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Evaluation of Telehealth Equipment

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Evaluating the social and economic value of the use of telehealth technology to improve self-management by older people living in the community.

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Abstract

The aim of the project was to evaluate the use of Telehealth equipment in the homes of older community-dwelling people, and to review its social and economic impact. A mixed methods approach was adopted, involving interviews, observation and Depression Anxiety Stress Scales. Overall, the greatest benefit was apparent in those participants with a low familiarity with technology and low digital literacy, where changes in behaviours to prevent an exacerbation of their condition was possible. The user-interface design reduced concern about using the technology. Changes achieved were through better compliance with medication and associated understanding of the impact on their vital signs and hence daily activities. This represented an improved health literacy and the economic benefits appear to be linked to that. Less benefit was observed by those who had been self-monitoring previously. A greater focus on specific conditions and improved self-management could strengthen the evidence for targeted economic benefits.

Keywords Older people, disability, rural, regional, elderly.

1 Introduction

Telehealth can reduce the socio-economic demands by reducing travelling for face-to-face visits. Technology can be successfully applied in community-based patient care to enhance the capacity of nurses to deliver medications management for clients, resulting in increased efficiency of service delivery as well as staff and patient satisfaction (Georgantzi & Gheno, 2012; Towers & Tyler, 2014). Overseas studies involving telehealth and related technologies have been shown efficacious in various ways (Burmeister, 2016; Jenkins & Draper, 2015; Niemeijer, Depla, Frederiks, Francke, & Hertogh, 2014; Pakrasi, Burmeister, McCallum, Coppola, & Loeb, 2015; Ritchie, 1997; Teipel et al., 2016). Similarly, within Australia, Telehealth and other interventions for community-dwelling older people and other age groups have been shown to be effective in supplementing delivery of health care, with positive impacts on patient's care and is clinical staff (Bernoth et al., 2016; Burmeister, Bernoth, Dietsch, & Cleary, 2016; Burmeister & Marks, 2016; Hungerford & Fox, 2014; Soar, Capamagian, Denaro, Prentice, & Skinner-Smith, 2015; Warburton, Cowan, & Bathgate, 2013). Remote healthcare can supplement the delivery of care, providing support to clients and healthcare staff.

This article reports on an evaluation of a trial installation of Tunstall Telehealth monitoring equipment, with a small selection of CareWest clients in the rural and regional area about Orange, NSW. The trial was undertaken to investigate how telehealth equipment, with a well-designed user-interface, can overcome any initial resistance to the use of technology by older persons with chronic health conditions who are accustomed to health support being provided face-to-face. It contributes to our understanding of the particular needs that Telehealth has to meet for these regional and rural community-dwelling older people. With the technical dimensions of the information technology residing in the "background", the "foreground" focus was placed on the social perspectives associated with the use of this technology. The article begins with describing the context of CareWest Ltd and the Telehealth equipment utilised by their clients. It then describes the methodology and findings, before discussing the results.

2 Context

2.1 CareWest

CareWest has offices in 25 locations across New South Wales including Orange, Bathurst, Bourke, Broken Hill, Dubbo, Griffith, Mudgee and Wagga Wagga. A not-for-profit organization, CareWest offers support and advice to individuals, families, and communities across Aged, Disability, Carer, Aboriginal, Child and Family Services as well as Ability Links, Community Links, Community Transport and Home Modifications.

CareWest's 2015-2020 strategic plan clearly identifies its purpose as 'enabling people in regional Australia to live their best lives', and a key goal within this mission is to ensure that 'citizens in regional and rural communities have access to the services they require'. A significant issue for the organization in driving this agenda is how to manage the large distances involved. The organisation's footprint covers roughly 70% of the State of New South Wales, a similar size to Kenya, and larger than either Sweden, Germany, or Italy.

