DEPARTMENT OF VETERANS’ AFFAIRS

EVALUATION OF THE IN-HOME TELEMONITORING FOR VETERANS TRIAL

FINAL REPORT

OCTOBER 2017
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### GLOSSARY OF TERMS

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<th>Definition</th>
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<tr>
<td>Clinical complexity</td>
<td>An assigned descriptive measure indicating the intensity of resources used to treat a person in an acute hospital setting based on the application of cost weights per Diagnosis Related Group. Note, cost weight increases with clinical complexity</td>
</tr>
<tr>
<td>Comorbidity</td>
<td>Any two or more diseases that occur in one person at the same time. This may occur simply by chance, however, more often than not, diseases occur together because there are some associations between them[^1]</td>
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<tr>
<td>GP consultation</td>
<td>A face-to-face visit between a patient and their GP</td>
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<tr>
<td>Hospital episode</td>
<td>Admitted and non-admitted hospital episodes. Noting that reference to service utilisation data (through DMIS) includes admitted hospital episodes only</td>
</tr>
<tr>
<td>Participant</td>
<td>A trial participant who is either a veteran or a war widow</td>
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<tr>
<td>Telecare</td>
<td>The use of information and communication technology to facilitate health and social care delivery to individuals in their own homes[^2]</td>
</tr>
<tr>
<td>Tele-coaching</td>
<td>An element of tele-health that refers to the delivery of education, tools and support to patients to help them understand the impacts their conditions on their life, develop their coping skills to wellbeing, develop their confidence as well as a sense of control and quality of life. Key goals may include improved self-management, decreasing unplanned interventions[^3]</td>
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<tr>
<td>Tele-consulting</td>
<td>The client (patient) and local worker (practice staff) undertaking a consultation with a remote provider via videoconference[^4]. Note, that in the context of this trial, tele-consulting is a consultation between a patient and their clinician (nurse, Dr or specialist) using video-conferencing via the in-home telemonitoring tablet, designed to replace the need for participants to attend the practice, i.e. instead of a face to face consultation</td>
</tr>
<tr>
<td>Tele-health</td>
<td>A subset of e-health that includes the application of information technology and tele-communications for diagnostic and treatment services, educational and support services locally and at a distance, and the organisation and management of health services (including health information management and decision support systems)</td>
</tr>
<tr>
<td>Tele-medicine</td>
<td>A subset of tele-health that deals with medical diagnostic and treatment services</td>
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## Telemonitoring

A form of tele-health - "the remote monitoring of patients, including the use of audio, video, and other telecommunications and electronic information processing technologies to monitor patient status at a distance." A more limited definition involves "transmission of biologic or physiologic data from a remote location to another location for data interpretation and decision-making".

## Specialist Consultation

A face-to-face visit between a patient and their medical specialist.

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6 Ibid.
# List of Abbreviations

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
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<tbody>
<tr>
<td>ADSL</td>
<td>Asymmetric digital subscriber line</td>
</tr>
<tr>
<td>ALOS</td>
<td>Average Length of Stay (in a hospital)</td>
</tr>
<tr>
<td>AQoL-8D</td>
<td>Assessment of Quality of Life (Eight dimensions)</td>
</tr>
<tr>
<td>BSL</td>
<td>Blood sugar level</td>
</tr>
<tr>
<td>CAD</td>
<td>Coronary Artery Disease</td>
</tr>
<tr>
<td>CDM</td>
<td>Chronic disease management</td>
</tr>
<tr>
<td>CHF</td>
<td>Congestive Heart Failure</td>
</tr>
<tr>
<td>CN</td>
<td>Community nursing</td>
</tr>
<tr>
<td>COPD</td>
<td>Chronic Obstructive Pulmonary Disease</td>
</tr>
<tr>
<td>CVC</td>
<td>Coordinated Veterans’ Care</td>
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<tr>
<td>DMIS</td>
<td>Departmental Management Information System Development &amp; Support Services</td>
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<tr>
<td>DVA</td>
<td>Department of Veterans’ Affairs</td>
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<tr>
<td>ECG</td>
<td>Electrocardiogram</td>
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<tr>
<td>GCH</td>
<td>Gold Card Holders</td>
</tr>
<tr>
<td>GP</td>
<td>General Practitioner</td>
</tr>
<tr>
<td>HbA1c</td>
<td>Glycated haemoglobin</td>
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<tr>
<td>HOI</td>
<td>Health Outcomes International</td>
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<tr>
<td>IHT</td>
<td>In-home telemonitoring</td>
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<tr>
<td>IHT new CVC</td>
<td>In-home telemonitoring - joined CVC Program concurrently with trial</td>
</tr>
<tr>
<td>IHT pre CVC</td>
<td>In-home telemonitoring - joined CVC Program prior to trial</td>
</tr>
<tr>
<td>INR</td>
<td>International Normalised Ratio</td>
</tr>
<tr>
<td>K10</td>
<td>Kessler-10 survey</td>
</tr>
<tr>
<td>MBS</td>
<td>Medicare Benefits Schedule</td>
</tr>
<tr>
<td>NBN</td>
<td>National Broadband Network</td>
</tr>
<tr>
<td>NSW</td>
<td>New South Wales</td>
</tr>
<tr>
<td>PBS</td>
<td>Pharmaceutical Benefits Scheme</td>
</tr>
<tr>
<td>Qld</td>
<td>Queensland</td>
</tr>
<tr>
<td>RACF</td>
<td>Residential aged care facility</td>
</tr>
<tr>
<td>Tunstall</td>
<td>Tunstall Healthcare</td>
</tr>
<tr>
<td>VHC</td>
<td>Veterans’ Home Care</td>
</tr>
<tr>
<td>VIC</td>
<td>Victoria</td>
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EXECUTIVE SUMMARY

From 2012 until the end of 2016, the Department of Veterans’ Affairs (DVA) trialled the use of in-home telemonitoring to determine its value as a complement to traditional primary health care for veterans with chronic conditions. By the end of the recruitment period in September 2014, there were 250 Gold Card Holder veterans and war widows across 55 general practices in four trial sites (Darling Downs in QLD, New England and North Coast in NSW, and Bayside in VIC) participating in the trial. As there was no on-going recruitment, this number decreased gradually over time, although the rate of attrition was substantially less than originally expected and the trial reached its conclusion with 147 active participants across 52 general practices.

The trial was an enhancement to DVA’s Coordinated Veterans’ Care (CVC) Program and participants in the trial had one or more of four chronic conditions (Coronary Artery Disease (CAD), Chronic Obstructive Pulmonary Disease (COPD), Congestive Heart Failure (CHF) or diabetes).

Health Outcomes International (HOI) carried out the independent evaluation of the trial’s design, processes, management, impacts and cost-effectiveness, using a range of primary and secondary data and a comprehensive evaluation framework mapped to the trial’s objectives. These data included quantitative (e.g. service utilisation data, standardised surveys, monitoring data) and qualitative (e.g. case studies, interviews) data, that was collected and analysed throughout the trial.

The approach supported a robust analysis against three geographically and condition matched control groups: CVC Program recipients, Gold Card Holders, and an active control group for survey purposes. It should be noted that while the trial and active control groups were selected by application of a high-risk algorithm, this algorithm was not applied to the CVC and Gold Card data control groups, suggesting any identified reductions in service utilisation would be more notable for the trial group.

E.1 KEY FINDINGS AND CONCLUSIONS

The trial has provided a range of beneficial impacts for participants and practices, indicating there are a number of potential ‘success factors’ for future implementation of the model.

Benefits included a small reduction in the number of public hospital admissions and clinical complexity of both public and private hospital episodes for some participants, smaller increases in the use of general practice health services compared to the increases observed for control groups, improved quality of care through earlier identification of health issues, and improved medication management. The evaluation concluded that telemonitoring led to increased cost effectiveness of care for some trial participants (based on quantitative service utilisation data), but not for the majority of the cohort.

An overall cost-effective analysis based on the operation of the trial model, excluding trial set up costs, showed operation as a service in the future could be cost neutral. Other qualitative analysis indicated a “plateau effect” for the trial’s benefits over the short to mid-term, and that value for money is more likely to be achieved by using in-home telemonitoring as a short to medium term intervention for appropriate participants in appropriate clinical settings (detailed in section E.3 below).
It should be noted there were a number of challenges impacting the intended model and its cost effectiveness, including increased service utilisation partly attributed to a response to high telemonitoring readings and early identification of new conditions, and also the initial response to receiving enhanced coordinated care for those new to the CVC Program.

Additional benefits of the trial were that participants improved their health literacy and self-management leading to a more cooperative approach to health management, improved relationships between participants and their practice, and an overall improved sense of assurance and well-being. The trial also supported some participants to live in their own homes longer with delayed entry into residential aged care facility (RACF).

Key findings are detailed further below based on the five evaluation themes. Importantly, our findings need to be considered in conjunction with potential residual confounders. These are highlighted in section E.5 below.

**E.1.1 Service Utilisation**

Analysis of hospital utilisation suggests that telemonitoring, in conjunction with the increased coordination provided by the CVC Program, contributed to reduced clinical complexity and a stabilisation of the veteran’s condition. A number of participant hospital admissions were also reported for serious and/or potentially life-threatening events due to the availability of monitoring data.

An increase in utilisation and costs of general practice services were less on average for the trial group compared to the broader veteran community included in the control groups. Increases in costs of general practice services were attributed to participants 80 years and over in the trial group.

An increase in average costs per client for allied health services was most significant for the new to CVC trial participants, potentially owing to the increased planning and coordination provided by the CVC Program (for example, patients not previously accessing an optimal level and mix of services), or early detection due to the availability of monitoring data.

The trial participants that enrolled on the CVC Program at the same time as the trial demonstrated slightly more benefit (reduction in service utilisation) compared to those already on the CVC Program at the time of trial enrolment. It is likely this was due, in part, to the increased coordination and access to services provided by the CVC Program. Of note also, the new to CVC group were, on average, five years younger than those participants previously on the CVC Program.

The trial group had a 1.25 year delayed entry into RACF due to the trial, supporting the trial objective to enable veterans to live in their own homes longer.

**E.1.2 Clinical Effectiveness**

Monitoring and interventions benefited specific participants through early identification of changes in existing conditions or the identification of new conditions. Most participants and practices indicated qualitatively that the trial contributed to improved wellbeing, stronger relationships between the trial participant, carer and the practice, and increased health literacy and interest in their health and condition.

While the use of pharmaceuticals increased evenly across trial and control groups, increased pharmaceutical use for trial participants may be related to increased compliance, potentially linked to the trial’s impact on health literacy and self-management, and coaching from clinicians. A commonly cited benefit of the trial was the ability to use the vital signs monitoring when changing the dose of a medication or when a new medication was being introduced. Practices also reported examples where
lifestyle changes contributed to improvements in participants’ conditions reflected by the results of monitoring, and provided the basis for changes in medication.

Practices identified that younger (and less clinically complex) and older (and more clinically complex) groups gained different benefits from telemonitoring. For younger participants, these potential benefits included longer term quality of life and early detection of medical issues obviating hospital admission. For older participants, potential benefits included a better understanding of their condition and control of factors to reduce symptoms, such as lifestyle changes.

**E.1.3 Patient and professional experience**

Individual participants and practices had variable experiences and outcomes.

Experiences of practices varied based on their size, resourcing capacity and capability, number of participants, and the attributes of their staffing and participants. Practice efficiency was reported to improve moderately to significantly for some practices, due to the availability of vital signs data to enable early detection, and the capability to respond more quickly through telemonitoring. Improved efficiency was generally more significant for larger and well-resourced practices.

More than half of practice staff respondents to interim and post participation surveys felt the trial had changed or enhanced their role. This was due to the increase in analytic skills required, a greater level of empathy and strengthened relationship with the trial patient, and improved access to data.

Factors impacting the experience for participants included variation in personal traits relating to cognition, level of activity, level of independence, and capacity and/or attitude to using technology. With training and support, most participants managed the telemonitoring equipment and technology with limited difficulty. Age was not considered a factor in capacity or willingness to participate. Most participants had an overall good experience using the equipment. A small number of participants experienced stress and anxiety using the equipment, leading some of them to withdraw from the trial.

**E.1.4 Service delivery and organisation**

The evaluation suggests the trial provided a safe (no harm) and acceptable complementary service to conventional health care. Overall, practices identified a range of benefits regarding the general practice-centred model, including improved relationship and communication with participants and capability to provide better integrated care. It was noted that some practices experienced challenges with resourcing capacity to undertake monitoring (e.g. due to practice size, limited staffing), lack of GP engagement, and limited existing technology capability to support streamlining of processes.

**E.1.5 Cost effectiveness**

The financial impacts of the trial were informed by comparison of service utilisation (and associated costs) for the trial participants with the CVC control group. There were identified small financial benefits for the trial group across most service categories due to reduced activity and/or average costs per service when compared to changes for the CVC control group.

As the trial was an extension of the CVC Program, it is likely to provide ongoing and long-term cost benefit beyond the completion of the trial (e.g. earlier detection of health issues, reduced unplanned hospitalisations) for participants whose health literacy and self-management has improved, particularly driven by those in the younger age groups, and who continue to benefit from introduction to the CVC Program. Importantly the application of the telemonitoring technology and monitoring did not appear to negatively affect the delivery of treatment or care coordination provided under the CVC Program.

From a cost effectiveness perspective, the evaluation found that the cost of delivering the telemonitoring service over the course of the trial was around 4.2% per client higher (approximately
$256 per year per client or a negative return on investment of 0.04 or 4%). Therefore, for each $1 spent on IHT a return of $0.96 was achieved. The analysis excluded set-up and trial management costs (evaluation and reporting) associated with the trial, as well as payments to general practitioners made under the CVC Program.

Whilst noting that the trial did result in additional costs, there was sufficient evidence to suggest that these additional costs could be reduced by recognising that:

- the DVA IHT model encompassed a high-end full video monitoring capability (which was largely unused by general practitioners and participants)
- more cost-effective equipment options have since emerged
- broader implementation of IHT (and subsequent economies of scale), coupled with standard competitive tendering processes, are likely to reduce the cost per client
- quarterly GP payments in addition to CVC payments were made to encourage practice participation in the trial and it would be appropriate to consider that these payments would not be part of the service model. For comparative purposes, exclusion of these costs from the cost effectiveness analysis produced a positive ROI for the trial of 0.17.

Anecdotal feedback from clinicians and participants also suggested that full time monitoring may not be clinically necessary and alternate models using time-limited IHT could be explored.

### E.2 Key Challenges

Challenges and limitations relating to the design and operation of the trial were identified as follows:

1. **Recruitment.** Initial recruitment to the trial was challenged by the delay in NBN rollout. This was mitigated successfully through the use of other broadband solutions. Despite this, recruitment was labour intensive and involved multiple parties including staff from DVA, the service provider, Primary Health Network (formerly Medicare Local) representatives and practice staff.

2. **Availability and capacity of practice staff.** Part-time employment and turn-over of nursing staff affected the continuity of monitoring and relationship-building for some practices. In addition, monitoring was a challenge where capacity was limited and staff inevitably had competing responsibilities. Availability and capacity of staff was particularly challenging in small practices and led to an increased reliability on co-monitoring by the service provider.

3. **Limited engagement and involvement by GPs.** General Practitioners were involved in the trial in varying capacities across the practices, impacting on the overall practice engagement with the trial, and the optimisation of integrating monitoring data into patient care. It is acknowledged that engagement of GPs in healthcare reforms can be challenging due to their already limited capacity and variance in attitudes to change.

4. **Limited interoperable capability of software systems.** Practices across the four trial sites utilised different medical software systems and were not able to automatically transfer information to/from the monitoring software (reflecting the technology capabilities at the time of the trial design) and leading to some inefficiencies in trial operation.

