalescence. Neither service exists at present in isolation or combined in the one structure. The model CASCADE produces will be freely available to any interested organisation in both public and private sectors.

PP3 are currently trialling Speakset, technology that supports a video connection from a health professional to a patient's television in their own home. This empowers the local population to live independently and improves their lives by supporting treatment at home. At the same time video consultation reduces the need for health practitioners to travel to consultations as these can be done remotely. The system is currently being piloted with six patients who have respiratory conditions. The device costs £600 per device per year, and for the pilot of six patients £3600 for the year. There is no evidence available for dissemination about impact of patient or staff wellbeing at this time and no metrics available for comparison. PP3 are looking to expand the trial of Speakset to care homes and possibly use DOCOBO telehealth solutions for monitoring observations alongside the Speakset technology. This will enable practitioners to monitor a person's blood pressure, heart rate, and general wellbeing remotely and facilitate digital assessment.

3.3 PP5 ZorgSaam

ZorgSaam provides hospital care, ambulance services, home care & elderly care in a coastal region of the Netherlands experiencing demographic changes leading to an increase in the average age of its population & change in demand for healthcare. Dutch government policies have led to healthcare budgets being cut. In response ZorgSaam has developed guesthouses with care offering 24/7 elderly care: a hotel with medical care facilities making stays in hospital shorter. GPs, medical specialists & nursing home doctors all work together in co-located services. CASCADE offers the opportunity for PP5 to increase potential for international contact and networking that results in a broader approach of care for older people and telemedicine solutions that share best practice.

ZorgSaam use a digital file management system (HIX, NEDAP) with a client portal known as NEDAP being implemented and the client version of HIX to be implemented in 2019 designed to reach all patients of home and elderly care in their organisation. To support in the home elderly care they use a double medication control App currently and report that a wound control APP will be implemented in the latter part of 2018. They will be investing in the Medido - automatic medication dispenser with roll out planned for September 2018. The organisation are currently focusing on the development of mixed reality, robotics, domotics, e-health and networked care supported by an innovation trajectory strategic document for 2018-2022. They have a business case that provides flexible costs depending on the type of innovation being adopted. They report that for each individual project, consideration is made of how intensively each phase is completed on the basis of the added value and proof of concept.

They do not report any current metric used but plan to consider this when HIX and NEDAP are implemented.

3.4 PP6 Emmaus

Emmaus Elderly Care is just 1 of the 5 welfare & healthcare sectors covered by the Emmaus group. Ten Kerselaere is the oldest & most well-known residential elderly care facility in Heist op den berg. The Emmaus concept combines safe & comfortable housing facilities with assisted living facilities & state of the art holistic care for older people and PLWD. Emmaus Elderly Care's involvement in CASCADE will enable them to implement a model of integrated care for people with dementia and an education program for dementia care providers and caregivers. In their guest house model they intend to combine our expertise in the field of dementia care and small scale living with tourist facilities and for people with dementia and their caregivers, in a rural environment.

Currently PP6 use a range of technology and care solutions from Microsoft applications that provide an electronic patient platform for care planning, medication management, RIZIV for federal administration for social security, update services, home link (link between medication module and pharmacy – so we can order individual doses for each resident). Quint (for document management (procedures, work instructions, information. They also employ software to support staff planning and rostering for shifts (for example SAGA (planning staff), blocks, sdworx). Televic is used as a call system to enable them to connect with data related to caring for clients with dementia but they are considering the use of senso2me as a replacement (<https://senso2.me/>).

In the care facilities they use an automatic night lighting system for security and orientation at night as well as Spotter, a GPS tracking system applied to the clothing of PLWD who wander.

The running costs for each solution is presented below in Table 1.

Table 1 Running Costs for Each Solution reported by PP6

Technology	Costs cited	Additional resources required
Care Solutions	Licence of 20, 20 euro per resident (tax not included) Maintenance of 5.20 euro for each resident per year (tax not included) Education 85 euro per hour Assistance is 85 euro per hour	laptops, secure internet connection, and insurance for cybercrime
Televic	licence 2017 was 7615.74 euro the investments were too long ago, so it is not possible to calculate the installation cost anymore	
Spotter	69.99 euro for the purchase of the spotter – the spotter works on a prepaid base with a subscription for a month (4.99 euro), 6 months (26.95) or a year (47.88 euro)	

The reported benefits of these technologies are cited as a medication management system that runs automatically, resident care plans are kept up to date and the system allows audit of administration and personnel functions.