One of CareWest's strategies in managing both the large distances and sparse population densities involved is to turn to technologies that will allow patients and practitioners access each other, exchange information, and develop appropriate care plans. These efforts are designed to improve not only the health outcomes for patients, but the financial and time commitments made by individuals, their families, and the wider community.

2.2 Equipment

Tunstall Telehealth monitoring equipment was installed for at least 2 months in the homes of clients who consented to participate in the trial. The monitoring equipment assessed a core set of measurements (such as blood pressure, heart rate, and weight) and obtained custom measurements depending on each client's health condition e.g. heart failure, chronic obstructive pulmonary disorder, hypertension and diabetes. The clinical/triage team from CareWest ascertained the custom measurements for each client. Clients who consented to installation of the Telehealth monitoring equipment were given the choice to participate in the research.

Equipment description	Model	Brand	Manufacture Location
myclinic@home touch screen device	EP121	ASUS	Korea
Digital blood pressure monitor	UA-767 plus BT	A&D Medical	Japan
Omron Bluetooth Blood Pressure Monitor	BP792IT	Omron	Kyoto, Japan
UC-321PBT Precision Health Scale	9030600	AND	Japan
Glucometer Accu-Chek Performa	CE0088	Roche	Badan-Wurttemberg, Germany
Glucometer MyGlucoHealthWireless Meter	MGH-BT1	MyGlucoHealth	USA
Onyx® II Model 9560 Finger Pulse Oximeter	9560	Nonin	Plymouth, United States of America
ECG remosEKG	100BT	Vitaphone	Chemnitz, Germany
Forehead Thermometer	TD-1261	TaiDoc	Taipei County 248, Taiwan
Lung monitor with Bluetooth	40750	Vitalograph	Ennis Co Clare, Ireland

Table 1: Tunstall Telehealth equipment utilised during the CareWest trial

Tunstall 'data sheets' available on their website, www.tunstallhealthcare.com.au, provide the following information about this equipment. For instance, in Table 1 the "myclinic@home is an individual user wireless touch screen telehealth communication device designed to manage health interviews for up to 4 family members in a home environment. A range of Bluetooth vital signs peripherals interface with the myclinic@home, and video conferencing capability is enabled. This device uses GSM or an internet connection, to securely transmit data to the icp triagemanager". The two types of blood pressure monitors facilitate daily blood pressure monitoring regimes. The pulse oximeter which is slipped on to a finger and activates automatically, measures blood oxygen saturation and pulse rate. The Weight Scales (UC-321PBT precision health scale) are specifically designed for integration with the Telehealth application. The Forehead Thermometer "measures the patient's temperature by infrared heat scanning skin over their forehead". The two Glucometer devices enabled participants to monitor and manage their blood glucose levels, testing blood sugar levels in diabetes, using very small blood samples.

3 Trial evaluation method

The purpose of the evaluation of the Telehealth hardware and software was to determine the social and economic values of this program to older Australians living in community in the Orange region. Evaluation research addresses questions such as: Is it better than what we had before? Is it better than the other options we might have chosen? How else might it be improved to push it to the next level? What did we learn from trying it out? (Davidson, 2005, pp 1-13). This evaluation focussed on the situation before the installation of the equipment and subsequent to the removal of the equipment. For this reason the evaluation took place over two phases. Approval to conduct the study was granted by the University Human Research Ethics Committee.

Having identified the purpose of the evaluation, the next step is to determine the evaluative criteria or dimensions of merit (Davidson, 2005, pp 23-153). In addition to assessing the situation before the installation of the equipment, the first phase (Phase 1) is also crucial for determine the evaluative criteria. Data collected using semi-structured interviews during Phase 1 allowed the researchers to understand the true needs, attitudes, and skills of the clients using these technologies. The outcome of this needs assessment (Davidson, 2005, pp 23-153) exercise formed the basis for the evaluative criteria.

The focus of the Phase 2 interviews was to find out how well the Telehealth program was helping clients meet the needs identified during Phase 1. Interviews in Phase 2 were conducted immediately prior to the removal of the Telehealth equipment.