5. **Unintended socialisation between the service provider and trial participants.** A risk to the post-trial continuity of the practice-patient relationship (through reliance on a third-party service provider) was identified as a risk early in the trial. Although strategies were implemented to minimise this issue, the reliance of some smaller practices on monitoring by the service provider due to limited practice capacity may have resulted in potential confusion around trial role delineation. In addition, a level of socialisation or psycho-social dependencies on the third-party
clinical providers was realised for some participants, an unintended outcome of the trial’s original design, and a potential misconception that the trial provided emergency monitoring support.

6. **A misconception that the trial provided emergency monitoring support.** Qualitative evidence indicates many participants felt an unintended sense of security due to the increased accessibility of the third-party service provider’s clinical support outside practice hours, and may have incorrectly assumed this was part of the in-home telemonitoring service.

7. **Residual confounder.** The trial was designed and implemented as an extension of the CVC Program and therefore participants for both the trial and comparison groups were required to be enrolled in the CVC Program. This means most health outcomes cannot definitively be attributed to in-home telemonitoring. In addition, the trial participants were selected for their high risk of hospitalisation. This different baseline risk, compared to the data control groups may confound the overall relative impacts of the trial.

**E.3 LESSONS LEARNED AND FUTURE DIRECTION**

The evaluation identified a range of opportunities informed by our key findings, conclusions and the key challenges of the trial. These recommendations and lessons learned will support broader implementation in a trial setting or as part of an ongoing program and suite of services for the veteran community. Recommendations include:

1. **Consideration of flexible nursing workforce or centralised models** (focused on the benefits of existing local context and relationships) to support increased resource capacity, feasibility and sustainability. Flexible models include options for shared resources across a broader geographical region and/or a centralised model where a third party is engaged to provide monitoring and triaging.

2. **Options for short or medium-term monitoring care and review plans** to support individualised health goals and improved cost effectiveness of the model. This should include an assessment of health needs, risks and benefits mapped to what the telemonitoring can provide to support improved individualised care planning.

3. **Potential expansion of the trial model to benefit a broader cohort**, for example in relation to age, complexity of condition (e.g. presence of comorbidity). It is also anticipated that telemonitoring could be used to support veterans or war widows recently discharged from hospital (to reduce readmissions), patients needing psychological or end of life support, geographically or socially isolated patients vulnerable to decreased support and service access, and ‘grey nomads’.

4. **Future application of emerging and dynamic technologies**, including use of personal devices as a more cost effective and sustainable alternative, and matching appropriate technology to need.

5. **Enhanced optimisation and application of DVA knowledge and health data** for developing optimal future services. This includes acknowledgement of DVA’s strengths and competencies in the unique needs of the veteran community, and innovative data usage to support service planning and development (e.g. understanding current and projected veteran health and wellbeing needs to support ongoing monitoring and more efficient planning and resource allocation).

6. **Acknowledgement of the challenges and future opportunities for engaging with GPs and primary care providers as telehealth matures and is adopted across the sector.**

7. **Acknowledgement of the importance and impacts of psychosocial benefits, behaviour change, self-management and relationship building** in designing telemonitoring and delivery
of services to the veteran community into the future (i.e. improving measurement and building evidence of benefits, shifting focus from only service utilisation outcomes).

8. **Continue to monitor impacts of the CVC Program** on service utilisation and other health and wellbeing outcomes to enable a clearer picture of the impacts of telemonitoring on outcomes and costs. Consideration could also be given to trialling in-home telemonitoring without CVC.
INTRODUCTION

In 2012, the Department of Veterans’ Affairs (DVA) established a project to trial the use of in-home telemonitoring (IHT) across a select group of DVA clients. Health Outcomes International (HOI) was engaged by DVA to undertake the evaluation of IHT trial that operated from early-2013 to the end of 2016.

This report represents the final evaluation report of the trial.

1.1 OVERVIEW OF THE IN-HOME TELEMONITORING TRIAL

An overview of the key elements of the trial, and their links to the evaluation are provided below. The trial objectives were focused on achieving the following outcomes:

1. To enhance the existing range of DVA services for veterans with selected chronic conditions.
2. To test if telemonitoring is a safe, effective and efficient complement to conventional health services.
3. To determine the value of expanding the service.
4. To improve health and aged care by demonstrating service delivery opportunities enabled by broadband.
5. To test the NBN and other broadband capability in supporting in-home monitoring and high-quality video conferencing for veterans.
6. To support veterans to continue living in their homes for longer, improving quality of life and realising net budget savings.
7. To measure whether in-home telemonitoring delivers reductions in premature admission to residential aged care facilities, unplanned hospitalisations and re-admissions, length of stay in hospitals, emergency admissions, increased responsive management of chronic conditions and reduced burden on carers.
8. To test the efficacy of the service supplier’s clinical triage support.
9. To determine if remote access by veterans to clinical staff through video conferencing leads to improved health and social outcomes for veterans.
10. To assess the benefits and costs of telemonitoring using in-home monitoring equipment and services and to develop a delivery model which, if successful, can be adopted more broadly in the veteran treatment population.
1.1.1 DEVELOPMENT AND BACKGROUND

The IHT Trial was originally funded as a National Broadband Network (NBN) demonstration project, to assess whether telemonitoring over high quality, high capacity broadband was a safe, effective and efficient complement to conventional health services and, specifically:

- improves monitoring and management of complex chronic conditions
- reduces preventable admission and enables veterans to remain at home (and avoid admission to a residential aged care facility (RACF))
- realises net budget savings in the longer term.

The IHT Trial was designed with the aim to reduce face to face health service utilisation through teleconsulting and early detection of health issues through telemonitoring, thereby improving outcomes and cost-effectiveness (e.g. through reduced hospital admissions). The trial was originally to operate for twelve months but was then extended for an additional 18 months to provide an opportunity to build the evidence base of impacts over a longer term.

The key drivers at the design and developmental stages of the trial included:

- a focus on the benefits of the NBN
- the growing evidence base regarding efficacy and cost effectiveness of health technology
- an opportunity to build on evidence base through a longitudinal study with a large cohort
- the ageing population and forecast impacts on service utilisation and costs
- the unique health, social and cultural characteristics of the veteran community
- to optimise the emerging telemonitoring technology at the time with respect to veterans with chronic conditions at risk of hospitalisation.

Evidence on the efficacy and cost-effectiveness of telemonitoring continues to show positive outcomes for people with chronic conditions, albeit to varying degrees, on health and wellbeing, and health expenditure. It is noted also, that some evidence suggests there is little or no benefit to complementary telehealth. The effectiveness of telehealth programs is dependent on a number of factors, including:

- which patients – age, sociodemographic, culture and language, location
- which health conditions
- program operations
- technology
- staffing
- training’.

The IHT Trial targeted veterans and war widows, a large proportion of who were aged and were located in non-metropolitan locations. The cohort had chronic health problems requiring frequent travel to specialists and frequent visits to their local GP. These factors were anticipated to increase

cost-effectiveness (e.g. limiting travel and inconvenience and increase GP productivity through teleconsulting).

1.1.2 **Key Elements**

Key elements of the trial included:

- In-home telemonitoring service to complement usual primary care
- Eligibility criteria based on chronic condition(s) and risk of unplanned hospitalisation
- Being designed as a general practice-centred trial
- Engaging with 55 practices across three states
- Recruiting around 300 participants to an intervention cohort and a further 300 to an active control cohort (note there were also two data control groups)
- Conducting the trial from February 2013 through to December 2016.

1.1.3 **Eligibility of Participants**

The trial was an enhancement to DVA’s Coordinated Veterans’ Care (CVC) Program which targets Gold Card Holders (GCH) who had chronic conditions and were at increased risk of unplanned hospitalisations. The telemonitoring cohort of the CVC Program had to be living in the community (not in a residential aged care facility), not be part of any other telehealth program, and have one or more of the following conditions to be eligible to participate in the trial:

- Coronary Artery Disease (CAD)
- Chronic Obstructive Pulmonary Disease (COPD)
- Congestive Heart Failure (CHF)
- Diabetes.

1.1.4 **Trial Sites**

The trial involved up to 55 participating practices spread across three jurisdictions and four major locations: Darling Downs (QLD), New England (NSW), North Coast (NSW), and Bayside (VIC).

1.1.5 **Profile of the Control Groups**

In addition to the trial participants, the trial involved a matched control group (Gold Card Holders) sourced from different geographic locations - with similar demographics (age, sex and health condition(s) profile) to the intervention group and similar risk of unplanned hospitalisation. Participants in the matched control group completed the same quality of life (QoL) and psychological surveys as the trial participants to inform the comparison of outcomes. Additionally, there were two data control groups from the same regions: (1) Gold Card Holders who were not enrolled in the CVC Program and (2) CVC Program participants who were not enrolled in the trial. Note that the two data control groups were not matched for similar risk of unplanned hospitalisation and this potential confounder is considered in our findings and discussion.

1.1.6 **Overview of the Service Provider Role**

Tunstall Healthcare was the technology and services supplier to the trial providing:

- The hardware and software
- A national data repository
• training for all stakeholders
• technical monitoring and support
• clinical co-monitoring services for a period of up to three months following practice commencement on the trial.

1.1.7 Trial Period
The trial commenced in February 2013 and was originally due for completion at the end of June 2015. The Government provided additional funding to continue the trial for a further 18 months until December 2016.

1.1.8 Inclusion of Trial Participants in Data Collection
Enrolment of participants commenced in June 2013. The majority of participants were enrolled and had equipment installed between April 2014 and August 2014. By October 2014, 300 participants had been enrolled and booked for installation. Of these 300, 292 completed the installation process and are defined, for the purposes of this evaluation, as trial participants. It is also noted that at 30 September 2014, a further 42 participants had withdrawn from the trial, resulting in 250 active telemonitoring participants at the end of the recruitment period.

At the time of the trial extension, when participants were contacted and offered the opportunity to continue the trial, the great majority of active participants (175) elected to stay on the trial with 22 electing not to. At the end of September 2016 there were 147 active participants. Active participants were offered a ‘step-down process’ to enable a smooth transition out of the trial and the additional support it provided.

Qualification for inclusion in the analysis of health service utilisation within the final evaluation report includes the 167 trial participants (active and withdrawn) that were on the trial for a period of at least 18 months between their commencement and the data cut-off point of 30 September 2016. Qualification of inclusion in analysis of other data sources is highlighted throughout this document.

1.2 Overview of the Evaluation
The following section provides an overview of the evaluation including the objectives, methodology and challenges for the conduct of the evaluation.

1.2.1 The Evaluation Objectives
The IHT Trial evaluation (the evaluation) aimed to establish, through scientifically valid research methods, if remote access to clinical staff supported by in-home telemonitoring, leads to improved health and social outcomes for veterans and improvements in the overall health system. The objectives for the evaluation are as listed below and a full description including performance indicators are at Appendix A.

1. Is telemonitoring a safe, effective and efficient way to complement conventional health services?
2. Is there an improvement in monitoring and management of selected complex chronic conditions for veterans?
3. Was there a reduction in unplanned hospitalisations for intervention group participants?
4. Was there increased health workforce productivity?
5. Does broadband optimise opportunities for veteran healthcare?
6. Do veterans experience reduced pain and suffering?

7. Do veterans using the in-home telemonitoring equipment remain in their home longer than those not using the telemonitoring equipment?

8. Is there a return on investment?

9. Were there any systemic issues?

10. Was the trial managed effectively?

11. Is the telemonitoring trial suitable for further development and/or delivery to a broader cohort (scalable)?

12. Are there improvements to be made to enhance the outcomes achieved by the trial?

13. What risks are reduced or increased by telemonitoring?

14. What telemonitoring technology could DVA consider into the future to enhance veteran services?

15. What were the unintended consequences both positive and negative that arise from in-home telemonitoring and how could this be used for learning both within the trial and more widely?

These evaluation objectives form five (5) key themes for the evaluation which were to consider:

1. Service utilisation
2. Clinical effectiveness
3. Patient/professional experience
4. Service delivery and organisation
5. Cost effectiveness.

1.2.2 The evaluation methodology

A comprehensive Evaluation Framework and Evaluation Plan were developed at the initiation of the project. These documents have guided HOI throughout the project, and in preparing this report. It is also relevant to acknowledge that there was significant engagement and communication with DVA and the service provider throughout the trial and that interaction has been important to the ongoing data collection, analysis and reporting for the evaluation findings.

The evaluation methodology was a multi-method design involving the use of existing (secondary) data, collection of evaluation-specific (primary) data, both qualitative and quantitative, from a range of sources (see section 1.2.5). This approach increased the complexity of analysis and synthesis, but also supported a more robust evaluation.

Broadly, the telemonitoring evaluation was a mixture of ‘design’, ‘process’, ‘program management’, and ‘impact’ evaluation forms, each of which called upon a variety of quantitative and qualitative research methods.

There were four major evaluation features that collectively addressed the evaluation objectives:

- experience and outcomes for all participating veterans and war widows
- case studies at the practice level
- use of a control group (data control group, matched control group)
- economic Evaluation (Financial evaluation, cost-effectiveness analysis).
The broad philosophy for the development of the evaluation framework included the need to be credible, to recognise the realities and weaknesses of data and collection methods and at the same time not be excessively demanding or interventionist, particularly on clients. The approach to the development of the framework was therefore guided by the following principles:

- the evaluation process must be **rigorous and credible**
- the success of such an evaluation depended on **simplicity and comprehensiveness**
- the core results of key evaluation questions must be **comparable where relevant**
- there must be clear, answerable questions
- the evaluation methodologies used (both quantitative and qualitative) must be **appropriate for each task**
- the evaluation activities specified in the framework should **maximise the use of secondary data** where these are appropriate, together with information collected primarily for the purposes of the evaluation process
- the framework must **balance 'relevance' and 'cost'**. There must be recognition of the need for a trade-off between the usefulness of results of the evaluation, and the costs of acquisition and analysis of relevant data
- The success of the evaluation requires a genuine **partnership** between DVA and the evaluators.

1.2.3 **LIMITATIONS AND CHALLENGES FOR THE EVALUATION**

There were a number of limitations and challenges identified for evaluating telehealth trials. Key areas included:

- limited access to some quantitative data sources
- confounding factors of CVC Program participation
- confounding factors of other health services (e.g. community nursing, allied health)
- complexity in quantifying impacts
- limited evidence on effectiveness of other similar trials
- lack of interoperability between software systems.

Each of these is discussed briefly below.

**Limited access to some quantitative data source** meant that some data and information was limited or not available, including:

- detailed baseline admission data for comparison of entry into RACFs (to assess if entry into RACFs has been delayed for participants due to the trial)
- public hospital admissions (to assess service utilisation of participants on the trial). Note that these data were available up to June 2016 (three months less than data available for private hospital admissions)
- emergency department admissions
- avoidance of hospital admissions (to assess if the trial has supported hospital avoidance for participants).

Of note, since quantitative data was not available for avoidance of hospital admissions, we were reliant on analysing this through qualitative processes.
Residual confounders. The trial was designed and implemented as an extension of the CVC Program and therefore participants for both the trial and comparison groups were required to be enrolled in the CVC Program. This means most health outcomes cannot definitively be attributed to in-home telemonitoring. A number of participants were on the CVC Program for a period of time before commencing on the trial while others joined the CVC Program concurrently. It is possible, that ‘major benefits’, from a health outcomes perspective, relating to the increased support and services under the CVC Program have already taken effect for those previously on CVC. It is also possible that the effects observed when people join the CVC Program, such as increases in service utilisation, may be exacerbated by commencing on CVC and telemonitoring concurrently. The differences between these two groups have been explored in this report. It is also noted that a recent evaluation of the CVC Program was not available, making it difficult to assess impacts of the CVC Program against the trial.

In addition, the trial participants were selected for their high risk of unplanned hospitalisation. It should be noted that while the trial and active control groups (for standardised health and wellbeing surveys) were selected by application of a high-risk algorithm, this algorithm was not applied to the CVC and Gold Card Holder data control groups. This different baseline risk, compared to the data control groups may confound the overall relative impacts of the trial, for example, any identified reductions in service utilisation may be considered more notable for the trial group.