PP 6 report that they are seeking clarity about what will happen when the current financing system changes to personal funding for elderly care and whether they will need to change their current IT systems such as billing as a result. They are currently exploring whether they could use senso2me in the houses for assisted living currently under construction. This system is radio controlled and works with five wireless sensors that work autonomously, but also have a button (to set an alarm), a care station with audio and an extra wireless sensor with audio functions. Users place the sensor in the living room, kitchen, bathroom, bedroom and / or other frequently used rooms. Family members and staff can look at all information online to be able to make an informed decision. Follow-up is possible via tablet, smartphone or computer. The sensors measure how long the person usually stays in the bathroom, what their usual sleep and day rhythm is, when or how often they enter the kitchen. Data are processed anonymously to be able to raise alarms in unusual situations and the system can be tailored to personal habits and preferences (together with the person and informal caregivers / family). The technology sensors are water resistant, so they can be placed in the shower, can monitor ambient temperature and can monitor the speed at which a resident answers phone calls raising an alert if unanswered. In a nursing home setting; staff have a mobile care button and a fixed button for communal use and in the future the technology will have a track and trace function as well as a chip that detects incontinence. The technology interfaces with current data management systems and a data centre at the University of Ghent.

3.5 PP8 Residential Care Holy Hart Zorggroep

PP8 use a range of technologies currently which they have summarised in Table 2 below.

Table 2 Range of Technologies currently used by PP8

Name of Technology	Type of System	Stakeholder user group	Measured/monitored by
Geracc	administration	for residents	prezo
Resident invoicing	care	by staff	
Resident administration			
Care module (resident files)			
Supplier : Corilus			
Cubic- pro (Exact)	financial	by staff	
Financial package used for accounting			
gevoelige persoonsgegevens.			
Supplier: Corilus			
Saga	organisation	by staff	
Planning package for duty schedule			
Supplier: Tobania			
SoftN	administration	for residents	
Package used by nursing at home services	Care	by staff	
Supplier: Mederi			

FARMAD	medication	for residents	prezo
Support system for ordering and distributing medication		by staff	
Reinaert/FOXI			
Support system for childcare initiatives			
Supplier: Marius Software			
Winkind/Deona			
Software used by childcare initiatives			
Supplier: Deona			
Logosmart			
Software used by speech therapists			
Supplier: SmartSystems			
Cipal			
Software used by services at home			
Supplier: Cipal Schaubroeck			
D-Plan			
Software used by service voucher services			
Supplier: Advani			
ODOO	administration	by staff	
Software used by social services			
Supplier: RIS			
GISA	care	for residents	
Software used by Pamele		By staff	
ARADIS	Food	by staff	
Additional selling by kitchen			
Supplier: Aramark			

4. Proposal for a Collaborative TECS Evaluation Strategy D3.3.2

There are a number of approaches to evaluation of TECS which might be adopted by partners which are outlined here. The most robust strategy published to date appears to be from NHS England which identifies a number of methods, measures, and strategies that might be used depending on what aspects of TECS are being evaluated (Figure 3). They identify that it is highly problematic to attempt to focus on the impact of a technology on its own but rather suggest that an evaluation focuses on the overall performance of a service. They also highlight potential issues that might arise and strategies for overcoming these in the evaluation process.