Assurance of privacy has been shown to be of particular concern to Australians in rural areas (Burmeister, Islam, Dayhew, & Crichton, 2015), and therefore, prior to the start of the process of

interviewing, all participants were provided with a copy of the Ethics Information sheet and the opportunity to seek clarification regarding their involvement before providing their written consent to participate. The interviews were conducted face-to-face and followed a semi-structured interviewing format utilising open-end questions and further probing questions. The semi-structured in-depth interview format was selected to allow rich accounts of participants' experiences to be obtained. The interviews were conducted from September 2015 to July 2016 in Orange and the surrounding region. All the interviews were recorded and transcribed verbatim.

In addition, the emotional and mental well-being of each participant was assessed using the Depression Anxiety Stress Scales (DASS), which include subscales for depression, anxiety and stress. Furthermore, Carewest's nurse clinician provided reflections on how the trial went from a personal perspective. These are presented separately in the findings section below.

3.1 Recruitment

CareWest identified and recruited clients by convenience sampling. There were 18 participants for Phase 1 and 11 for Phase 2. As at the time of drafting this report one post interview had yet to take place, due to that person joining after most of the others had completed the trial. Thus pre and post data reported here only relates to 10 of the 18 participants. Three couples, where both parties in the couple participated, chose to not always do separate interviews. For instance, one woman was not well enough to be interviewed separately for Phase 2, but she was present at her husband's post-interview and contributed to that discussion. Hence we consider we have data from 10 pre and post interviews, even though there are only nine post-interview transcripts. Of the seven pre-participants who did not participate in the post-evaluation, one died and his wife chose to discontinue in the trial, one was a couple and when the male entered a care facility both dropped out of the trial, and three others gave no reason for discontinuing. Finally it should be noted that two participants had their spouses present during their interviews, but those spouses did not participate in the trial themselves. For instance, in one case the person being interviewed was also the carer for her husband, which is why she needed to have him close to her, in case she needed to see to his care.

Participant demographics were not a specific matter of data collection. However, 4 couples participated in which both members of the couple were also part of the trial. 10 of the 18 participants were female, 8 male. Ages ranged from the low 60s to the low 80s, with the exception of one 51 year old. Multicultural data was also not specifically captured, but participants included one Indigenous person, two from the Middle East, descendants from various cultures, but with all participants having been long term residents of rural and regional NSW. At the time of the trial the majority lived in Orange, a few in the immediate region near Orange and the furthest participant lived 120 km outside Orange.

3.2 Analysis

The transcribed interviews were analysed using thematic analysis with QSR NVivo 10, a software package for managing data. The analysis of all interviews was carried out by the team leader. Early during the analysis process another member of the team independently analysed four interview transcripts, and near the conclusion of the Phase 2 analysis that same member independently analysed another 3 interview transcripts. The latter was for inter-rater reliability, with the two team members discussing all discrepancies in analysis, to ensure the reliability of interpretation of the results.

The DASS is an industry standard and well tested instrument and was analysed using the standard methods for that instrument. In addition to comparing Phase 1 and 2 results to each other, the results were also compared to the Australian norms.

4 Findings

Three themes emerged from the analysis of the interviews. They were Service Delivery, Social Impact, and Technology. Exemplary quotations addressing the two aims of the trial are given below, to reveal participant perceptions about the Telehealth trial.

4.1 Theme 1: Service Delivery

Categories within Service Delivery included Self-monitoring, Health support, Assisted monitoring, and Economic impact. Most participants valued the ability to have independence and control, but not all. Hence whilst there are many exemplars of self-monitoring, assisted monitoring was also needed.