Confounding factors of other health services. There is a risk that health benefits experienced by participants linked to services outside of the CVC Program and the Telemonitoring Trial may be interpreted as being related to the trial. To account for this, our qualitative approaches have focussed on identifying what differences have arisen because of the trial specifically. Additionally, most participants do not receive additional services beyond the CVC Program, which already supports a comprehensive approach of care for those with a chronic disease. As indicated above, analysis of differences in outcomes for those who were already on CVC and those who joined concurrently to commencing the Telemonitoring Trial are examined in this report.

Complexity in quantifying impacts. The challenges of evaluating telehealth trials are well documented by Greenhalgh and others. While technology (including telemonitoring) can create opportunities for improved outcomes, it is also important to consider the cohort, social, organisational and technical relationships, and context for each trial. These factors lead to variations in reported impacts, for example, across practices or within a practice. As an example, personnel from the same practice within this trial expressed opposing views about the relative benefit of the trial. In addition, the nature of psychosocial and wellbeing impacts made them a challenge to quantify to inform a cost-benefit perspective. The design of this evaluation included a comprehensive mixed methodology to address such challenges, including use of standardised quality of life measurement tools. Noting this, alternate views of benefit and outcomes have been presented and analysed based on the predominant finding.

Limited evidence on effectiveness of other similar trials. There was limited robust evidence available on the effectiveness of similar telehealth and/or telemonitoring trials over the longer term,

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9 Professor Trish Greenhalgh presentation to the Australian Telehealth Society 6th Annual Meeting viewed at https://webcast.gigtv.com.au/Mediasite/Play/b2ab343d08224a229eaf981436e025c1d?catalog=08f0cdda-f199-477c-b3bb-180c7e29ae6c&catalog=08f0cdda-f199-477c-b3bb-180c7e29ae6c
and particularly in relation to general practice-centred models and the Australian context. In addition, it is noted that many other telehealth trials have been reported on/evaluated after a shorter time frame. These challenges are further detailed in section 1.2.4. A comparison of this trial’s model to similar contemporary trials is also provided in chapter 2.

**Lack of interoperability between software systems.** The trial design determined that the Integrated Care Platform (ICP) triage manager (or ICP triage manager) would not be automatically linked to the practice’s medical record system, reflecting the technology capabilities at the time, and noting the challenge of linking to a range of medical record systems, across 55 practices. This approach also aimed to reduce early confounding related to the range of capabilities.

Monitoring data was transferred from the telehealth hub in the participant’s home to the ICP triage manager located in the general practice or to the practice email (via the service provider). The lack of interoperability required that any trial monitoring information be copied by practice staff to the practices’ main record system to enable the GP to access it. The reliance on ‘manual’ and relatively time-consuming data transfer (or duplication) from one system to the other often resulted in a focus on the limited transfer of only significant monitoring or alert data. If a GP wanted to access all the participant’s data, both the practice system and ICP triage manager needed to be open when reviewing the patient (or having a ‘hard copy’ printed for review). This limitation also impacted the evaluation of the trial, in that not all interventions were recorded in ICP triage manager (one of the sources of data for the evaluation) but rather in each practice’s system. In addition, the triaging information collected at the practice level was not fully comparable to the information collected by the service provider for analysis purposes.

### 1.2.4 LIMITATIONS AND CHALLENGES IDENTIFIED IN OTHER TELEHEALTH EVALUATIONS AND RESEARCH

Limitations and challenges identified in the literature included:

- A wide range of technologies - limits classification and comparability
- Technology is ever changing - published reviews become ‘dated’ quickly
- Randomised control trials are not integrated into socio-technical systems – leading to biased or less meaningful results
- Technologies create opportunities, but do not ‘determine’ outcomes – therefore are difficult to measure
- Communication and data collection across two (or more) sites – leads to problems if methods are different (and may not be generalizable to other programs/trials)
- Access to hospital data (including complex and lengthy processes for ethics approvals)

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11 An ‘alert’ is a notification flagged through the ICP triage manager indicating a reading is outside the set parameters that requires follow-up by the practice or Tunstall. ‘High’ readings or alerts receive immediate follow-up.

12 Professor Trish Greenhalgh presentation to the Australian Telehealth Society 6th Annual Meeting viewed at https://webcast.gigtv.com.au/Mediasite/Play/b2ab343d08224a229eaf981436e025c1d?catalog=08f0cdfa-f199-477c-b3bb-180c7e29ae6c&catalog=08f0cdfa-f199-477c-b3bb-180c7e29ae6c

• reliance on NBN rollout for trial implementation, and subsequent variation in installation processes for different internet connections

• identification and recruitment of patients – more difficult than anticipated, including consent by GP of patient participation (delays), limited engagement of practices in new methods of care

• slow and patchy adoption of telemedicine and innovations in health technology by some clinicians

1.2.5 EVALUATION REPORTING

The evaluation of the longitudinal IHT Trial included a range of reports across the trial period, as follows:

• a baseline report was developed that included an assessment of the trial participants and various control groups to allow for measurement of change within the groups and across the groups

• the first interim report updated the baseline position given the incremental enrolment that had occurred with the trial

• the second interim report provided early considerations and an evaluation of the trial up to June 2015

• the third interim report provided further considerations and an evaluation of the trial up to December 2015

• the fourth interim report built on previous findings and provided the third full assessment and analysis against the baseline position to September 2016 (dependant on data source), with a range of early conclusions.

This final report builds on the findings of the fourth interim report and provides additional assessment and analysis against the baseline position using trend analyses. The data sources used to inform the reports to date included:

1. Data extracted from DVA’s Departmental Management Information System Development & Support Services (DMIS) database. This included:

   - the baseline data for the period 1 July 2012 to 30 June 2014 (24 months of data commencing two complete financial years before the trial began) which profiled Gold Card Holder and CVC Program participants (control groups) in the trial regions, as well as trial participants

   - comparative data from DMIS for the period 1 July 2014 to 30 September 2016 (27 months of data extracted end March 2017). Trial participants (active and withdrawn) included in the data analysis are those who participated in the trial for a minimum of 18 months in the period 1 July 2014 to 30 September 2016, i.e. 167 participants. It is noted that comparative DMIS data


15 Armfield NR, Edirippulige SK, Bradford N, Smith AC (2014) Telemedicine – is the cart being put before the horse? MJA 200 (9) · 19 May 2014
for public hospital admissions was only available to June 2016. This limitation has been incorporated into the analysis.

2. Completed mental health (Kessler 10 or K10) and assessment of quality of life (AQoL 8D) surveys from the trial participants and the matched control group undertaken on commencement, at an interim point (between 6-12 months later depending on the trial commencement point for the participant), and post participation (at withdrawal, end of trial before extension, or end of trial extension period).

3. Data from Tunstall Healthcare in the form of ICP triage manager, Key Performance Indicators (KPI), Safety Committee reports and End of Project Report. Quantitative data from ICP triage manager was extracted up to end September or December 2016 as appropriate.

4. Online practice surveys sent to all 55 practices across the four trial regions at interim point (September to October 2015) and post participation (January to April 2017).

5. Case study interview findings from:
   - November 2014 to March 2015: case study visits with 14 practices and their trial participants across all four trial regions. Visits included consultation with 42 trial participants, practice nurses and three GPs.
   - April to May 2016: 35 participants, two carers, and staff (practice nurses and practice managers) from 15 practices across all four regions. The case study interviews were undertaken via telephone (49) and video (1) consultations.
   - September to October 2016: staff from 13 practices across all four trial regions. The case study interviews were follow-up telephone conversations from case study visits in 2014-2015. Note that one practice in the NSW North Coast region did not partake in the follow-up consultation due to a change in monitoring process, and was therefore considered unsuitable. Seven participants were also interviewed in this round of case studies as a supplement to the previous round.

6. Consultation with staff from DVA and Tunstall regarding experiences and perspectives of the trial.

7. Additional evidence collected from other sources including trial newsletters, the IHT Trial Facebook page and other communication records between practices and DVA or Tunstall.

8. Literature and contemporary evidence supporting similar telehealth and telemonitoring trials or implementation, with a focus on Australia and hospital avoidance for people with chronic conditions.

Note also that the evaluator’s secure participant and matched control group databases were used for quality assurance purposes, including cross referencing with Tunstall and DVA datasets as required.
THE IN-HOME TELEMONITORING TRIAL MODEL

This chapter describes the trial’s design features, discusses its intended benefits and conceptual logic, compares it to other similar trial or program models, summarises its limitations over the course of this trial, and describes opportunities for how the model could be further developed to support a safe, effective, efficient and sustainable model going forward.

2.1 TRIAL DESIGN FEATURES

The IHT Trial was designed as a general practice-centred model where the selection and enrolment of suitable patients, setting of parameters for vital sign readings, monitoring, and subsequent interventions were carried out by the practice nurse and GP as illustrated in Figure 2.1 below. This model aims to capitalise on the existing relationship and health knowledge the practice has with their patient whilst providing integrated care. This is different to the design of many telehealth and telemonitoring trials where a specific provider undertakes the monitoring and follow-up action or coordinates a response from other service providers as required. Note that throughout the remainder of this report, veterans and war widows enrolled on the trial will be referred to as participants. Key features of the IHT Trial were as follows:

- participant used telemonitoring equipment at home. Data was transmitted through the internet
- GP and practice nurse set and adjusted parameters and monitored participants’ vital signs through telemonitoring hub (ICP triage manager) located at the general practice and would follow up with participant over tele/video-conferencing as required
- co-monitoring role provided by the service provider clinical team as back up to the primary monitoring role of practice staff
- secure data storage and portal located with the equipment and technical provider (Tunstall)
- DVA provide overarching governance and management role for the trial.

Figure 2.1: Design of the in-home telemonitoring trial
2.1.1 **In-Home Telemonitoring by Participants**

Trial participants played an integral role through ‘self-monitoring’ using the Tunstall touchscreen tablet kiosk (Figure 2.2) and the measuring equipment that had been prescribed to them based on their condition(s). Each piece of equipment was ‘virtually’ connected (e.g. through Bluetooth technology) to enable vital sign measurements to be transmitted from their tablet to the *ICP triage manager* at their local participating general practice.

Self-monitoring enabled participants to engage in the monitoring process, and provided the potential to ultimately increase interest in their condition (and health) over time as their knowledge base grew. Each participant was provided training in the use and management of the trial equipment and technology.

![Figure 2.2: Tunstall touchscreen tablet kiosk for trial participants](image)

2.1.2 **The General Practice-Centred Model**

There are a range of characteristics of the general practice-centred model that differentiate it from other telehealth approaches and have been found to be beneficial in this trial. As indicated above, the general practice-centred model aimed to capitalise on the existing relationship between the practice and patient, optimising the historical and contextual health knowledge the practice has with their own patient, and enabling an integrated care approach alongside CVC services. This model also provided opportunities for enhancing the relationship with patients, and increasing practice efficiency and productivity over time. In addition, GPs and other practice staff had access to data and trends recorded on the *ICP triage manager* to enable integration of the data into decision making and care. The model was also designed to enable tele-consulting and video-conferencing (using high-definition cameras and high-speed broadband, NBN) between practices and participants.
The features and benefits identified from the research (which were generally supported by the practice surveys, case studies, and trial newsletters) included:

1. **The practice and participant are known to each other.** The practice can undertake monitoring and follow-up with an existing knowledge of the participant’s complete health and social history, and with an established rapport and relationship:
   - the existing relationship supported recruitment (e.g. through GP recommendation)
   - the monitoring alert parameters can be better tailored to the participant as a history of their ‘normal’ vital signs are already known
   - the follow-up actions to alerts are better suited to the participant’s situation (e.g. less mobile)
   - changes or variance in a pattern of vital signs can lead to earlier detection of new or emerging conditions.

   *I don’t have to do as many home visits, and I am confident that a phone call is enough because I know the patient, their situation and how much contact they have with their family. It really helps me fit more into my day.* - Practice Nurse, Bayside

2. **Enabled further enhancement of practice and patient relationship.** Practices reported that the trial has built trust and assurance for the participant through communication related to telemonitoring. This is likely to realise broader social, health and wellbeing benefits for the participant through enhanced communication and coordination\(^\text{16}\). Some practices reported their overall knowledge of the participant had also been enhanced given the more granular detail provided by frequent monitoring.

3. **Monitoring and follow-up was integrated into usual GP care.** This ensures the GP is aware of changes and interventions for the participant and is central to decisions on their management. The findings of other telehealth trials are that GP engagement is challenging because they are not central to the trial. Our case study findings indicate that the level of GP engagement varies across practices within this trial (based on perspectives of the practices), but that the convenient and easy integration of data by the practice nurse into patient files has enabled GPs to optimise the availability of vital sign data. We note that use of available data was not optimised by all GPs, and this is likely related to their level of engagement, as further discussed in section 2.3.

4. **External monitoring service not required.** An external service may result in duplication of messages and care, and cause the participant, carers and family to be interacting with more service providers than necessary. Older cohorts and frequent service users tend to prefer continuity and established trust with providers.

5. **Aligned with the established CVC Program.** The CVC Program for chronic disease management (CDM) is also a general practice-centred model. The trial can enhance the delivery of CVC through the availability and integration of vital signs information for monitoring and management and video-conferencing with the client as required. It is noted that video-conferencing has had little uptake to date by practices, discussed further in this report.

### 2.1.3 Co-monitoring element

The trial was designed so that the practice was the primary monitoring service and the service provider was the co-monitoring service. As a support to improve integration and competency with the system, the co-monitoring service allowed for up to three months of the service provider’s monitoring support.

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for all practices. Co-monitoring ensured there was a back-up system, where needed, for follow-up of high reading/alerts (for example after seven days of no intervention, or a ‘7-day pick-up’). This element of the trial aimed to optimise the benefits of having the practice staff in the primary monitoring role, whilst enabling a health management ‘safety net’ until practices were competent in trial processes and systems. The service provider’s co-monitoring role also aimed to support increased cost-effectiveness (external provider only used when necessary), and the sustainability of practice and patient relationships beyond the trial.

### 2.1.4 Data and Communication Portal and Technical Services

A secure data storage and portal for the trial’s large database was located with the service provider (Tunstall) in Brisbane. In addition, Tunstall provided the technical equipment, training and maintenance services for practices and participants to support ongoing data collection. This element of the trial model aimed to optimise the specific technical expertise and experience of the technical staff within Tunstall that was required for the trial.

Whilst this trial started as an NBN technology-centred activity, subsequent Government policy changes meant that the use of a range of different broadband technologies was added to the trial parameters. This has included 3G, 4G and ADSL technologies as well as NBN connections where available.

The internet connection type for the 300 installations has been significantly weighted (90%) toward 3G/4G. NBN installations only realised a total of 6%. We understand that this change in technology focus was only expected to cause limitations in the quality of video-conferencing. However, use of video-conferencing was limited (discussed further below), and we have had no negative feedback through our evaluation processes regarding the type of internet connection.

### 2.1.5 Governance and Management

The trial was governed by a DVA Project Board and managed by a project team with varying levels of resources provided over the life of the trial (depending on the workload required by the phase of the project. In addition, a number of specialised groups provided support at trial initiation and/or throughout the trial as required, including:

- a Clinical Reference Group (CRG), provided external clinical stakeholder input to the clinical model
- a Technical Advisory Group (TAG), provided technical expertise and advice early on the trial including advice on technology and evaluation
- the DVA Human Research Ethics Committee, provided advice and support in ethical research, including data collection and engagement with participants
- a Safety Monitoring Committee, provided assistance in identifying and escalating any unsafe or potentially dangerous clinical patterns emerging from the trial.

The governance approach provided a central DVA team with diverse and targeted expertise for evaluators and technical service providers to communicate with and supported a focus on participants’ safety and health outcomes throughout the trial.