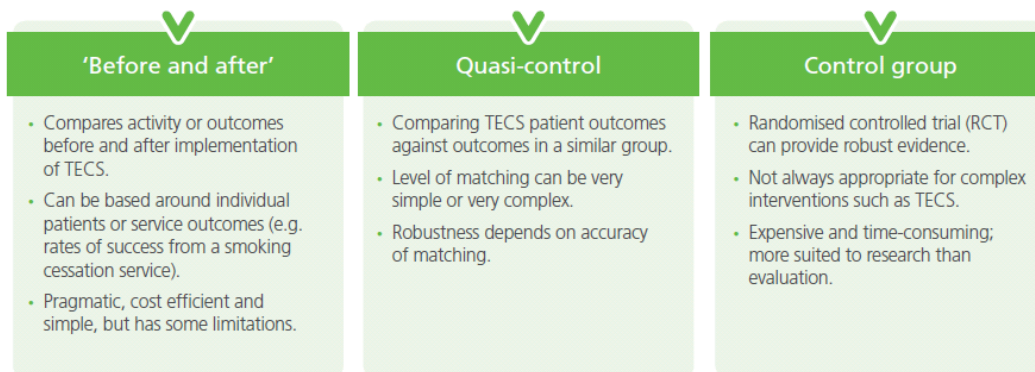
Figure 3 NHS England (2015) Measuring Impact Framework for TECS

MEASURING IMPACT

Approaches to evaluation

It is important to recognise that any evaluation of TECS should be an evaluation of the overall performance of a service. It is very difficult to focus solely on the impact of the technology itself and attribute benefits entirely to the technology component of a service.

Below are some examples of various approaches to evaluation and an overview of when they may be appropriate to deploy:



Evaluation issues and suggestions

The table below highlights issues to be aware of when designing your TECS evaluation and suggestions on how to address them.

Issues	Suggestions
Determining to what extent change can be attributed to the technology element of the service.	Consider using a randomised control trial or a quasi randomised control trial as this is the best way to control for other factors.
A randomised control may not be practical.	A quasi randomised control trial (e.g. propensity score matching as used in the Bosch Buddy example or a before and after methodology).
Sample size is important both for statistical significance and economies of scale.	The sample size needs to be big enough for statistical validity and to allow for economies of scale, but small enough to take into consideration the inherent risk associated with testing something that may not work.
Establishing the follow up period.	Where possible, quarterly data collection for formative evaluation is recommended to demonstrate impact and inform continuous improvement to the programme.
A baseline is needed against which to measure progress.	The comparison could be between the same group of patients before and after an intervention or between a control and intervention group.
It can be difficult to quantify benefits. Using Quality Adjusted Life Years (QALYs) may be impractical.	Quality Adjusted Life Years, mortality rates, comparative activity rates and qualitative feedback from surveys can all be used to compare the IT based service against a baseline.




Evaluation issues and suggestions - continued

Issues	Suggestions
Potential for high patient drop out rates.	When recruiting patients for the evaluation, consider recruiting more patients for the intervention arm to mitigate potentially high drop out rates.
The need to ensure confidentiality.	Using an external interviewer and conducting the interview over the phone may make the patients feel at ease and assure them that their interview is confidential. Participants should be informed beforehand of how their interview answers will be used and reminded about the confidentiality of their data.
Evaluation can be time consuming and resource intensive.	Group interviews or think tanks may be used to save time and resources. However it is important to ensure that quieter people are not drowned out and that the interviewees do not influence each others' answers. Conducting the interviews over the phone could save time.
Low response rate.	Collect multi channel feedback including online, by phone/text or post. It is worth sending reminders (through various channels) to patients to complete the questionnaire and return it. Patients could be asked to complete the questionnaire while in the waiting room at their next appointment.
People may interpret each question differently and respond accordingly.	It is worth keeping the questions as simple and uncomplicated as possible.

The NHS England TECS Evaluation Framework identifies a number of metrics which may be used against which measures can be designed to evaluate the impact of TECS. These include personal goals of the PLWD, key risk indicators, service utilisation, patient experience, socio-economic impact and staff engagement with TECS and their satisfaction with use at the bedside.


The TECS Evaluation Framework

The TECS Evaluation Framework is designed to measure a range of benefits for the individual, commissioner and wider economy. Click on a measure within the evaluation framework to see suggested metrics and technical specifications, case studies and potential issues to consider when designing the evaluation. Click [here](#) to see an example of how these can be used in a cost-benefit analysis.