> It good service because daily, ten o'clock in the morning, eleven o'clock - between ten and eleven I got a chance to check my data because sometime it is different. (Male)

> When I first had the equipment I thought, oh dear I'm not that ancient that I need that much help. Even though I'd had heart failure, and I thought well it won't be much use to me. But in the last few months I've found it's been excellent, because I've been able to monitor a bit more and (nurse clinician) said "If you can take your blood pressure twice a day." But I've been taking it three times now, if I didn't have that equipment I wouldn't be able to do that, and they wouldn't be able to compare whether my blood pressure was dropping, or whether it was too high. So I've found that very good. And I've sort of changed my opinion about the whole thing, because I think it could be really very, very helpful as personally it gives you a bit more security. (Female)

Several participants complained about the difficulties and costs of changing batteries. One lady, who bought groceries weekly, had to forego groceries one week, because after paying rent, utilities and the Green Slip for her car, she only had 5 cents left. Clearly for someone in such a position, even the cost of replacement batteries, though small, is economically hard to manage.

4.2 Theme 2: Social Impact

Categories within Social Impact included Health status, Reassurance, Socialising in the home, Socialising out of the home, and Treatment.

The health status of participants and/or their spouses impacted the ability to engage in social activities in and out of their residence. Health status was distinguished from treatment in that treatment was the reason for the Telehealth monitoring, but in addition to that, e.g. diabetes, the person might also have other health conditions, such as impaired mobility that required the use of a walking frame, which might also affect their ability to socialise or necessitate medical appointments.

Reassurance is different from self-monitoring in the theme above. Self-monitoring gave participants the ability to feel like they had a measure of control over their condition. Reassurance is about the peace of mind that comes with knowing that when things go wrong, they can receive the help they require. For instance, one participant who died during the trial period and therefore did not participate in the Phase 2 (post) interviews, had experienced a fall in his kitchen prior to the trial. His wife was away and it was many hours before he could drag himself to the phone to ring for help. To him it was reassuring to know that if something like that happened again, the Telehealth monitoring might speed assistance getting to him. That anticipation of alarm monitoring was not a correct perception, but other participants did benefit from the monitoring of their measurements to gain interventions before they might have become aware of the need for assistance.

Examples of socialising in the home and out of it follow. Noticeably for many participants social activities revolve around medical support activities, and/or care package services, such as cleaning, cooking and mowing. First, in the home, including around the home, such as in the garden or on the farm.

> (Name) the heart failure clinic nurse comes around once a week. (Male)

> Neighbours come down at least twice a day to see how I'm going and then if I'm doing something they'll give me a hand to do it and all this type of business. So I go and help them too which I think that's part of life. (Male)

> Well sometimes I go in the Ute with him around the farm. I drive and he looks and opens the gate. And I prefer that, to be with him. Oh, we do it every day, every second day. (Female)

> A couple of days a week we have some friends up the road that pop in. My daughter or my son in law at least every second day. (Female)

Next, socialising out of the home:

> I'm a member of, like I said, an important men's group. That's – the idea of that is to get out of house. I have to go the doctors and go to mobility school which gets me out. The biggest problem with me was not being able to drive, because once you have a – your defib goes off you're not allowed to drive for six months. And mines gone off that many times I'll probably never get a licence back. (Male)

> I don't have much in the way of friends or social activities, or anything like that. I feel too bloody useless like I can't do anything because I can't walk properly, I can't use my hands the way I used to because they shake all the time. I want to try and do some walking up and down in the pool, but that's a bit expensive. (Male)

> Well we leave the house virtually every day for medical matters. Socially maybe once or twice a week for church. (Male)

The last was from a man who went into a care facility during the trial period and therefore did not participate in a Phase 2 (post) interview.