### 2.2 Comparisons with the Contemporary Evidence Base

A range of evidence has been reviewed to support the development and assessment of the trial’s design, and the evaluation. Recent similar trials relevant to the DVA Telemonitoring Trial include:

- Department of Health Whole-Systems Demonstrator Pilot (WSD), United Kingdom (2008-2009)
• CSIRO and Australian Government Telehealth Pilots Program – Home monitoring of chronic disease telehealth trial (2013-14)
• Telehealth Remote Monitoring for Community-Dwelling Older Adults with Chronic Obstructive Pulmonary Disease, Western Australia (2013)
• a Randomized Controlled Trial of Telemonitoring in Older Adults with Multiple Health Issues to Prevent Hospitalizations and Emergency Department Visits, USA (2012)
• the Systematic Implementation of Health Informatics, Home telehealth and Disease Management to Support the Care of Veteran Patients with Chronic Conditions, USA (2008).

Summarised comparison of selected trials with the DVA trial are provided in Appendix B.

2.3 Key challenges and limitations of the model

While many benefits of the model have been identified to date, there are also some limitations identified through analysis of the data, case studies, practice feedback and other information that would need to be considered by DVA from an effectiveness and efficiency perspective should IHT be mainstreamed in the future. In summary, the key challenges relate to practice nurse availability and capacity, unintended socialisation between service provider and participants, limited engagement and involvement by GPs, and lack of interoperability between software systems. These are described further below:

1. Practice nurse availability and capacity. Part-time employment and the natural turn-over of nursing staff affected the continuity of monitoring and relationship-building for some practices, given most tasks within the trial were assigned to the practice nurse. This was particularly challenging in small practices where there may have been one part-time practice nurse and only a single participant on the trial. This resulted in a number of practices relying on the service provider for co-monitoring and follow-up intervention (which potentially impacts on the benefits of continuity and relationship building and, in the longer term, financial sustainability). Staff availability was also a contributing factor in the lack of video-conferencing with participants.

Limitations relating to nurse availability and integration resulted in the service provider conducting much of the monitoring and follow-up intervention past the three-month co-monitoring period at the beginning of the trial for a number of practices. This was evidenced by the second and third round of case studies, and through the ICP triage manager monitoring trends. It is acknowledged that additional monitoring by the service provider was driven by limited engagement and capacity of the practice which led the service provider’s nurses to feel obliged to respond to alerts to support patient care. It is noted that this was not an intended feature of the design, and while some practices were comfortable with additional monitoring support, others felt it was not required and caused frustration and lack of clarity around monitoring roles and responsibilities. The service provider noted that a great level of effort was required (by DVA and the service provider) to encourage practices to lead the monitoring in order for the trial to be implemented in line with the design. Overlapping of monitoring roles is discussed further below.

2. Unintended socialisation between the service provider nurses and trial participants. A strong rapport was developed between the service provider nurses and trial participants through their telephone contact relating to monitoring and follow-up, particularly where the co-monitoring role was more intensive that the trial design had planned for. Though this was a positive outcome for the participants who enjoyed the psychosocial benefits of conversation and relationships, the potential longer-term impacts, particularly as trial participants withdrew from the trial or stepped down from the trial included feelings of separation and isolation for some. It is acknowledged that DVA felt strongly that the key relationship to maintain throughout the trial was between the
practice and the participant, given its ongoing nature to support continuity and quality care. It is also acknowledged that future primary care models should consider the benefits and risks of building rapport between third party clinicians and patients in a coordinated care approach, and the impacts on the cost-benefit ratio of longer consultations that include non-clinical conversation and rapport.

3. **A misconception that the trial provided emergency monitoring support.** Qualitative evidence indicates many participants felt an unintended sense of security due to the increased accessibility of the third-party service provider’s clinical support outside practice hours, and may have incorrectly assumed this was part of the in-home telemonitoring service.

4. **Limited engagement and involvement by GPs.** General Practitioners and practice managers were involved in the trial in varying capacities across the practices. For some practices, this was due to practice nurse availability or capacity. Importantly, practice nurses felt that the trial impacted on their role, not so much the role of the GP, particularly where engagement was a challenge. Where GPs were not as engaged, nurses felt the data could be utilised more by the GPs. Limited engagement and involvement by GPs, including limited use of the available clinical data was an unexpected outcome of the trial given significant efforts were made at the onset and throughout the trial to engage, involve and communicate with GPs. It is acknowledged that engagement of GPs in healthcare reforms can be challenging due to their already limited capacity and variance in attitudes to change (including angst regarding additional tasks or processes)\(^\text{17}\). Future models should consider the costs and sustainability of GP engagement.

5. **Integrating monitoring into daily tasks.** Practice staff (part-time and full-time) have numerous competing responsibilities within the practice which can create challenges to integrating monitoring and follow-up into daily routine. In addition, participants were provided flexibility to monitor at a suitable time of day or forgot to log on during the nominated period. If a practice nurse checked the monitoring results at the same time each day, results from all participants may not yet have been logged. To capture all results, practice staff were then required to check more than once each day, which may be unfeasible (particularly for smaller practices with part-time staff). It is noted that many practice staff checked the *ICP triage manager* two or three times a week as their availability allowed, even if participants monitored each day of the week.

> *My main concern again is finding the time to look at the readings and because I am the only nurse trained I worry about what happens with the readings when I am not in the practice.* - Practice Nurse

6. **Inefficiency relating to the lack of interoperability of software systems.** Although the duplication and transfer of information from one system to another reflects the technology capabilities at the onset of the trial, this can be considered an inefficiency related to this particular general practice-centred trial model. A practice nurse is required to ‘copy and paste’ information from the *ICP triage manager* (e.g. located centrally in the practice) to a patient’s file in order for the GP to access it during a consultation (e.g. in private consultation room).

7. **Trial design not focused on disease specific ‘specialists’**. Other telehealth programs may use disease specific ‘specialists’ to support program delivery, particularly where external monitoring providers are used. This was not a feature of the Telemonitoring Trial, given the level of complexity that already existed within the model being tested. It is noted cost savings via tele-consulting with specialists may have been achievable given specialists are incentivised by Medicare schedule fee to carry out tele-consultations in this manner (whereas general practitioners are not)\(^\text{18}\).


This chapter details the demographic profile for the three DMIS data control cohorts used throughout this report:

1. **Gold Card Holders (GCH)** in the trial’s four geographic regions that have one or more of the four target conditions and do not reside in a RACF. A total of 5,793 records were examined for this report.

2. **Coordinated Veterans’ Care (CVC)** clients in the trial’s four geographic regions that have one or more of the four target conditions and do not reside in a RACF. A total of 2,612 records were examined for this report.

3. **Telemonitoring participants.** For the purposes of this final report this includes DMIS data for 167 trial participants who have one or more of the targeted conditions and have been on the trial for a period of at least 538 days (18 months with 10-day buffer). In this report, we have also undertaken an analysis of the telemonitoring participants according to when they commenced CVC as follows:

   - **New to CVC:** Those designated as the new to CVC group are those telemonitoring participants who joined CVC immediately prior to commencing the trial, i.e. concurrently. This group is abbreviated to ‘IHT-New CVC’ for data table purposes. There were 59 participants in this group.

   - **Previously on CVC:** Those designated as the previously on CVC group are those telemonitoring participants who were enrolled in the CVC Program for a period of at least three months prior to commencing the trial. This group is abbreviated to ‘IHT-Pre CVC’ for data table purposes. There were 108 patients in this group.

Any data discrepancies in cohort numbers are highlighted as appropriate throughout the document, and are based on the available data fields for each participant within DMIS at the time of extraction. Assumptions around the impacts of these changes have been highlighted as appropriate, as have the impacts on interpreting conclusions based on the DMIS data (e.g. based on low service volumes).

*Note that selection of trial participants also included a factor of hospitalisation risk. Therefore, the trial group has a higher baseline risk of unplanned hospitalisations compared to the data control groups (Gold Card Holders and CVC groups).*

### 3.1 Telemonitoring Participants by Location

An analysis of the three data cohorts by state shows a high degree of consistency between the CVC and telemonitoring cohorts across all three states, enabling robust comparison between these two groups.

Table 3.1 details the client cohorts by location. There was a relatively even distribution of clients across the three cohorts in Queensland. There was a greater differential between the GCH and telemonitoring...
cohorts with a greater proportion of telemonitoring participants from NSW and a smaller proportion from Victoria. A potential implication of this uneven distribution in NSW and Victoria is the variance in health systems and practices between jurisdictions influencing outcomes. This potential implication has been considered in Chapter 4 in respect of service utilisation. In contrast, there was a relatively even distribution of clients across the three cohorts in Queensland and may support identification of differences that may be attributable to the trial. These demographic factors are further explored in chapters 4, 5 and 6.

Table 3.1: Client cohorts by state

<table>
<thead>
<tr>
<th>Location</th>
<th>GCH</th>
<th>CVC</th>
<th>IHT</th>
<th>IHT-New CVC</th>
<th>IHT-Pre CVC</th>
</tr>
</thead>
<tbody>
<tr>
<td>New South Wales</td>
<td>2,785</td>
<td>1,548</td>
<td>104</td>
<td>34</td>
<td>70</td>
</tr>
<tr>
<td></td>
<td>48%</td>
<td>59%</td>
<td>62%</td>
<td>58%</td>
<td>65%</td>
</tr>
<tr>
<td>Queensland</td>
<td>1,080</td>
<td>417</td>
<td>29</td>
<td>12</td>
<td>17</td>
</tr>
<tr>
<td></td>
<td>19%</td>
<td>16%</td>
<td>17%</td>
<td>20%</td>
<td>16%</td>
</tr>
<tr>
<td>Victoria</td>
<td>1,928</td>
<td>647</td>
<td>34</td>
<td>13</td>
<td>21</td>
</tr>
<tr>
<td></td>
<td>33%</td>
<td>25%</td>
<td>20%</td>
<td>22%</td>
<td>19%</td>
</tr>
<tr>
<td>Total</td>
<td>5,793</td>
<td>2,612</td>
<td>167</td>
<td>59</td>
<td>108</td>
</tr>
</tbody>
</table>

3.2 TELEMONITORING PARTICIPANTS BY AGE AND GENDER

The gender profile of each of the three data cohorts shows that the trial participant group had a greater proportion of male participants (62%) when compared to the GCH (46%) and CVC (45%) cohorts (see Table 3.2). No significant differences in trial experiences or outcomes relating to gender were identified qualitatively. Analysis of early withdrawal from the trial by gender is provided at Section 5.5.3, and identified a higher proportion of females withdrew early.

Table 3.2: Client groups by gender

<table>
<thead>
<tr>
<th>Gender</th>
<th>GCH</th>
<th>CVC</th>
<th>IHT</th>
<th>IHT-New CVC</th>
<th>IHT-Pre CVC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Female</td>
<td>3,143</td>
<td>1,440</td>
<td>64</td>
<td>21</td>
<td>43</td>
</tr>
<tr>
<td></td>
<td>54%</td>
<td>55%</td>
<td>38%</td>
<td>36%</td>
<td>40%</td>
</tr>
<tr>
<td>Male</td>
<td>2,650</td>
<td>1,172</td>
<td>103</td>
<td>38</td>
<td>65</td>
</tr>
<tr>
<td></td>
<td>46%</td>
<td>45%</td>
<td>62%</td>
<td>64%</td>
<td>60%</td>
</tr>
<tr>
<td>Total</td>
<td>5,793</td>
<td>2,612</td>
<td>167</td>
<td>59</td>
<td>108</td>
</tr>
</tbody>
</table>

Source: DMIS data extract; GCH = Gold Card Holders; IHT = In-home telemonitoring participants
An analysis of the average age of the three cohorts, shows that the average (mean) age of the telemonitoring cohort (81 years) was five to six years less than the average ages of the GCH (86 years) and CVC (87 years) cohorts (Table 3.3). This difference was consistent for both genders. For the two sub-groups of the telemonitoring participants, ‘pre CVC’ and ‘new CVC’ there was also an average age difference, where ‘new CVC’ trial participants are five years younger on average (78 years) compared to the pre CVC group (83 years). The potential impacts of these differences are detailed in chapters 4 and 5.

### Table 3.3: Client groups by mean age (years) and gender

<table>
<thead>
<tr>
<th>Gender</th>
<th>GCH</th>
<th>CVC</th>
<th>IHT</th>
<th>IHT-New CVC</th>
<th>IHT-Pre CVC</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Average Age</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>Mean</td>
<td>83</td>
<td>84</td>
<td>79</td>
<td>75</td>
</tr>
<tr>
<td></td>
<td>Std Dev</td>
<td>12</td>
<td>11</td>
<td>10</td>
<td>8</td>
</tr>
<tr>
<td>Female</td>
<td>Mean</td>
<td>89</td>
<td>89</td>
<td>85</td>
<td>82</td>
</tr>
<tr>
<td></td>
<td>Std Dev</td>
<td>7</td>
<td>6</td>
<td>8</td>
<td>10</td>
</tr>
<tr>
<td>Total</td>
<td>Mean</td>
<td>86</td>
<td>87</td>
<td>81</td>
<td>78</td>
</tr>
<tr>
<td></td>
<td>Std Dev</td>
<td>10</td>
<td>9</td>
<td>10</td>
<td>9</td>
</tr>
</tbody>
</table>

Source: DMIS data extract; Std Dev = Standard deviation from the mean; GCH = Gold Card Holders; IHT = In-home Telemonitoring participants

Our analysis, elsewhere in this report, considers the differences in age within the trial group, but also considers the more advanced age of the control groups.

### 3.3 Telemonitoring participants by targeted conditions

An analysis of the average number of health conditions in each of the three client groups illustrates that telemonitoring participants experience, on average, 1.71 target conditions per participant, compared to the GCH and CVC cohorts experiencing on average 1.57 and 1.59 target conditions respectively (Table 3.4). In addition, those participants who joined the CVC Program concurrently (IHT new CVC) had the highest average number (1.83) of conditions.

### Table 3.4: Average number of conditions for all client groups

<table>
<thead>
<tr>
<th>Number of Conditions</th>
<th>GCH</th>
<th>CVC</th>
<th>IHT</th>
<th>IHT-New CVC</th>
<th>IHT-Pre CVC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean</td>
<td>1.57</td>
<td>1.59</td>
<td>1.71</td>
<td>1.83</td>
<td>1.65</td>
</tr>
<tr>
<td>Std Dev</td>
<td>0.78</td>
<td>0.76</td>
<td>0.85</td>
<td>0.87</td>
<td>0.84</td>
</tr>
<tr>
<td>95% CI</td>
<td>[1.55, 1.59]</td>
<td>[1.56, 1.62]</td>
<td>[1.58, 1.84]</td>
<td>[1.60, 2.06]</td>
<td>[1.49, 1.81]</td>
</tr>
</tbody>
</table>

Source: DMIS data extract; Std Dev = Standard deviation from the mean; GCH = Gold Card Holders; IHT = In-home telemonitoring participants
Analysis of the four specific targeted conditions for each cohort (Table 3.5) illustrates that:

- overall, the IHT participants exhibited a relatively similar profile to both the GCH and CVC group in terms of the proportions experiencing each of the four targeted conditions, except for diabetes
- trial participants exhibited a higher prevalence of diabetes (51% compared to the control cohorts (44% for Gold Card Holders and 45% for the CVC cohort)
- participants joining the CVC Program concurrently with the trial were more likely to have diabetes (61%) compared to those already on the CVC Program (45%), and other cohorts.