PERSONAL GOAL METRIC

This measures how TECS can support individuals' goal attainment (within the context of their social care plan and/or LTC). Goals are set by the individual patient or informal carer in consultation with their healthcare professional or social worker. Specific goals could include retaining or regaining independence and confidence, lowering blood pressure, being able to walk in the park, or returning to work. This will test the premise that the appropriate use of TECS will empower patients, support carers and improve lives.



KEY RISK INDICATOR

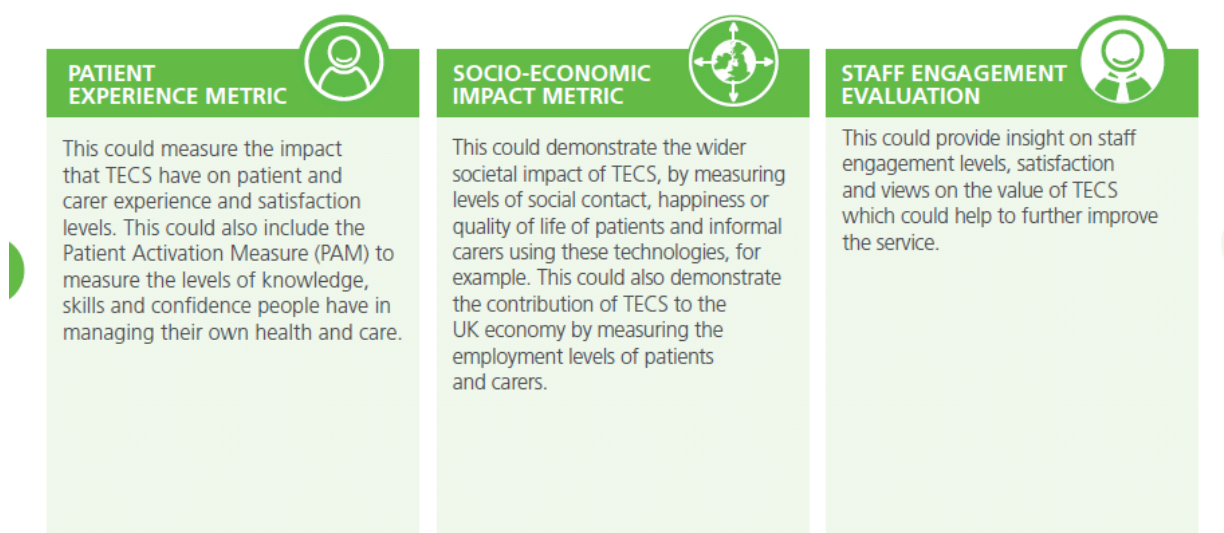
This could measure the effectiveness of TECS in slowing the progression of illness, frailty or the loss of independence; or accelerating rehabilitation, self-management or reablement. This measure will test the premise that appropriate use of TECS could help reduce dependence on and use of primary and secondary services, domiciliary or care home support by people with LTCs, lifelong disabilities or frailty.



SERVICE UTILISATION METRIC

This could measure the effectiveness of TECS to reduce avoidable or unplanned service activity by evaluating the cost avoided and capacity released as a result of these technologies. This would demonstrate the increase in efficiency of service delivery and the net-positive cost impact on a local health economy.

NHS England (2015)



The original TECS evaluation strategy developed by PP4 for PP2, 3, 5, 6, 8 to consider has been shared and we are awaiting feedback and agreement as to the best way forwards at the time of writing this report. PP2 has administered a technology survey to establish usage and we are awaiting the results of this survey (Appendix 1). The results of this survey we would propose is synthesized with the proposal here and a collaborative plan developed for years 2-4 of the project.

Below is the suggested TECS evaluation strategy developed and shared with partners in August 2017 forming part of the required D3.3.2 report.

4.1 Year 1: Establishing the Evaluation Strategy and Shared Purpose D3.3.2

Activity 1: Developing consensus on TECS strategy

1. Establish evaluation objectives with telemedicine centres;
2. Set priorities for the selection of specific applications to be evaluated;
3. Assess the probable feasibility of evaluation in the case study site(s), including the availability of adequate funding and the likelihood of adequate cooperation from relevant stakeholder parties;
4. Identify the particular intervention to be evaluated, the alternatives to which it will be compared, the outcomes of interest, and the level and timing of evaluation;
5. Specify the expected relationships between interventions and outcomes and the other factors that might affect these relationships; and
6. Develop an evaluation strategy that includes a credible and feasible research design and analysis plan.