Some participants were very immobile. One man had started dental treatment immediately prior to a fall, and given that dentists do not do home visits, had not had further dental treatment for months, and was badly in need of such services. Another example of a Phase 1 interview in September 2015, below, is that of a man who had only left his house once in 12 months:

> (Name)'s been out of the house once since September last year. (Female)

4.3 Theme 3: Technology

Categories within Technology included Prior use, Passive, Attitude, Post use, Equipment, Hardware, and Interface. Numerous studies have shown the importance of good interface design, including for older people (Burmeister, 2000a, 2000b; Hawthorn, 2000, 2007). Generally the interface was easy to use, even for participants will little prior use of technology. Attitudes towards technology use varied, but most participants welcomed the Telehealth equipment and were willing to put in effort to learn to use it properly. A minority preferred a passive, minimalist approach, which did not involve much input from them. Exemplary quotations of participant views in this theme include the following.

> It said "Please take your ECG reading now", you take it and you press the button, and then you go onto the next one, and you finish the four. And then when that's all finished you just press the finish button, and then you just watch for the – I always watch for the signal little round piece – red piece that goes round and round to make sure it's gone to Brisbane. (Female)

> There's the blood pressure, then weight, and then ask me about salt, and how I feel today. But see it's only got better, worse, or something on the thing. Well it doesn't have in-between, so every time I press it I've got to press – same, same is the word. I just put the same because some days I feel in between it and I can't put worse down, but I could say not as well or something like that. (Female)

> That's the ECG ... It will ring and you just hold it on your chest, and it does its business. It's pretty simple. (Male)

> The rough summary of that is the blood pressure one has worked probably ninety-nine percent of the time, at least all the time. The thermometer one has hardly worked at all and the little one over the finger (pulse oximeter). It has been very poor; it hasn't probably worked for the last month. (Male)

> Very good, because I don't know – I would never know me blood pressure was up without it, because you can't go up the doctor every day. I hadn't been up the street for about probably three years. So I find that very handy – very good. (Female)

4.4 Nurse Clinician Insights

The main themes that emerged from the nurse clinician's observations included: (1) chronic disease management; (2) social connectedness; (3) reduction in anxiety; (4) technical difficulties and opportunities.

4.4.1 Chronic disease management

The nurse clinician observed a favourable effect of telehealth monitoring on chronic disease management, likely associated with telehealth monitoring supporting self-management of symptoms associated with chronic diseases. Telehealth monitoring of vital signs combined with phone support and education from the nurse, improved participants' ability to recognise and appropriately manage symptoms and medical exacerbations. This was also associated with better medication compliance, resulting in improved vital signs during the trial and reduced unplanned hospitalisations. These benefits were most noticeable in participants with multiple chronic conditions and/or higher severity of disease state.

The participants expressed to the nurse clinician that they valued their partnership with the nurse, who helped set health goals and provided advice for health-related decisions. Most importantly, this relationship provided access to a trusted nurse clinician. The participants would initiate conversations with the nurse clinician to clarify health information they had received from medical specialists and seek help to solve health-related issues. One client with heart failure stated that "the telehealth nurse has become one of the pillars in my health along with my General Practitioner (GP) and my Cardiac Nurse".

Telehealth played an important role in chronic disease management by facilitating interdisciplinary care. The nurse clinician shared information with and collaborated with GP's, Nurse Practitioners, Registered Nurses, Pharmacists and home-care workers. Data obtained from Telehealth monitoring influenced medical management decisions related to medications and identified the need for further investigations. In one case, data from the ECG Telehealth peripheral contributed to investigations which led to a more invasive procedure, significantly improving the participant's quality of life.

4.4.2 Social connectedness

Telehealth monitoring also provided social connectivity, with 46% of the participants living alone. The nurse clinician called all the participants at least once a fortnight, including participants with stable vital signs and well-managed conditions. Participants have expressed their appreciation of these conversations to the nurse clinician. These phone calls provided social connection and reassurance of remote monitoring for older participants.