### Table 3.5: Targeted chronic conditions of all client groups

<table>
<thead>
<tr>
<th>Condition</th>
<th>GCH</th>
<th>CVC</th>
<th>IHT</th>
<th>IHT-New CVC</th>
<th>IHT-Pre CVC</th>
</tr>
</thead>
<tbody>
<tr>
<td>CAD</td>
<td>3,196</td>
<td>1,496</td>
<td>113</td>
<td>37</td>
<td>76</td>
</tr>
<tr>
<td></td>
<td>63%</td>
<td>66%</td>
<td>68%</td>
<td>63%</td>
<td>70%</td>
</tr>
<tr>
<td>COPD</td>
<td>1,081</td>
<td>487</td>
<td>39</td>
<td>17</td>
<td>22</td>
</tr>
<tr>
<td></td>
<td>21%</td>
<td>22%</td>
<td>23%</td>
<td>29%</td>
<td>20%</td>
</tr>
<tr>
<td>CHF</td>
<td>1,494</td>
<td>603</td>
<td>49</td>
<td>18</td>
<td>31</td>
</tr>
<tr>
<td></td>
<td>29%</td>
<td>27%</td>
<td>29%</td>
<td>31%</td>
<td>29%</td>
</tr>
<tr>
<td>Diabetes</td>
<td>2,224</td>
<td>1,010</td>
<td>85</td>
<td>36</td>
<td>49</td>
</tr>
<tr>
<td></td>
<td>44%</td>
<td>45%</td>
<td>51%</td>
<td>61%</td>
<td>45%</td>
</tr>
</tbody>
</table>

Source: DMIS data extract; GCH = Gold Card Holders; IHT = In-home telemonitoring participants

Further analysis of the telemonitoring participant group by number and combinations of conditions are provided in Table 3.6 and shows the following:

- 60% of the telemonitoring participants had only one of the targeted conditions with the greatest proportion being either CAD only or diabetes only
- 28% of the telemonitoring participants had two targeted conditions, with CAD and diabetes being the most common combination (12%) followed by CAD and CHF (8%)
- 10% of participants had three conditions, with CAD, CHF and diabetes being the most prevalent combination (5%) followed by a combination of CAD, COPD and diabetes (3%)
- only 2% of the participants (three people) had all four conditions.
### Table 3.6: Telemonitoring participants – targeted chronic conditions (detailed)

<table>
<thead>
<tr>
<th>Number of Conditions</th>
<th>Combination of Conditions</th>
<th>Number of participants</th>
<th>% of total (n=167)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Condition</td>
<td>CAD Only</td>
<td>43</td>
<td>25.7%</td>
</tr>
<tr>
<td></td>
<td>COPD Only</td>
<td>6</td>
<td>3.6%</td>
</tr>
<tr>
<td></td>
<td>CHF Only</td>
<td>5</td>
<td>3.0%</td>
</tr>
<tr>
<td></td>
<td>Diabetes Only</td>
<td>31</td>
<td>18.6%</td>
</tr>
<tr>
<td></td>
<td><strong>Total</strong></td>
<td><strong>85</strong></td>
<td><strong>50.9%</strong></td>
</tr>
<tr>
<td>2 Conditions</td>
<td>CAD and COPD</td>
<td>9</td>
<td>5.4%</td>
</tr>
<tr>
<td></td>
<td>CAD and CHF</td>
<td>12</td>
<td>7.2%</td>
</tr>
<tr>
<td></td>
<td>CAD and diabetes</td>
<td>19</td>
<td>11.4%</td>
</tr>
<tr>
<td></td>
<td>COPD and CHF</td>
<td>2</td>
<td>1.2%</td>
</tr>
<tr>
<td></td>
<td>COPD and diabetes</td>
<td>4</td>
<td>2.4%</td>
</tr>
<tr>
<td></td>
<td>CHF and diabetes</td>
<td>5</td>
<td>3.0%</td>
</tr>
<tr>
<td></td>
<td><strong>Total</strong></td>
<td><strong>51</strong></td>
<td><strong>30.5%</strong></td>
</tr>
<tr>
<td>3 Conditions</td>
<td>CAD, COPD and CHF</td>
<td>5</td>
<td>3.0%</td>
</tr>
<tr>
<td></td>
<td>CAD, COPD and diabetes</td>
<td>6</td>
<td>3.6%</td>
</tr>
<tr>
<td></td>
<td>CAD, CHF and diabetes</td>
<td>13</td>
<td>7.8%</td>
</tr>
<tr>
<td></td>
<td>COPD, CHF and diabetes</td>
<td>1</td>
<td>0.6%</td>
</tr>
<tr>
<td></td>
<td><strong>Total</strong></td>
<td><strong>25</strong></td>
<td><strong>15.0%</strong></td>
</tr>
<tr>
<td>All Conditions</td>
<td>CAD, COPD, CHF and Diabetes</td>
<td>6</td>
<td>3.6%</td>
</tr>
<tr>
<td></td>
<td><strong>Total</strong></td>
<td><strong>6</strong></td>
<td><strong>3.6%</strong></td>
</tr>
</tbody>
</table>

Source: DMIS data

### 3.4 Summary – Demographic Profile

Overall, the data examined showed that there were minor differences in the demographic profile of the three DMIS cohorts in terms of where they lived, and their gender. Differences in age across each cohort were noted. Key demographic similarities and differences to note include:

- the trial group was 5-6 years younger than the control groups
• the trial sub-group new to CVC was 8-9 years younger than the control groups
• the trial group was similar to the CVC control group in its distribution across jurisdictions
• higher proportion of males in the trial group compared to the control groups
• compared to the control groups, the trial group was younger, more likely to have diabetes, and less likely to have CHF.

• compared to the pre CVC sub-group, the new to CVC sub-group was younger, had a higher mean number of conditions, was more likely to have diabetes (and COPD to a lesser degree), and was less likely to have CAD.

• the trial group had a higher baseline risk of unplanned hospitalisations compared to the data control groups (Gold Card Holders and CVC groups).

We discuss the impact of age, number of conditions and location further in this report as it relates to potentially influencing outcomes realised from the trial. Analysis is also provided on the differences in service utilisation for the new to and pre CVC subgroups.
This chapter provides an analysis of changes in service utilisation (and where available associated cost) for the IHT participants and provides an analysis of quantitative and qualitative data including DMIS data, case studies, practice surveys, newsletters and other sources of information. Further information on the economic evaluation of the trial is provided in Chapter 8.

The analysis of DMIS data has been undertaken for all three client cohorts (Gold Card Holders, CVC and IHT participants) for the period 1 July 2014 to 30 September 2016 (the ‘Trial data’), unless otherwise specified, against the reported baseline position which covers the period 1 July 2012 to 30 June 2014 (the ‘Baseline data’). An analysis of the differences between participants already on the CVC Program before the trial, and those who concurrently joined the CVC Program at the trial onset is also provided. Key points from the analysis are presented here and the full DMIS data analysis tables have been included at Appendix C. Where relevant, we have noted specific limitations of the data on interpretation.

Note that the CVC Program group had a higher baseline use of services (e.g. via increased coordination due to the nature of their health condition(s)), and the trial group had a higher baseline risk of hospitalisation (compared to all other data comparison groups) due to the parameters of their selection, i.e. higher than average service use and risk of hospitalisation. It is also noted that some participants with a higher risk of hospitalisation may benefit from the telemonitoring, but others may not. These confounders are considered in our findings and conclusions as appropriate.

To recognise the varying times that participants were on the trial, the analysis has been standardised to derive measures based on quarterly calculations.

### 4.1 General Practitioner Visits

An important focus of the trial was to monitor impact on the number of physical GP clinic visits. It was anticipated that a regular in-home telemonitoring service and improved chronic condition management may lead to a reduction in GP clinic visits. The trial was designed with the intent that the practice (nurse and/or GP) communicated with the participant via telephone or video-conferencing/consulting (e.g. after a high alert reading) in the first instance, reducing the need for face-to-face attendance at the practice. Anecdotally, our case studies have indicated a few participants had less clinic visits.

One of our participants is coming in less. We used to see him every two weeks, now we see him every 2-4 months. The trial has empowered him. **Practice Nurse, Darling Downs**

The trial has cut down on the number of clinic visits for participants – most seem happy to have a chat over the phone. – **Practice Nurse, Bayside**

Of note, in the pre-trial questionnaire completed by telemonitoring participants, a small number considered that there might be less face-to-face contact with the GP (7%) and practice nurse (13%), whereas the majority expected that face-to-face contact would increase or be maintained. Post participation surveys confirmed these expectations, where 43% survey respondents believed face to face contact had been maintained with the nurse, and 64% indicated face to face contact had been...
maintained with the GP. In addition, 1 in 4 reported increased face to face contact with nurse, and 13% reported increased face to face contact with the GP. Further detail of this analysis is provided in Appendix F.

Further evidence supports these findings, including a recent report on a large telehealth trial in the UK (as part of the Whole Systems Demonstrator) suggesting that telehealth did not appear to be associated with different levels of contact with GPs and practice nurses.

### 4.1.1 DMIS data shows that GP consultations have increased

GP consultations for trial participants have increased. It is noted that across each of the cohorts:

- all trial participants had a GP visit in the baseline period and in the trial period
- all of the CVC control group had a GP visit in the baseline period compared to 99.2% in the trial period
- 99.4% of the GCH control group had a GP visit in the baseline period compared to 97.5% in the trial period.

Analysis of the DMIS data for GP visits (see Appendix C, Tables C19 to C33 and Figures C15 to C17) shows there had been a slight overall increase in the number of face-to-face contacts with the GP as follows:

- the total number of all GP visits/quarter decreased between baseline and trial periods for GCH (↓12.2%) and CVC (↓14.9%) control groups but increased for the IHT group (↑11.7%). There was little difference between IHT (new CVC) and IHT (pre CVC)
- there was a slight increase in the average number of GP visits/participant/quarter of 0.13 visits/quarter (13.1%) for trial participants whereas the increases were much larger for the control groups (10.63 visits/quarter or 15.7% for the CVC cohort and 10.87 visits/quarter or 23.1% for the GCH cohort. There was little difference between new CVC and pre CVC within the trial group.
- the IHT participants demonstrated a substantial increase in Level A (brief) consultations/quarter from the baseline data (↑16.0%). Level A consultations reduced on a quarterly basis for both the CVC cohort (10.4%) and the Gold Card Holders cohort (110.3%)
- each of the three cohorts demonstrated a slight decrease in Level B (standard, less than 20 minute) consultations/quarter, noting that the control group reductions were greater (↑14.4% for GCH, ↑18.6% for CVC and 13.3% for IHT)
- IHT participant group demonstrated the largest increase in Level C (long – 20-40 minutes) consultations/quarter (↑18.3%) compared to the CVC cohort (↑15.4%) and a decrease for the Gold Card Holders (↓14.5%)
- significant increases were seen for Level D (prolonged, greater than 40 minute) consultations across the control groups. The IHT participants Level D consultations increased by 6.2% (and 8.2% for those in the pre CVC subgroup) compared to a 28.0% increase for the CVC cohort and an 8.7% increase for the Gold Card Holders group. Significant increases in Level C and D consultations may be reflective of ageing and incremental deterioration of health across all groups. The trial may have contributed to the lower observed increases for the IHT participants.

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• the average cost/participant/quarter increased for all groups noting that, for the IHT group, this increase was less (110.2% for IHT, 132.6% for CVC and 140.9% for GCH). Average cost per GP visit also increased for all groups (114.6% for CVC and 114.5% for GCH), but not as significantly for the IHT group (16.8%)

• increases in GP costs were statistically significant for the trial group. There was a statistically significant difference (increase) between the means for costs of GP visits per client per quarter for the trial group that were 80 years from baseline to trial period (but not for under 80 years). Similarly, there was a statistically significant difference between the means for GP costs per client per quarter for the pre CVC sub-group from baseline to trial period (attributed to the participants 80 years and over). This suggests that any increase in costs for GP visits were attributed to older participants (over 80 years of age), who were likely experiencing non-trial related deterioration in physical and/or mental health and needed more complex care. It is noted that 64% of practice-led interventions resulting in a ‘GP visit’ were for participants 80 years and over, in line with representation across the trial cohort (65%)

• further analysis showed that the increase in total number of GP visits/quarter were concentrated in the Bayside region. Noting also, the number of GP visits/quarter in Bayside and New England increased significantly more for IHT (pre CVC) than for IHT (new CVC). In the North Coast, GP visits/quarter increased in the IHT (new CVC) group by 10.4% compared to a decrease of 5% in the IHT (pre CVC) group. GP visits/quarter decreased in Darling Downs for both IHT (new CVC) and IHT (pre CVC)

• mean cost of GP visits per participant increased by 33.7% in Bayside, compared to smaller increases in Darling Downs (3.8%), New England (6.9%) and North Coast (5.4%). These increases were more significant for the IHT (pre CVC) group compared to the IHT (new CVC) group. It is noted indexation was not applied to medical and allied health services across the period of the trial and is not attributable to any change in costs. This issue is further explored in Chapter 8

• further analysis of total number of GP visits/quarter by age indicated the increase can be attributed to those in the 90 years and older group (1130%) and those in the IHT (new CVC) group aged 70-79 years (143.6%). Total number of GP visits/quarter for IHT (new CVC) and IHT (pre CVC) groups in the under 70 years, and 80-89 years age groups all decreased over the trial period

• further analysis of total number of GP visits/quarter by number of chronic conditions indicates the increase can be attributed to those with four conditions (18.7%) and for those with one condition (16.9%). Total number of GP visits/quarter decreased for those with two conditions (10.9%) and three conditions (18.7%).

These findings suggest:

• increased GP service use across all groups, but less significant increase for the trial group (note not a statistically significant change from baseline to trial)

• increased total (and Level A, C and D) consultations in trial group were attributed to the pre CVC sub-group

• increased average cost of GP consultations per participant per quarter was less significant for trial group compared to control groups

• older age of the pre CVC trial sub-group is likely to negatively impact the trial’s capacity to reduce GP service use

• interpretation of changes in GP service use (and costs) by region and number of conditions was limited by small sample sizes and variation around the means (due to a small number of ‘outliers’
• analysis by age group indicates the trial supported reduced GP service use in participants in a younger age cohort (e.g. under 70 years) compared to an older cohort (e.g. over 90 years).

4.1.2 OTHER EVIDENCE FOR DECREASED GP VISITS AND BOOKINGS

An analysis of trends in GP visits and bookings (recorded by practices in the ICP triage manager) indicates that the overall total number of GP visits and bookings (of all practice interventions) decreased over the course of the trial. When analysing GP visits and bookings based on the number of active trial participants, the decrease in rate was not significant (Figure 4.1). Noting that the service provider ceased daily back-up monitoring in December 2014, and this is reflected in Figure 4.1 as a surge in GP visits and bookings led by the practice after that time. The maximum peak of GP visits or bookings in July 2015 may be attributed to the winter months and ‘flu season’.

Figure 4.1: GP-led interventions resulting in GP booking or visit from July 2014 to October 2016

The post participation surveys indicated that 10% of participants were seeing their GP less through face to face visits, and 14% perceived they had less overall contact with their GP. Only a small proportion (8%) of practice staff respondents indicated at the interim and post-participation online surveys that participants had experienced a decline in trips to the practice.

Within the second and third round of case studies, a few practices reported lower GP attendance by participants, and 11 of the 42 participants felt they were seeing their GP and/or practice nurse less often.
4.1.3 Other evidence demonstrates increased or no change in GP visits

Further analysis demonstrated that some trial participants experienced little or no change in GP attendances while others observed increased GP attendances. This analysis is presented below.

Increased attendance was reported for some trial participants through Tunstall intervention reports, case studies, participant surveys, and practice surveys. The increase may reflect the triaging component of the trial design where, following a high alert reading, a common action was for the practice nurse to telephone the participant and ask (either independently or in consultation with the GP) for them to come to the practice for review by the GP. An increase in GP attendance may also be attributed to a heightened awareness of participant’s conditions and a related propensity to seek further support and care. As the participants’ monitoring parameters were adapted and intervention was tailored earlier in the trial, visits then returned to a regular (pre-trial) frequency for most.

Analysis of general practice interventions based on data contained within the ICP triage manager, illustrated that the greatest proportion of actions taken was having the participant come into the practice for review by the GP or booking an appointment (52%), followed by a review of the monitoring plan (18%) and medication reviews (8%) as illustrated in Figure 4.2. This high frequency of booking GP consultations may be linked to maintaining healthcare quality and safety standards, particularly since available trial data had been introduced, supporting some level of risk to manage.