Tools/Measures

- CCI's
- Values Clarification Tool
- SWOT analysis

Deliverables

- Shared Purpose and clear evaluation plan and strategy
- Map of enablers, barriers and anticipated outcomes

Activity 2: Review of drivers, resources, barriers and enablers

1. Conduct PESTLE review
2. Undertake systematic review of existing literature, documentary evidence and local evidence for TECS in case study sites, preparing an inventory of what works well and not so well - lessons from other sites already in existence.
3. Conduct baseline provider and administrator survey online. Think of these key questions
 - How common is the TECS application now? How common is it likely to be?
 - How significant is the problem addressed by the application?
 - What is the prevalence of the problem?
 - burden of illness (e.g., mortality, quality of life)
 - cost of managing the problem
 - variability across regions or population subgroups
 - What is the likelihood that evaluation results will affect decisions about adoption of the application, its integration into routine operations, and other missions of the venture?
 - Will the study wastefully duplicate or constructively supplement conclusions from other evaluations?
4. Undertake TECS assessment for adequacy- Check that the technology is "good enough for now" for the intended purposes and circumstances in the case study sites. Assess the adequacy of the:
 - input data—including its quality (e.g., image resolution, sound quality), the speed of the equipment for encoding and delivering it to the main transmission medium, and the quality of any data compression and other pre-transmission modification of the data;
 - transmission of data—based on the bandwidth (information carrying capacity) of the communications medium, its cost, and practicality; and
 - display of data received—including the quality of the images, sound, or other information, and the options for enhancing or otherwise manipulating the information (e.g., increasing or decreasing contrast).

Tools/Measures

- PESTLE analysis
- Systematic literature review
- Documentary analysis of local evidence
- Online survey -design, administration and analysis
- Technology utility assessment

Deliverables

- Case study report
- Literature and policy analysis review
- Baseline survey data
- Technology utility assessment report

4.2 Year 2: Measuring Effectiveness of the TECS Initiatives

Activity 3

1. Develop clear criteria for measuring effectiveness in early proof of concept to test the feasibility and logic of the intervention, demonstrate operational feasibility and perceived value and measuring the impact to address the following questions:
 - Are acceptable clinical outcomes associated with the use of the TECS system?
 - Is the system technically acceptable?
 - How well is the system integrated into the overall health system?
 - What are the costs and benefits in day-to-day operations? Is the system affordable?
 - Will patients and providers accept and value TECS-enabled care?
 - Will the use of telemedicine improve access to health care?
2. Develop plan for collecting data on (a) fixed and variable program costs; (b) use of services by participating patients; (c) patient demographic characteristics and clinical history; (d) presenting symptoms and complaints; (e) health status; (f) symptom distress; (g) functional capacity; (h) symptom resolution; and (i) characteristics of the consultation. Information collection will involve abstraction of information from patient records, patient satisfaction surveys, telephone interviews with staff and other sources.

Tools/Measures

- Economic analysis
- Utility and logic analysis
- Project management tools

Deliverables

- Economic cost benefit report
- Utility and logic analysis report
- Programme management plan and resource map for activities in Years 3 and 4
- Progress report across case study sites

4.3 Year 3: Pilot TECS Hubs- comparative analysis

Activities

1. Conduct any staff training that is required to implement the telemedicine initiative as required by participating hub sites
2. Pilot the telemedicine hub in one or more locations (? Dover and Medway) using a quasi experimental pre-test post-test design which will randomly assign patients to a number of different interventions e.g. telephone consultation only; still images with audio or text; interactive video; and face-to-face consultation. The objective is to compare the effectiveness of the alternatives and to identify the marginal effects and costs of each of the additions of information (e.g., shifting from audio only to audio plus still images). The pretest, posttest research design will help to assess the feasibility, acceptability, and cost-effectiveness of a telemedicine network.
3. Conduct Regular 4 monthly review meetings to identify problems that arise during implementation.