4.4.3 Reduction in anxiety

At the start of the telehealth monitoring trial, the nurse clinician noticed that anxiety impacted the quality of life of most participants with chronic and complex conditions. The presence of multiple chronic conditions seemingly increased the participants' likelihood of psychological distress. As the trial progressed, the nurse clinician observed a reduction in anxiety related symptoms. This may be related to the participant's ability to monitor their vital signs, enabling them to self-assess their own physical state and thus decreasing anxiety associated with fear of physical deterioration or a health emergency. It may also relate to improved disease self-management and deduction in symptoms. However, ongoing reassurance from the nurse clinician was the most obvious influence on reduction of anxiety.

4.4.4 Technical difficulties and opportunities

There was diversity in the ability of the participants to use the Telehealth equipment, with some requiring more technical support. Age did not seem to be a factor in determining ability, whilst previous technological experience may be a positive factor. For example, an 81 year-old participant with tablet and email experience found the Telehealth technology intuitive. In comparison, one participant of similar age felt overwhelmed by the technology and withdrew participation during installation of the equipment.

The nurse clinician seemingly provided the most technical phone support during the first 3 weeks after installation. After this period, the participants felt more confident using the technology. They were also better able to troubleshoot technical difficulties independently or in consultation with IT support who could access their Telehealth computer remotely to fix program issues.

Conditions associated with older age, including osteoarthritis and poor vision, seemingly restricted some of the participants' ability to independently replace the Telehealth equipment batteries. This impacted on the role of the nurse clinician, who was at times required to attend the participant's residence in order to replace the batteries. The nurse clinician suggests that using USB or electricity charged equipment may provide a solution to this issue.

5 Discussion of results

5.1 Games

In the initial interviews, several participants reported playing electronic games, using consoles such as X-box or Play Station, that younger family members might use, or other electronic devices such as iPad, but did not regard these as using technology in the same way they viewed the proposed tele-health monitoring equipment. One participant would join in games, as an interaction with younger family members, but was not really good at it or necessarily interested in that type of action oriented games. They reported not having clear expectations of the tele-health monitoring equipment because it was unknown. Other participants, using electronic devices such as an iPad, were interested in hand-eye coordination and would play for that purpose, but were then drawn into successful play and advancement into higher levels of complexity. They would return to the device with that motivation as a distraction from other health related concerns, yet would still discount their understanding of technology. Entertainment was separated from monitoring health in regard to the importance of the technology. Win or lose in a game did not have the consequences associated with participants' concerns about their health. The commencing level of health literacy of participants understanding the relationship between measurement of vital signs and the interaction required with the equipment was something that changed substantially.

Confusion about how to work with technology was expressed by some participants as being uncertain or disinterested in knowing how to use equipment such as a personal content recorder or player. A television could be switched on or off, and channels changed, but several had not bothered to become familiar with video players when tapes were used, let alone digital entertainment. Many kitchens had micro-wave ovens, washing machines that had programmed settings, but these were regarded as household appliances and were not recognised as being technology. There were frequent doubts expressed about the complexity of the proposed tele-health monitoring equipment. A number of participants also had mobile phones, but these were used for basic communications, such as text or voice calls, and were not smart phones with more advanced features. Some participants, who had iPads, could also communicate with family members using Skype or Facetime, having been assisted with the setup of those programs by family members for easy use. The different reactions in part to technology depended on who had provided assistance in encouraging the use of the technology in the first instance, and the purpose it was used for. Communicating with family, and then friends, meant that a video call was not much of a technological leap from making a mobile phone call, from using a landline, when a family member had programmed the calling numbers and all that was required was a few simple steps, easily remembered or written down. How participants had been moved from what they were familiar with to more advanced forms of technology seemed to influence perception and initial apprehension.