**Figure 4.2: General practice-led interventions to 31 December 2016**

The intervention data findings (recorded by practices) also supported the low uptake of practices using video-conferencing to consult with participants as discussed earlier. Review of participants by practices through video-conferencing has only occurred on 43 occasions. This is consistent with our findings on use of video-conferencing from the three rounds of case studies with practices and participants, and the practice surveys, where it was indicated a phone call was adequate or a clinic visit was often
preferred by participants. In addition, practices indicated through the case studies that participants continued to prefer the personal engagement of a clinic visit, or require consultation for other health issues (e.g. wound management).

Though some practices indicated in the case studies that GP visits were maintained or increased over the trial, only one of 42 participants reported a slight increase in GP visits in the second and third round of case studies.

**No change in GP attendances**

Many trial participants had no change in GP attendances during the trial. This was evidenced through the case studies and participant surveys. Figure 4.3 details the change in face to face visits with the GP, based on our participant survey analysis. Expectations at the commencement of the trial, and experiences at interim and post participation, did not differ significantly. The majority of interim and post-trial survey respondents (65% to 72%) suggested the trial did not impact face to face contact with their GP. Further tables for the analysis of the participant survey and GP visits are provided in Appendix F.

![Figure 4.3: Changes in face to face contact with GP](image)

In case study interviews with practices and participants it was noted that many of the participants were already attending their GP for the routine CVC consultations and/or for other conditions requiring review, for example, eye, skin, wound, musculoskeletal and psychological concerns.

*(the) Patient has always had regular appointments with his GP & myself via CVC. The trial has had no impact.* - Practice Nurse, North Coast NSW

Within the second and third round of case studies, practices generally reported that there had been no change in GP attendance (30 of 42 participants), given that participants attended regularly for check-ups, but contact through phone calls (generally with the practice nurse) had increased slightly. Many of these participants cited a preference to maintain a face-to-face relationship through practice consults. This may also be impacted by the complex needs and historical expectations of doctor-patient contact of an aged cohort. This finding was supported by the majority (63%) of participants reporting in the post participation surveys that overall GP contact remained ‘about the same’.
In addition, 48% of respondents to the interim practice survey confirmed that there had been no change in attendance at the GP due to telemonitoring, and this increased to 58% at post participation.

\[
\text{Our participants have routinely come to Clinic for GP or nurse consultation for other things.}
\]

- Practice Nurse, North Coast NSW

Whilst DMIS data indicated a small average increase in GP attendances/quarter across IHT participants, it is likely there was a greater number of visits for some individual participants, for example, those who joined CVC concurrently in the North Coast region, those in the Bayside region, those with four conditions, or those 90 years and over.

Supporting this finding, we identified through case study interviews a small proportion of participants who are relatively stable and healthy, even with their chronic condition. They were already infrequent users of GP services (for example three monthly visits), however, had not attended any less with both the practice and the participant considering an in person face-to-face visit on a quarterly basis to be appropriate.

Statistical analysis of the number of consultations per client per quarter (paired and independent t-test) between the baseline and trial period shows no statistical significance. There was a statistical difference, however, between the means relating to consultation costs per client per quarter (using the paired sample). It is noted that indexation was not applicable to medical and allied health services across the period of the trial, and therefore cannot be attributable to changes in cost. This is further explored in Chapter 8. Appendix C also provides a series of trend graphs and analysis.

### 4.1.4 Summary of findings on GP consultations

Although there is some contrasting data, our overall findings suggest:

- increased GP service use across all groups, but less significant increase for the trial group (note not a statistically significant change from baseline to trial), with increases generally attributed to the pre CVC sub-group
- increased average cost of GP consultations per participant per quarter was less significant for trial group compared to control groups, but a statistically significant (increase) was identified for the trial group from baseline to trial, attributed to the participants more than 80 years old in the pre CVC sub-group
- analysis by age group indicated the trial was more likely to support reduced GP service use in participants in a younger age cohort (e.g. under 70 years) compared to an older cohort (e.g. over 90 years). Older age of the pre CVC trial sub-group is likely to negatively impact the trial’s capacity to reduce GP service use
- most participants reported that GP contact had not changed, indicating that a few were seeing the GP less, and a few whose contact with the GP increased over the course of the trial. The increase for some participants appeared related to older age and number of conditions, suggesting telemonitoring had less impact on GP visits for this cohort.

Importantly though, there was limited use of video-conferencing and increased attendance at the GP for some participants. There were also examples of telemonitoring identifying new emerging health conditions and preventing exacerbation of an existing condition—an important consideration for the benefits of the trial and its longer-term health impacts. Furthermore, as reported in the participant surveys, additional contact and communication between the practice and participant led to increased empathy, stronger relationships and increased information to support health management.
Note that there was no statistically significant change in GP consultations for the trial group, but there was an increase in consultation costs from baseline to trial end.

4.2 Hospital Episodes

An important aim of the trial was to explore the extent to which telemonitoring could lead to a reduction in preventable acute care interventions such as premature unplanned admissions to hospital, re-admissions and/or length of stay. Trial participants were selected for their high risk of hospitalisation\(^{20}\), whereas high risk parameters were not applied to recruitment of the data control groups meaning the baseline risk of hospitalisation for the trial group was higher than the data control group. It was anticipated, therefore, that any overall decrease in hospital admissions for the trial group (over the course of the trial) would indicate that the trial interventions reduce the rate of hospitalisation (e.g. tending toward the baseline and unchanged rate of the data control groups). Similarly, it was expected that if rates of hospital and other service utilisation increased at a lower rate for the trial group compared to the data control groups, this would indicate that the trial interventions contributed to relative reduced rate of service utilisation for the participants. We note that practices identified that the trial was unlikely to lead to a significant reduction in hospital admissions, particularly for older participants with a higher level of complexity. Our findings suggest that the risk of hospitalisation remained unchanged for some participants but reduced for others. We also note that the trial reduced the complexity of hospitalisations for some participants.

It is noted that while a number of telehealth trials show that acute service utilisation may decrease in the longer term, a number of other trials were not able to determine whether telehealth technology influenced overall healthcare resource or service use. This highlights the complexity of measuring and attributing changes in health service utilisation to the trial itself. In addition, the experience of participants commencing on the CVC Program is that acute health service utilisation increases in the short term.

Figure 4.4 depicts the use of hospital services (public and private) and indicates that, prior to the trial, the trial participants had a much higher incidence of hospitalisation (82.6%) compared to the GCH (44.3%) and CVC (54.0%) groups. During the trial, there was a slight reduction in the proportion of participants who were hospitalised at least once (from 82.6% to 80.2%).

\(^{20}\) Level of risk was based on a standard algorithm informed by factors such as age, health status and frequency of hospitalisation.
From Figure 4.5 (private hospital episodes) and Figure 4.6 (public hospital episodes), we note that:

- there was minimal change in private hospital utilisation
- all cohorts increased public hospital utilisation. The most significant increase was within the GCH group with an increase of 68.4% compared to increases of 44.8% in the CVC group, and 26.4% in the trial participant group
- within the trial cohort, there was a change of 14.3% for those new to CVC (from 35.6% to 40.7%) compared to a 34.4% increase for those previously on CVC (from 29.6% to 39.8%).

**Figure 4.4: Percentage of cohort who had a hospital episode (private and public)**

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<th></th>
<th>Baseline</th>
<th>Trial</th>
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<th>Trial</th>
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<th>Baseline</th>
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<th>Baseline</th>
<th>Trial</th>
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<tbody>
<tr>
<td>GCH</td>
<td>52.5%</td>
<td>44.3%</td>
<td>54.0%</td>
<td>52.5%</td>
<td>63.2%</td>
<td>60.5%</td>
<td>82.6%</td>
<td>80.2%</td>
<td>84.7%</td>
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<td>CVC</td>
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<td>IHT (pre CVC)</td>
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**Figure 4.5: Percentage of cohort who had a hospital episode (private)**

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<th>Baseline</th>
<th>Trial</th>
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<th>Trial</th>
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<tbody>
<tr>
<td>GCH</td>
<td>36.6%</td>
<td>37.7%</td>
<td>47.8%</td>
<td>50.0%</td>
<td>70.1%</td>
<td>72.5%</td>
<td>74.5%</td>
<td>74.5%</td>
<td>67.6%</td>
<td>71.3%</td>
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<tr>
<td>CVC</td>
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<td>IHT</td>
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<td>IHT (new CVC)</td>
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<td>IHT (pre CVC)</td>
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The following sections examine changes in hospital utilisation for the trial participants from a review of the DMIS data (public and private hospital admissions) and qualitative data from the case studies, practice surveys and other sources. Emergency department attendances are not available through DMIS data and could not be analysed. Detailed tables are provided in Appendix C, Tables C1 to C18 and Figures C1 to C14.

**4.2.1 DMIS data shows that private hospital episodes have increased**

For trial participants, private hospital episodes were more predominant than public hospital episodes for all three cohorts and particularly the telemonitoring cohort. For example, 63.4% of total trial hospital episodes per quarter for the GCH control group were in the private setting, 68% for the CVC control group and 87.1% for the IHT participant group.

The key finding is that the mean private hospital episodes/client/quarter has increased more for telemonitoring participants (137.6%), compared to the other two cohorts (GCH 123.8%, CVC 120.8%). In addition, the total number of private hospital episodes per quarter increased more for the IHT group (141.2%), compared to the GCH group (12.4%) and CVC group (16.9%).

The sub-group of telemonitoring participants who joined CVC and the trial concurrently recorded a 32.0% increase (n=73) in total private hospital episodes/client/quarter, while the group who were already on CVC recorded an increase of 39.3% (n=77). Other findings include:

- participants in the North Coast (157.6%) and Bayside (132.4%) regions experienced the greatest increases in private hospital episodes. Participants in the North Coast region experienced the greatest increase across all regions for both the new to CVC and previously on CVC sub-groups. It should be noted that the volumes of private hospital episodes/client/quarter were relatively small (in the range of 0.4-0.7 episodes/client/quarter)

- the mean cost/participant/quarter (for private hospital episodes) has increased by 12.5% for IHT participants, 39.7% for Gold Card Holders and 60.2% for CVC. This smaller “increase” for the IHT cohort compared to the control cohorts is positive, and predominantly reflects the reduction in average costs for those participants new to CVC. The issue is further discussed in Chapter 8
• the mean cost/participant/quarter for those previously on CVC has increased by 44.7% and mean episodes/participant/quarter have grown by 39.3%. This may be somewhat explained by increased clinical complexity of hospital admissions for an older cohort (mean age 83) where there is a higher likelihood of comorbidity. It is also noted that mean episodes per client per quarter increased similarly for control and participant groups.

• the mean cost/participant/quarter for new to CVC trial participants decreased by 30%, although mean episodes/participant/quarter increased by 32%. This potentially relates to a decrease in the complexity of hospitalisations, discussed further in Chapter 8.

• the mean cost/participant/quarter for the CVC control group has increased by 60.2% and the mean episodes/participant/quarter increased by 20.8%

• The mean length of stay for all private hospital admissions (overnight only):
  – decreased for new to CVC trial participants by 32.1%
  – increased for those trial participants previously on CVC by 52.9% (in line with increasing costs described above for this sub-group)
  – increased for the CVC cohort (117.9%) and Gold Card Holder cohort (19.7%)

• The proportion of overnight private admissions for the telemonitoring participants decreased by 13.6% (from 40% to 35%). This contrasts with an increase from 48% to 52% for the CVC cohort. The Gold Card Holder cohort maintained the proportion of overnight admissions (47%).

• An overall decrease in average length of stay, although anticipated (as a result of using monitoring equipment at home to support post-discharge), and seen with the new to CVC group, was not observed across all IHT participants, potentially owing to:
  – an increased average length of stay for overnight admission of around one day for those participants previously on CVC (from 6.4 to 7.5 days), suggesting that acuity and/or factors such as an increased age removed any opportunity to observe earlier discharge based on monitoring availability. That is, while there may have been opportunities for early discharge for a small number of trial participants, it was not possible for the majority and as such is not reflected in the data
  – no systematic process in the trial for the practice to advise a hospital of the availability of telemonitoring equipment and its use in post-discharge to potentially save a day of additional observation in hospital. This opportunity, while discussed by the trial stakeholders (practices, DVA, Tunstall) as a possible future use for monitoring, was not exemplified in the trial.

An increase in hospital admissions is supported by evidence in a telehealth trial for frail elderly patients, where this was interpreted as being associated with an increased number of interventions and tests\textsuperscript{21}. Similarly, another trial reported that telemedicine was not effective in postponing admissions for patients with COPD over the course of a year, and concluded this was likely due to the enhanced clinical service rather than the telemonitoring communication\textsuperscript{22}.


\textsuperscript{22} Pinnock H et al (2013) Effectiveness of telemonitoring integrated into existing clinical services on hospital admission for exacerbation of chronic obstructive pulmonary disease: researcher blind, multicentre, randomised controlled trial BMJ 2013;347: f6070 \url{http://www.bmj.com/content/347/bmj.f6070}
4.2.2 DMIS DATA SHOWS THAT PUBLIC HOSPITAL EPISODES HAVE SLIGHTLY DECREASED

Public hospital utilisation data was available from DMIS for the period 1 July 2012 through to 30 June 2016. The key finding is that the mean public hospital episodes/client/quarter has decreased for telemonitoring participants (10.8%), compared to increases in the other two cohorts (GCH 155.3%, CVC 120.0%). It is noted that total public hospital episodes per quarter increased for all cohorts, with the IHT group experiencing the lowest growth (124%) compared to GCH (178.6%) and CVC (135.4%). Total public hospital episode costs per quarter also increased for all cohorts, with IHT group having the least growth (110.8%) compared to 54.9% increase for the GCH group and 25% for the CVC group.

The sub-group of telemonitoring participants who joined CVC and the trial concurrently recorded a 13.7% decrease (n=21) in total public hospital episodes/client/quarter, while the group who were already on CVC recorded an increase of 10.1% (n=32). Other findings included:

- although based on very small activity volumes, participants in the North Coast (121.7%) and Bayside (1259.5%) regions experienced the greatest increases in public hospital episodes. Participants in the North Coast region experienced the greatest increase across all regions for both the new to CVC and previously on CVC sub-groups. It should be noted that the volumes of public hospital episodes/client/quarter were relatively small (in the range of 0.3-0.4 episodes/participant/quarter for control and participant groups)
- the mean cost/participant/quarter (for public hospital episodes) has decreased by 11.5% for IHT participants whereas there was an increase of 76.6% for Gold Card Holders and 18.0% for CVC. As with the private hospital episode analysis, this is positive, and predominantly reflects the reduction in mean cost/client/quarter for those participants new to CVC. The issue is further discussed in Chapter 8
- the mean cost/participant/quarter for new to CVC trial participants has decreased by 23.4% and mean episodes/participant/quarter has reduced by 13.7%. This may be somewhat explained by the frequent monitoring and potential for early detection through the level of services introduced through the trial
- the mean cost/participant/quarter for previously on CVC trial participants has decreased by 2.7%, although mean episodes/participant/quarter have grown by 10.1%
- the mean cost/participant/quarter for the CVC control group has increased by 20.0% and the mean episodes/participant/quarter have grown by 6.4%
- the mean length of stay for all public hospital episodes (overnight only):
  - decreased for new to CVC trial participants by 3.1%
  - increased for those trial participants previously on CVC by 33.6% (in contrast to the slight decrease in costs described above for this sub-group)
  - decreased for the CVC cohort (111.2%) but increased for the Gold Card Holder cohort (14.3%)
- the proportion of overnight public hospital episodes for the IHT participants decreased by 15.7% (from 73% to 62%). This is similar to the GCH cohort (from 63% to 58%) but contrast with an increase from 63% to 67% for the CVC cohort
- analysis of public hospital episodes per quarter by age for the IHT participant group revealed that the overall increase can be attributed to the 70-79 year old (111.5%), 80-89 year old (130.9%) and 90 years and over groups (132%). In contrast, public hospital episodes per quarter decreased for the under 70 years age group (153.9%) for the trial group, attributed to a decrease in the new to CVC sub-group. A decrease in episodes per quarter was identified for the under 70 years groups in
GCH and CVC, and 70-79 years and 80-89 years groups for the CVC control group. Note that interpretation is limited due to small episode numbers per quarter by age group in the trial cohort.