Tools/Measures

- Site participants detailed logs to capture qualitative data about the various steps involved in putting the telemedicine system into place,
- Review encounter forms generated for every telemedicine contact to track information about the patient, provider, clinical problem, process of care, costs (including grant costs, patient or provider expenses, and in-kind contributions) and difficulties experienced with the equipment or other aspects of the consultation.
- Periodic re-inventory of telemedicine linkages to track changes,
- Survey patient and provider satisfaction,
- Focus Group interviews/drop box comments about user experience.

Deliverables

- Evidence of the effectiveness of the service in meeting provider and service user expectations
- Metrics to indicate impact on place of care delivery, hospital and treatment referrals etc

4.4 Year 4: Review evidence of impact from the TECS Hub sites and cascade learning across participating countries

Activities

1. Produce Impact Report that outlines impact in terms of ability to:
 - address patient problems
 - Identify and detect prevalence of problem
 - Monitor burden of illness (mortality, quality of life)
 - Cost of managing the problem
 - Address variability across population subgroups
 - Consider decisions about adoption of the application, its integration into routine operations, and other missions of the venture?
 - Address the question of resource duplication or cost savings
 - Cascade learning through an online learning programme for European partners
2. Share best practice through patient story and practitioner vlogs created for the web

5. Limitations of this Report

This report provides a baseline summary of current technologies used by partners in the project and therefore is only as good as the data provided. It is not intended to be a conclusive evaluative report at this point. Partners need to agree what telehealth initiatives they hope to pilot during the project and how they would like to evaluate the pilot of such initiatives. As workpackage 2 is led by PP2 it will be important that further work is undertaken by the partners responsible for the specific outcomes to determine the cost benefit analysis of their innovations within the project and to advise PP4 what role they wish us to take if any in evaluation. This requires full engagement of all interested parties so that the outcomes of the project are achieved.

6. Conclusions

The partners in CASCADE are using a wide range of different technologies to underpin their service delivery models and there is great scope to tease out and share best practice by the end of the project in 2021.

This report is intended to provide a baseline fulfilling D3.3.1 and part of D3.3.2 for all partners to collectively decide what evaluation strategy will fit best with intended project outcomes for Work Package 2 led by PP2 involving PP1, 2, 3, 6, 7, 8, 9,10 and 11.

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Appendix 1

Dementia Village Technology Questionnaire led by PP2 for WP2

This questionnaire concerns the use of technology to allow residents of a Dementia Village to live as independently as possible while maintaining privacy and dignity. It is also intended to support staff so that they know when they need to take action, and when this is not required/appropriate. The data collected will also be used for a research programme to determine whether it can be utilised to predict changes in a residents condition and/or behaviour, for example, a resident becoming more prone to falls. Examples of the types of devices that will be used are mobile devices (phones, tablets etc.), wearable devices e.g. alarms or wrist bands monitoring pulse rate etc. and sensors e.g. fridge/door opening etc.

Your responses to the questions will help in determining the practical approach taken to how we use the technology and in addressing the issues that we anticipate will arise from its implementation.