5.2 Self-management

In the initial interviews, several participants reported a relatively low level of awareness about self-management or interpretation of basic measures such as blood pressure, pulse, and blood-oxygen. When feeling unwell participants would consult a health professional. Understanding of medication, and its impact, was at the lower end of health literacy. This changed with the follow-up interviews. Several participants had been recording in notepads, or sheets of paper, their vital signs and had become comfortable in linking the recording of changes to how they felt. They were not using any recordings of their measurements but a technology, pen and paper, which they were comfortable with. Despite not starting with a clear level of comfort with the proposed technology at the initial interview, most were converts and wished to keep the equipment in the follow-up interview. Exceptions were those participants with diabetes who were used to having regular self-testing with their own instruments, and who were more comfortable in self-managing at the commencement of the study and reported little change as a consequence of the use of the tele-health equipment.

5.3 Business case

A number of participants who expressed some initial scepticism about the tele-health equipment, were very accepting of the equipment by the follow-up interview. This is in line with other studies that have introduced information systems to older people (Burmeister, 2010, 2012; Morris et al., 2014; Vichitvanichphong, Talaei-Khoei, Kerr, Ghapanchi, & Scott-Parker, 2016).There seemed to be relatively few technical problems with reliability, but some follow-up reminders to measure and report according to the agreed schedule had occurred. The development of health literacy about the relationship between the vital sign measurements, medication management, and perceptions of wellbeing, meant that it was possible that less expensive equipment, and less frequent reporting, might enable better self-management after the study had concluded. There seemed to be a development of both confidence and pride in the self-awareness and management of their conditions. A perceptible increase in the social interaction and positiveness on the follow-up interview was acknowledged by the interviewers. It seems possible that less expensive personal monitoring equipment, such as fitness or activity trackers, could be used in conjunction with digital scales and automatic blood pressure monitors. Indicative prices for purchase of Omron Blood Pressure upper arm monitors range from $99.95-249.00, digital scales Soehnle Pino Digital Personal Scale $28-35, fitness trackers e.g. Fitbit Charge $169-230.

5.4 Preventable admissions/reduced emergent medical and health consultations

Several participants reported a stabilisation of their vital signs, such as blood pressure, with improved compliance with medications and the ability to interpret “good” from “poor” health days. When blood pressure and/or weight was up adjustments to activity ensued, with increased activity and socialisation on good health days, and adjusted activity levels on poor health days. Participants generally reported better awareness about how they felt based on the measurements, and that meant overall they felt that they were doing more. Participants reported taking ad hoc measurements, outside of designated reporting times, just to “check” how they were measuring up against their perceptions. This suggests an improved health literacy and an ability to self-monitor and better manage their daily living. Participants were more likely to discuss trends and/or examples of good/poor days and what they felt were different

about them. Medications had been reviewed and adjusted and several participants indicated that ad hoc medical and health consultations were not as frequent. They generally expressed a greater degree of comfort with their ongoing management of their condition than the health professional directed management previously. To what extent preventable admissions have been avoided could not be ascertained, and nor could frequency of contact with health professionals be verified without access to personal health records, but participants were more confident in reduced reliance on direct visits to monitor their health status than previously.

5.5 Depression Anxiety Stress Scales

The Depression Anxiety Stress Scales (DASS) was administered with each interview (Figure 1). The depression subscale was observed to decrease from 9.56 ± 12.01 pre-telehealth to 6.33 ± 4.53 post-telehealth. The anxiety subscale decreased from 9.56 ± 5.75 pre-telehealth to 6.78 ± 4.66 post-telehealth. The stress subscale decreased from 9.22 ± 6.92 pre-telehealth to 6.11 ± 5.13 post-telehealth. The changes observed in the subscales were not significant.

The participants of this study scored higher in the depression and anxiety subscales pre- and post-telehealth compared with the Australian general adult population, which had a score of 5.02 ± 7.54 and 3.36 ± 5.07 for depression and anxiety, respectively (Crawford, Cayley, Lovibond, Wilson, & Hartley, 2011). For the stress subscale, the Australian general adult population scored 8.10 ± 8.40. The participants of this study scored higher before the telehealth intervention and lower after the telehealth intervention.