- comparison of new to CVC and pre CVC subgroups indicate that there was a larger increase in public hospital episodes (in the 70-79 years and 80-89 years groups) for the pre CVC compared to new CVC. Note that interpretation is limited due to small episode numbers per quarter by age group in the trial cohort.

- Interpretation of changes from baseline to trial periods for the trial group by number of conditions are limited.

Trend data and scatterplots were prepared to describe the number of episodes per participant per quarter and episode cost per participant per quarter by age and number of conditions. These show limited identifiable trends for the IHT group due to low episode numbers as provided in Figure 4.7. What is apparent, is the general relationship with episodes per participant as age increases, and number of conditions increasing across the control and participant groups. Additional analysis is provided in Appendix C.

**Figure 4.7: Timeseries-public hospital episodes per client per quarter-baseline to end of trial, IHT participants**

Statistical hypothesis testing (paired and independent samples) indicated no statistical difference between public hospital episodes per client per quarter from baseline to trial period.

### 4.2.3 Other evidence supports some hospital avoidance

In line with the DMIS data analysis, there is further evidence of changes to hospital admissions for the IHT participants, including potential hospital avoidance. As illustrated previously (see Figure 4.2), there were 109 (5%) general practice-led interventions recorded by the practice (in ICP triage manager) which resulted in hospitalisation. This is a positive health outcome as it has likely led to treatment of previously unknown conditions and early detection and intervention. It is possible that the earlier detection of these conditions led to less complex admissions and shorter lengths of stay than if there was a more serious episode (due to later detection of the condition).

The qualitative feedback through the case studies and practice surveys, and practice examples in the trial newsletters demonstrates how monitoring alerts and intervention by the practice and the service provider have indirectly resulted in avoidable hospital attendance on a number of occasions. In the third round of case studies, practices cited at least seven participants that avoided hospital due to the availability of monitoring data. In addition, most of the 28 practices interviewed in the second and third round of case studies could identify an example where monitoring led to:

- stabilisation of condition
• medication titration or change
• early intervention or prevented exacerbation of health condition.

Approximately 46% of practice respondents at the interim online survey indicated that there was a moderate to significant improvement for one or more of their participants in relation to hospital avoidance, compared to 26% of practice respondents at post participation. It is noted that the majority of practice survey respondents at post participation (74%), indicated there was no change in admissions to hospital, compared to 46% at interim.

These instances inferred potentially preventable exacerbation or avoidable hospital admissions due to improved management and stabilisation of the condition. Two examples involved participants with a low oxygen saturation alert leading to quick follow-up and treatment and an avoidable hospital admission.

"I think the monitoring has probably saved her life. We were able to follow up on her oxygen saturation levels before a hospital visit was needed." - Practice Nurse, Darling Downs

"With the monitoring, we were able to identify changes sooner and provide (our patient) with the appropriate treatment. This meant that she was able to remain independent at home with community support and have fewer hospitalisations." - Practice Nurse, North Coast

Importantly, the trial demonstrated an impact on early intervention using vital sign data for some participants. Though public hospital visits have not decreased significantly overall, it is important to consider the clinical complexity of admissions and lengths of stay also as these are important indicators for improved post-discharge health outcomes for older people. Data analysis from this trial has not been able to determine the impact of the trial and telemonitoring on preventable readmissions. Cost effectiveness regarding impacts from the trial on length of stay and admission complexity is further considered in Chapter 8.

"As hospital care becomes more expensive and at times less personal, programs like CVC and telemonitoring provide real tools and resources to keep our patients out of hospital." - GP, North Coast

Of note, the rate of practice-led hospitalisation interventions for trial participants, recorded in ICP triage manager, indicates a slight increase over the time of the trial, based on the linear trend line, as indicated in Figure 4.8, correlating with the increase in practice-led monitoring.

**Figure 4.8: Rate of practice-led hospitalisation interventions per participant over time**

(Source: Tunstall – baseline data not available)
4.2.4 Summary of Findings on Hospital Admissions

There was a slight increase in private hospital admissions and slight decrease in public hospital admissions for the trial group. The increase in mean private hospital episodes per client per quarter was more substantial for the trial group than the control groups; however the increase in mean private hospital episode costs per client per quarter was less for the IHT group than the control group increases. This smaller “increase” for the IHT cohort compared to the control cohorts is positive, and predominantly reflects the reduction in average costs for those participants new to CVC. This is likely attributed to a reduction in admission complexity (including decreased average length of stay), explored further in Chapter 8.

The proportion of the cohort with a public hospital episode increased from baseline to trial for all groups (GCH, CVC and trial group). The increase in the proportion of the trial cohort who had a public hospital admission was less that the increase across control groups. There was a 13.7% decrease in public hospital episodes/client/quarter for the IHT (new CVC) while the group who were already on CVC recorded an increase of 10.1%. The mean length of stay (overnight only) increased more significantly for the pre CVC sub-group compared to the control groups, and decreased slightly for the new to CVC sub-group. In addition, the mean cost per public hospital admission decreased for the trial group, and this was predominantly attributed to the new to CVC sub-group. Our findings suggest that the trial was more likely to reduce public and private hospital admissions (and costs) for those new to the CVC Program. Of note, this trial sub group is on average 5-9 years younger than the other cohorts, suggesting the trial is more likely to support reduced hospital admissions for a younger cohort with potentially less complex conditions. Interpretation of DMIS public hospital admission data by age group is limited by small episode numbers.

Interpretation of these findings should also consider that the trial group was selected for trial participation based on their high risk of hospitalisation, and that these high-risk parameters were not applied to the data control groups. As such, the existing clinical risk of the trial participants may limit the capacity for rates of hospital admissions to decrease significantly, particularly for older participants with more complex conditions, making any decrease more significant. We note overall that there was a minor decrease in public hospital admissions for the trial group, a positive outcome of the trial, but that these benefits were concentrated in the younger sub-group.

4.3 Specialist Visits

An aim of the trial was for telemonitoring to enable more information to be provided to specialists to enhance and support management of the patient. Utilisation of health specialists was not anticipated to change due to monitoring. This section summarises the findings from analysing specialist utilisation with additional detail included in Appendix C, Tables C34-57.

4.3.1 DMIS Data Shows that Specialist Use has Increased

Specialist use increased for both trial and control groups, however, specialist use by trial participants increased at a lower rate. In relation to proportions of each of the comparison groups using specialists:

- for the GCH control group, 85.7% had a specialist service consultation in the baseline period compared to 75.6% in the trial period. This represented a decrease of 11.8%
- for the CVC control group, 92.8% had a specialist service consultation in the baseline period compared to 88.5% in the trial period. This represented a decrease of 4.7%
for the trial participant group, 93.4% had a specialist service consultation in the baseline period compared to 91.6% in the trial period. This represented a decrease of 1.9%, the smallest change of the three groups

for the new to CVC participant sub-group, 86.4% had a specialist service consultation in the baseline period compared to 89.8% in the trial period. This represented an increase of 3.9%, the only group to experience an increase in specialist episodes

for the pre CVC participant sub-group, 97.2% had a specialist service consultation in the baseline period compared to 92.6% in the trial period. This represented a decrease of 4.8%.

Further analysis of the use of specialist services illustrated varying changes over the course of the trial, with the following key findings:

• the proportion of IHT participants who utilised a specialist fell marginally (↓1.9%), however, the number of attendances for selected specialists\(^{23}\) increased by 15.9% (primarily due to geriatrics, general medicine and thoracic medicine). Importantly, this reflects the significant increase in attendance for the trial sub-group previously on CVC (124.4%) compared to a decrease for those participants new to CVC (16.3%). Note that mean cost per consultation decreased for the trial cohort, attributed to the new to CVC sub-group, potentially relating to positive impacts on the trial on service use

• growth in specialist service utilisation was demonstrated overall and for many specialties in the trial cohort compared to a reduction in specialist service utilisation in the control cohorts (including for geriatrics, general medicine, thoracic medicine, vascular surgery)

• growth in some specialist services was demonstrated for the trial sub-group that were previously on CVC, compared to a decrease in utilisation by those participants new to CVC (including for cardiology, endocrinology, thoracic medicine, vascular surgery, internal medicine) (detailed further below)

• growth in some specialist services was demonstrated for the trial sub-group that were new to CVC compared to a decrease in utilisation by those participants previously on CVC (including for ophthalmology and general medicine). The increase in the utilisation of ophthalmology services perhaps reflects the larger proportion of diabetic participants in this group

• there were decreased cardiology attendances for GCH (↓17.6%) and CVC (↓4.1%) cohorts, and the new to CVC trial sub-group (↓25.3%), but an increase for the pre CVC group of 4.5%

• the telemonitoring participants recorded a 5.1% increase in the number of endocrinology attendances, with the CVC cohort growing by 34.5%). This was attributed to a 7.9% increase in the pre CVC group compared to a decrease in the new CVC group. Endocrinology attendances decreased for the GCH cohort (↓15.5%). Interpretation is limited due to small numbers.

A range of differences in specialist utilisation were identified between the trial participants already on the CVC Program and those who commenced the program concurrently with the trial. It is noted that the (small) sample size for the new to CVC trial participants may have impacted on interpretation. Key findings within these sub-groups include:

• 23.7% increase in total specialist service consultations/quarter for pre CVC compared to a 15.3% decrease for new CVC trial participants (noting slight increase in cost/consultation for pre CVC)

\(^{23}\)Cardiology, Endocrinology, General Medicine, Geriatrics, Internal Medicine, Ophthalmology, Thoracic Medicine, Vascular surgery
• 4.5% increase in cardiology specialist service consultations/quarter for pre CVC compared to a 25.3% decrease for new CVC trial participants (noting slight decrease in cost/consultation for pre CVC and new CVC)

• 121.7% increase in the number of general medicine service consultations/quarter for pre CVC compared to a 28.8% increase for new CVC trial participants

• 36.0% increase in the number of internal medicine service consultations/quarter for pre CVC compared to an 89.8% decrease for new CVC trial participants (noting a decrease in cost/consultation for new CVC)

• 94.4% increase in the number of thoracic medicine service consultations/quarter for pre CVC compared to an 2.3% decrease for new CVC trial participants (noting decrease in cost/consultation for pre CVC)

• 33.0% increase in the number of vascular surgery service consultations/quarter for pre CVC compared to an 24.0% decrease for new CVC trial participants (noting increase in cost/consultation for pre CVC)

• 39.5% increase in the number of ophthalmology service consultations /quarter for new CVC compared to an 7.4% decrease for pre CVC trial participants (noting more significant decrease in cost/consultation for new CVC)

• there were no geriatric specialist service consultations provided to new CVC during baseline or trial periods (noting this group is 5-9 years younger than the other comparative cohorts)

• increases in specialist service utilisation consistently increased across all regions for those participants previously on CVC, and consistently decreased for those new to CVC.

These findings may reflect other features of the cohorts, including:

• pre CVC participants were, on average, five years older (compared to new to CVC) and may therefore have had more advanced conditions requiring more frequent and complex specialist care

• new CVC participants were more likely to have diabetes (who require ophthalmology services as part of their chronic disease management plans)

• new CVC participants were less likely to have had CAD. Other cohorts, including pre CVC participants, CVC and Gold Card Holders had relatively higher demand for cardiology specialist services

• Potential lag time in referral/assessment processes due to joining the CVC Program more recently and smaller sample size for new CVC participants may have impacted availability and accuracy of data.

As illustrated above in Figure 4.2, there were 106 general practice-led interventions (4%) recorded by practices in ICP triage manager which resulted in a specialist visit. Of note, the practice-led interventions recommending specialist review suggested a slight decrease in the rate of specialist reviews per participant over time, based on the linear trend line, noting there were a total of 92 recommendations for specialist review over the course of the trial (July 2014 to 30 September 2016), so monthly rates were low (see Figure 4.9 below). Note that these data were limited by the extent of practices’ data entry completion. Note also, that intervention data is a sub-set of information (e.g. 92 specialist review outcomes recorded by practices, and 229 specialist service consultations recorded in DMIS (for the targeted specialist services only).
4.3.2 Use of Telemonitoring Data for Specialists

From Tunstall reports and qualitative feedback from practices (including within case study interviews and trial newsletters), there were some increased requests by participants to bring vital signs data reports to their specialist appointments. An increased amount of data from trend reports was also used since the start of the trial within the practice for routine patient management.

> The participant is also now taking copies of his telemonitoring ECG readings to appointments with his cardiac specialist. This supports the cardiologist’s decision-making about this patient’s care. – Practice Nurse, New England

Whilst there was a reported minor increase in taking data to specialists, the feedback from participants and practices in our case study interviews predominantly suggests most specialists have shown limited interest in the data. They were reportedly more focussed on other diagnostic information (e.g. HbA1c rather than BSL) and their own assessment process at the time.

Responses from the practice survey also included: “I do not rely on the data from Tunstall when referring” and positively: “We have more data to provide specialist services”.

Most practices interviewed in the second and third round of case studies indicated that provision of information and referral to specialists has not been enhanced by the trial or monitoring data, noting that many active participants may not see specialists frequently. A few practices indicated that the data has added depth to the care plan, and has led to enhanced referral information. Supporting this finding, the practice survey analysis indicated 44% of respondents at interim and 32% at post participation thought the trial improved information provision for specialists. Note also, 54% at interim and 68% at post participation felt there was no change in the provision of information to specialists.

4.3.3 Summary of Findings for Specialist Reviews

Though the proportion of trial participants new to CVC visiting a specialist increased more significantly compared to those previously on CVC, the number of attendances for the pre CVC sub group increased more than the new to CVC group from baseline to trial end. These findings indicate the trial and telemonitoring may have led to an increased number of specialist reviews overall (e.g. based availability and referral using vital sign trends), but that the previous to CVC sub group (older)
experienced a greater increase in the use of services compared to the new to CVC sub group, again indicating the trial is more likely to reduce specialist service utilisation and costs for the younger new to CVC group. In addition, use of specialist services must consider that utilisation is based on the specific chronic conditions of each cohort, for example the new to CVC group had a more substantial increase in ophthalmology services in line with the higher proportion of diabetic patients in this cohort. Limited conclusions can be drawn where there are small numbers of specific specialist services.

4.4 **Pharmaceutical use**

Change in the use of condition-specific pharmaceuticals was not a significant outcome of the trial. Data was collected throughout the trial to assess changes in medications and numbers of medications. By having additional monitoring data available, it was anticipated that clinicians may be able to make more informed medication management decisions, thereby improving monitoring and management of conditions. Further review of the literature suggests interactive health communication applications can improve adherence to both medication and health behaviours designed to both treat and manage chronic conditions. We have discussed changes in medication behaviours for this trial below.

Table 4.1 provides a summary of the change in use and cost for ALL pharmaceutical and demonstrates that although changes in total items and total costs/quarter is variable across cohorts (reduced for the GCH, steady for the CVC and increased for the IHT groups), mean items and mean cost/quarter are changed (increased) consistently for the three cohorts (approximately 14% for meant items and (with a little variation) by increased 12-15% for the CVC and IHT groups.

<table>
<thead>
<tr>
<th>Table 4.1: Change in use and cost of all pharmaceuticals</th>
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<tbody>
<tr>
<td>Number and cost of all pharmaceutical (per quarter)</td>
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<tr>
<td>% Change for each cohort</td>
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<tr>
<td>GCH</td>
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<td>Total items per quarter</td>
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<tr>
<td>Mean items/client/quarter</td>
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<td>Mean cost/client/quarter</td>
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The remainder of the analysis below is based on consideration of condition-specific medications. Detailed tables showing the change in pharmaceutical use for the control and trial groups are provided in Appendix C (Tables C95 to C108).