Views on Computer Technology: Using the scale provided, please rate the extent to which you agree or disagree with the following statements regarding the use of computer technology in the Dementia Village:						
It will help deliver safe and effective care	A - Strongly Disagree	B- Moderately Disagree	C - Slightly Disagree	D - Slightly Agree	E -Moderately Agree	F -Strongly Agree
It creates significant ethical and privacy issues	A - Strongly Disagree	B- Moderately Disagree	C - Slightly Disagree	D - Slightly Agree	E -Moderately Agree	F -Strongly Agree
It will aid research	A - Strongly Disagree	B- Moderately Disagree	C - Slightly Disagree	D - Slightly Agree	E -Moderately Agree	F -Strongly Agree
Would you agree that the data collected can be used for research purposes	A - Strongly Disagree	B- Moderately Disagree	C - Slightly Disagree	D - Slightly Agree	E -Moderately Agree	F -Strongly Agree
It will promote collaboration amongst users	A - Strongly Disagree	B- Moderately Disagree	C - Slightly Disagree	D - Slightly Agree	E -Moderately Agree	F -Strongly Agree
It will promote the facility as a centre of excellence	A - Strongly Disagree	B- Moderately Disagree	C - Slightly Disagree	D - Slightly Agree	E -Moderately Agree	F -Strongly Agree
It is a valuable instructional tool	A - Strongly Disagree	B- Moderately Disagree	C - Slightly Disagree	D - Slightly Agree	E -Moderately Agree	F -Strongly Agree
Is too costly in terms of resources, time and effort.	A - Strongly Disagree	B- Moderately Disagree	C - Slightly Disagree	D - Slightly Agree	E -Moderately Agree	F -Strongly Agree
It will be obtrusive and impact my lifestyle	A - Strongly Disagree	B- Moderately Disagree	C - Slightly Disagree	D - Slightly Agree	E -Moderately Agree	F -Strongly Agree

Is successful only if there is the support of carers	A - Strongly Disagree	B- Moderately Disagree	C - Slightly Disagree	D - Slightly Agree	E -Moderately Agree	F -Strongly Agree
Too much time will be spent on technical problems	A - Strongly Disagree	B- Moderately Disagree	C - Slightly Disagree	D - Slightly Agree	E -Moderately Agree	F -Strongly Agree
Its use will mean staff have more time to support residents	A - Strongly Disagree	B- Moderately Disagree	C - Slightly Disagree	D - Slightly Agree	E -Moderately Agree	F -Strongly Agree
Do you agree with technology being used to reduce inappropriate staff responses to residents?	A - Strongly Disagree	B- Moderately Disagree	C - Slightly Disagree	D - Slightly Agree	E -Moderately Agree	F -Strongly Agree
Is an effective tool for people of all abilities	A - Strongly Disagree	B- Moderately Disagree	C - Slightly Disagree	D - Slightly Agree	E -Moderately Agree	F -Strongly Agree
Will increase the amount of stress and anxiety users experience	A - Strongly Disagree	B- Moderately Disagree	C - Slightly Disagree	D - Slightly Agree	E -Moderately Agree	F -Strongly Agree
Is successful only if there is adequate training in the uses of technology for all users	A - Strongly Disagree	B- Moderately Disagree	C - Slightly Disagree	D - Slightly Agree	E -Moderately Agree	F -Strongly Agree
Giving residents the opportunity to “roam” within the facility while monitored remotely is a good thing?	A - Strongly Disagree	B- Moderately Disagree	C - Slightly Disagree	D - Slightly Agree	E -Moderately Agree	F -Strongly Agree
Text Box: Please provide feedback on any ideas you may have for how this technology could be used at the Dementia Village						
Background Information						
Gender	Male	Female				
Are you (please indicate all that apply)	A person living with dementia	A carer	A clinician	Member of a charitable support organisation	Member of a community support organisation	Prefer not to say
Do you have smart phone?	Yes	No				

Do you have access to a computer or laptop?	Yes	No				
Determine the level that best describes your proficiency level in relation to computer technologies	A. Expert - I am extremely proficient in using a wide variety of computer technologies.	B. Advanced - I have acquired the ability to competently use a broad spectrum of computer technologies	C. Average - I demonstrate a general competency in a number of computer applications.	D. Beginner - I am able to perform basic functions in a limited number of computer applications.	E. Newcomer - I have attempted to use computer technologies, but I still require help on a regular basis	F. Unfamiliar - I have no experience with computer technologies
Do you understand any of the terms assistive technology, telemedicine, telecare or telehealth?	Yes	No				
Would you be prepared to live with sensors that collected data on your activity e.g. Global Positioning?	Yes	No				
What aspect of your health would you allow technology to provide input for?	Follow-up care for acute illness	Symptom tracking/diagnosis	Medication management/prescription renewal	Follow-up care for a chronic condition	Remote monitoring of vital signs	Behavioural/mental health
Text Box: Please provide information on any concerns or issues you have with use of this technology						