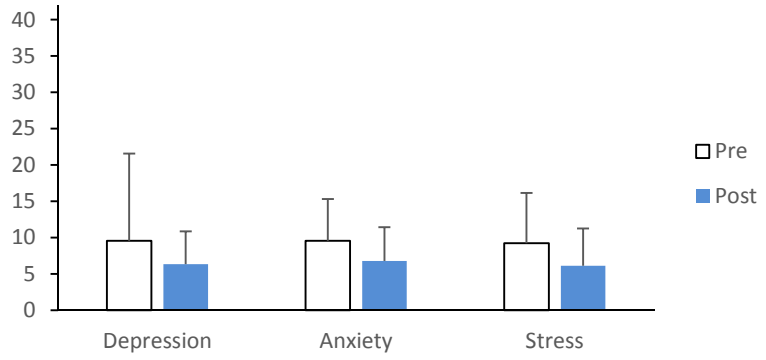

Figure 1. Pre- and post-telehealth DASS scores in nine Telehealth participants.

6 Conclusion

Caution should be exercised in making definitive conclusions from this evaluation based on the quantitative measures used. The size of the sample and nature of the participants recruited into the study make statistical inferences problematic. What can be observed is an improvement between the measures pre- and post-study, and a reduction in variation in the subscales between measures, despite the lack of statistical significance. That could suggest some value in further investigation in a study where aiming for statistical inference was a design consideration. The reduction in reported stress was a marked improvement compared to the generally higher depression and anxiety scales, and this seems to link to the reassurance that the tele-monitoring offered through greater health literacy and the empowerment associated with self-monitoring.

The participants from the age demographic in this study made clear that comfort with technology was an issue in recruitment and participation, and the efforts of the CareWest nurse clinician to address these was important. Understanding the concerns of this group of participants could change how they might be introduced to the potential benefits of the monitoring and support offered by the Telehealth equipment. The role of the CareWest nurse clinician in supporting and assisting participants develop their health literacy was significant and clearly remains one of the integral benefits many participants acknowledge. How future participants might be introduced to the technology, and the benefits of improved self-management, could facilitate a better fit between the health condition experienced and the life-style improvements that could result. The interface with the Tele-health monitoring equipment was regarded by all participants as being very straight forward, easy to follow, and with few problems. Slight changes could result in low equipment maintenance issues such as battery performance and replacement.

The positive experience of the participants is evident in a number of ways, apart from the administration of the DASS instrument. Those participants who were unstable in their self-management of their health condition previously, were assisted in the development of their ability to better self-manage medications and activity. This affected their mood and socialisation, both within their house and outside it. That participants, who previously had not been interested in the use of technology, could now see benefits in improving their daily living should not be underestimated. Several were now prepared to present their stories, as advocates, to others in similar circumstances who might not be initially receptive to the use of the equipment. Considering the use of lower cost equipment to support self-management after the trial is something that might be considered. It could also enable an expansion of the use of the resources to improve health status over a longer period of time to maintain independent living of these aging individuals.

In responding to the first aim of the project in evaluating the use of Telehealth hardware and software in the homes of older people living in the community it was successful for most participants who completed the study. Less benefit was observed by those who had been self-monitoring previously. The greatest benefit was apparent in those participants where changes in behaviours to prevent an exacerbation of their condition was possible, through either better compliance with medication, or better understanding the impact of medication on their vital signs and what that meant to their daily activities.

The second aim was to review the social and economic impact of the use of this equipment. Again, the overall impression from participants was an enhancement to the self-perceived quality of daily functioning. Higher levels of self-reported socialisation, activity, and self-assurance seemed common. The economic benefits appear to be linked to that social improvement, but access to data held by others would be required to determine just how significant the improved self-management would be to the range of health professionals the participants came into contact with in the lead up to the study and post. The difference between frequency of personal visits and phone contact is another consideration. A greater focus on specific conditions and the ability to achieve stability in self-management could strengthen the evidence for targeted economic benefits.

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