4.4.1 **DMIS data shows that medication use for the targeted conditions has increased**

Medication use for the targeted conditions has increased for all groups. We note that increased use may be attributed to increased compliance among the trial participants, a positive outcome of the trial.

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Key findings from the analysis of pharmaceutical use were as follows:

- the proportion of participants using a condition specific medication increased for each targeted condition group of medications. That is, there was no condition for which less participants were using a medication.
- the mean items per client per quarter increased by 14.1% to 14.8% for trial and control cohorts from baseline to trial.
- the mean items per client per quarter increased more significantly for pre CVC (17.3%) compared to new CVC (8.0%), potentially owing to the older mean age and complexity of condition(s) of the pre CVC group, and improved compliance.
- the average number of pharmaceutical items used per IHT participant/quarter increased for all four conditions. The greatest increase was for COPD items (114%), followed by diabetes (111.2%) and CHF (16%). Note that there was a concurrent (but generally lower) increase for the control cohorts across most conditions as follows:
  - the mean number of COPD pharmaceutical items per participant/quarter increased by 14.0% compared to increases of 11.0% for the Gold Card Holders and 9.4% for the CVC cohort.
  - the mean number of CHF pharmaceutical items per participant/quarter increased by 6.0% compared to increases of 2.8% for the Gold Card Holders and 4.2% for the CVC cohort.
  - the mean number of diabetes pharmaceutical items per participant/quarter increased by 11.2%, compared to increases of 7.7% for the Gold Card Holders and 8.8% for the CVC cohort.
  - the mean number of CAD pharmaceutical items per participant/quarter increased by 2.4%, compared to increases of 5.7% for the Gold Card Holders and 4.4% for the CVC cohort.
- some differences were identified within the telemonitoring participant subgroups (‘previously on CVC’ and ‘new to CVC’) as follows:
  - for CAD pharmaceuticals, participants previously on CVC demonstrated a decrease in mean pharmaceutical items per participant/quarter of 5.8% whereas the new to CVC had a 21.4% increase (noting mean cost per client increased for new CVC also). The more significant increase in CAD pharmaceuticals for the new to CVC group had high variability around the mean so is difficult to interpret, but may be related to increased compliance.
  - for COPD pharmaceuticals, participants previously on CVC demonstrated an increase in mean pharmaceutical items per participant/quarter of 2.9% whereas the new to CVC had a much greater 35.3% increase (appropriate to the larger proportion of participants with COPD in this sub-group).
  - for CHF pharmaceuticals, participants previously on CVC demonstrated an increase in mean pharmaceutical items per participant/quarter of 8.5% whereas the new to CVC had a lower 1.5% increase.
  - for diabetes pharmaceuticals, participants previously on CVC demonstrated an increase in mean pharmaceutical items per participant/quarter of 8.0% whereas the new to CVC had a greater 14.9% increase (appropriate to the larger proportion of participants with COPD in this sub-group).
4.4.2 Monitoring of Medication Change has been a Catalyst for Better and Reduced Use

A range of demonstrated benefits of telemonitoring for medication use are discussed below. It is noted, there has been no impact on the total use of medication for the targeted conditions across all participants, probably due to the ongoing nature of managing chronic conditions.

Monitoring for New or Managing Medication Change a Key Benefit of Trial

Through the case studies, feedback from practices and the practice surveys, one of the significant demonstrated benefits of telemonitoring is the capacity to enable close monitoring of vital signs when medication changes are required or commenced. In addition, vital signs data and trends have led the practice to discuss and recommend medication changes to help stabilise vital signs. The monitoring has been beneficial from both a pro-active and reactive logic with examples of both including:

- Pro-active: Practices cited examples where telemonitoring data trends informed medication adjustment or introduction of new medication. Practice nurses planned for and specifically reviewed a patient’s vital signs for a period of time to ensure that no adverse effects were arising and/or to assist in making dose adjustments in consultation with the GP.

- Reactive: Practices have also cited occasions where the nurse had observed that a participant’s vital signs were out of range and associated this to a known recent change in medication and again consulted with the GP for advice on management.

A significant finding from the participant survey was that 79% (n=113) felt that the trial improved the participant’s health management, including managing medication, communicating issues and managing symptoms. This suggests the trial played an important role in increasing participants’ knowledge and health literacy around medication.

Similarly, 56% of interim and 58% of post participation practice survey respondents suggested the trial had led to improved medication titration or change.

Reduced Use of Medication

Another cited benefit of telemonitoring is that it is a catalyst for health behaviour changes. Participants engaged in regular monitoring may be led to consider their health and wellbeing more broadly, resulting in lifestyle changes with immediate benefits. This included examples of weight loss, decreased blood pressure, and better controlled blood sugar levels leading to reduced medication requirements. One participant withdrew from the trial when her BP stabilised due to new medication. The following illustrates one of the more radical changes for a participant on the trial. This also supports tailored or short term telemonitoring periods as appropriate, to support a more sustainable model over time. This is discussed further in the report.

During the time of the trial, I was fitted with a pacemaker. Consequently, Tunstall added an ECG reader to my regime - this resulted in medication reduction that might not have been picked up as quickly. – Veteran, North Coast

I now only take seven tablets a day compared with 22 at one stage. – Veteran with diabetes and COPD, North Coast

4.5 Utilisation of Other Services

Data was available from DMIS to describe a range of other services provided to DVA clients. Analysis of these is set out below for both ‘use of an ambulance’ and ‘booked car with a driver’. Additional detail is provided in Appendix C, Tables C58-C94.
4.5.1 **USE OF TRANSPORT SERVICES**

The DMIS data indicates that ‘use of an ambulance’ has increased significantly for all cohorts. For IHT participants, this increase in mean services/client/quarter was 52.6%. For the Gold Card Holder group, the increase was 96.2% and for the CVC group, an increase of 76.8%. These comparisons indicate that the IHT group increased by less than the control groups. For ‘booked car with a driver’ for IHT participants, there has been a 39.0% increase in the mean services/client/quarter. For the Gold Card Holder group the increase has been 17.3% and for the CVC group an increase of 11.3%.

The greatest increase in the number of IHT participant per quarter using transport occurred in the New England region, however the greatest increase in costs per participant per quarter for transport occurred in the metropolitan Bayside region. Caution must be used in the interpretation of the transport data as the number of users and transport services are small (particularly when further disaggregated by region) compared to the other cohorts.

One practice identified the significant impact the trial had on reducing transport needs for one of their participants who uses telemonitoring for INR testing for warfarin therapy. The participant lives in a rural location approximately an hour from their practice. Travel to the practice required multiple buses and a significant uphill walk. The practice negotiated with the service provider for the person to have INR testing equipment in the home (not in the intended scope for the trial) as they considered this would make the most significant impact for her. This was agreed to and has reduced the need for numerous trips to the practice.

Of note, practices indicated that many of their participants (64% respondents at interim, 38% at post participation) lived within 10 kilometres of the practice, suggesting transport to and from the practice was not generally an issue, noting DVA provide assistance towards Gold Card Holders’ travelling expenses for medical treatment.25

4.5.2 **USE OF OTHER SUPPORTING HEALTH SERVICES**

It was not anticipated that the trial would significantly impact on the utilisation of other health services. Analysis of quantitative and qualitative data in relation to DVAs’ Veteran’s Home Care (VHC), community nursing, and allied health services, was undertaken to evaluate the trial’s impact on integrated service provision and the broader health system.

In broad terms, the DMIS data illustrated that the use of other services increased, although episode numbers are low so reliable conclusions on impacts are limited. The number of telemonitoring participants in 2016 who were using VHC (9, or 5%) and community nursing services (50, or 30%) remains small. Allied health service data has also been integrated making this overall analysis more robust. Data tables used for the analysis are presented in Appendix C including VHC service use (Tables C58-C62), community nursing service use (Tables C63-C66), and allied health service use (Tables C76-C94). Key findings were that:

- the number of trial participants using a VHC personal care service throughout the trial was only nine in total and:
  - the number of personal care services/client/quarter increased from 17 to 62 services for trial participants (1270.6%). Growth was also observed in the CVC that showed an increase of 25.6% (compared to 6.4% for the GCH cohort)

the number of VHC in-home respite care services/client/quarter for participants decreased from 42 to 38 (18.6%) whereas increases in service use were evident for the CVC cohort (118.4%) and the GCH cohort (19.0%). Interpret with caution due to small intervention numbers.

- the number of telemonitoring participants using community nursing services has increased from 36 to 50 (138.9%). Note that the number of Gold Card Holder clients reduced by 6.3% over the same period. Other findings include:
  - an increase of 177.4% for community nursing services/client/quarter to IHT participants, but much smaller for the Gold Card Holder and CVC cohorts (124.2% and 158.3% respectively)
  - a significant increase in the number of community nursing visits/client/quarter for the trial participants (1127.4, but smaller for the Gold Card Holder and CVC cohorts (16.6% and 135.7% respectively). Interpret with caution due to small intervention numbers

- increased use (112.6%) of total allied health services within the trial group compared to a decrease in the GCH control group (110.5%) and CVC group (10.9%). This increase was predominantly attributed to the pre CVC trial sub-group (117.9%)

- an increased cost (124.8%) of total allied health services within the trial group compared to a decrease in the GCH control group (19.6%) and small increase in the CVC group (12.2%). This increase was evenly distributed across new CVC and pre CVC trial sub-groups.

- an increased use of targeted allied health services overall with the total number of services/quarter increasing by 9.5%. The number of services/quarter for the CVC control cohort decreased by 3.6% and decreased by 15.7% for the Gold Card Holder cohort. Similar increased use of allied health services was also observed when analysing the utilisation of all allied health services

- physiotherapy and podiatry services/participant/quarter were the two most highly utilised allied health services across all cohorts. Combined, and as a proportion of all allied health services used in both time periods, they represent at least 81% of the selected allied health services used by all cohorts. Those trial participants joining CVC Program concurrently had the most significant increase in podiatry service use/quarter (24.2%), and this may be attributed to this group being more likely to have diabetes

- the largest increase in services/quarter for telemonitoring participants was for occupational therapy (150.1%), podiatry (110.3%) and physiotherapy (16.3%). The use of dietetic and diabetes educator services decreased slightly for all trial and control group cohorts. The only increase in any allied health service use across the two control cohorts was total physiotherapy services per quarter for the CVC cohort (10.7%)

- the mean cost per client per quarter increased overall for the targeted allied health services for GCH (19.3%), CVC (113.1%) and IHT (113.3%). The change in mean cost per client per quarter was slightly higher for IHT (new CVC), 116%, compared to IHT (pre CVC), 113.8%. The largest increase in mean cost per client per quarter for the targeted allied health services was demonstrated in the Darling Downs region across the trial group and both control groups.

### 4.5.3 Change in Referral to Other Services is Not Significant

As noted above, the IHT participants were not major users of VHC or community nursing services, although between the baseline data collection period and the trial data collection period there was an upward trend in the use of these services for participants. Allied health services, particularly physiotherapy and podiatry services, were more commonly used.
Approximately 59% of interim practice survey respondents said there had been no change to interaction with other services since the onset of the trial, and this increased to 67% at post participation. The remaining 41% (at interim) and 33% (at post participation) noted there had been moderate to significant enhancement in interaction. The second and third round of interviews with practices indicate there have been no significant impacts on interaction with other services, with indications that DVA participants are well connected to services generally, regardless of the trial.

Our findings from the case study interviews were that no new services had been introduced as a result of the trial, and where VHC and community nursing services were being utilised there was no apparent change in the frequency of visits due to the trial. Many of the issues being addressed by these services (e.g. showering, wound management) would not be avoided or reduced by telemonitoring. The conclusion we draw is that VHC and/or community nursing services are not impacted by the trial. Any growth in these services is likely a result of ageing, ongoing needs and/or deteriorating health of participants rather than a large increase in referrals as a result of telemonitoring.

**4.6 SUMMARY – SERVICE UTILISATION**

As the trial is an extension of the CVC model, it is important to acknowledge the impact CVC services have on a participant as they enter the program. These impacts include an expected initial increase in primary health service utilisation due to increased service access and coordination, and potential increased monitoring by health professionals following implementation of a care plan. Over time, these interventions aim to reduce the risk of hospitalisation and improve self-management, as were the aims for the trial. Impacts of the trial relating to service utilisation for participants who joined the CVC Program concurrently may be confounded by the impacts of the coordination provided by the CVC Program, and the attributable cause and effect are challenged by this confounding. In addition, the higher baseline ‘risk of hospitalisation’ in the trial group (compared to the control groups) suggests that there could be an intrinsic level of risk that confounds and reduces the potential impacts of the trial on service (particularly acute) utilisation. Our findings suggest the risk of hospitalisation remained unchanged for some participants (e.g. older), and that the trial potentially reduced the risk for others. Overall, as described below, there was no significant difference between baseline and trial for the trial participants’ use of hospital and GP services indicating the risk of hospitalisation has not reduced for the majority of participants.

The analysis suggested that from baseline to the end of the trial, there were small, non-significant reductions in GP visits and public hospital admissions, and these reductions were more extensive in the trial sub group who had joined CVC concurrently. We also note that there were no significant trends identified by quarter across the trial period for GP visits or hospital admissions for approximately 90% of participants.

An increase in mean private hospital episodes per client per quarter was more substantial for the trial group than the control groups; however the increase in mean private hospital episode costs per client per quarter was less for the IHT group than the control group increases. In addition, length of stay increased most significantly for the pre CVC group compared to the control groups and new CVC trial sub-group.

Statistical hypothesis testing (paired and independent samples) indicated no statistical difference between public hospital episodes per client per quarter from baseline to trial period. In addition,

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there was no statistical difference between public hospital episode costs per client per quarter from baseline to trial period through paired and independent sample testing.

Statistical analysis indicates no statistical significance between number of GP consultations per client per quarter (paired and independent t-test) between the baseline and trial period. There was a statistical difference, between the means relating to episode costs per client per quarter (using the paired sample).

Overall, the DMIS findings suggest that the trial is more likely to reduce GP visits and public and private hospital admissions for those new to the CVC Program. Of note, this trial sub group was an average 5-9 years younger than the other cohorts, suggesting the trial more likely supported reduced hospital admissions for a younger cohort with potentially less complex conditions. Interpretation of these findings should also consider that the trial group was selected for trial participation based on their high risk of hospitalisation, and that these high-risk parameters were not applied to the data control groups. As such, the existing clinical risk of the trial participants and qualitative feedback from practices suggest that the capacity for rates of hospital admissions to decrease significantly is limited, particularly for older participants with more complex conditions.

To minimise hospital admission and disease progression in the 85+ via IT is very, very difficult. Average age of our participating clients was 89! and... Not of huge benefit to our aged population who are already at high risk of hospital admission with their mostly advanced chronic diseases. - Practice Nurse, Bayside

Other evidence suggests no change in attendance for those participants already routinely attending the practice for check-ups, CVC appointments and/or other medical conditions. In addition, a few participants felt they were visiting the GP less frequently and this may be linked to the increased reassurance (i.e. impacting on healthcare seeking behaviours, improved health literacy, and access to care through teleconsultations).

Importantly, the trial has reported a number of hospital admissions for serious and/or potentially life-threatening events for some participants. There were also examples of hospital avoidance due to monitoring and early intervention.

The trial and telemonitoring may have led to an increased number of specialist reviews overall (e.g. based on availability of and referral using vital sign trends), but the previous to CVC sub group (older) experienced a greater increase in the use of services compared to the new to CVC sub group, again indicating the trial is more likely to reduce specialist service utilisation and costs for the younger new to CVC group.

Another key benefit of the trial was the use the vital signs monitoring when changing the dose of a medication or when a new medication was being introduced. There were also examples of monitoring leading to changes in medication. Additionally, there were qualitative examples of participants reducing the need for medications because of making lifestyle changes that improved their condition.

There were limited impacts from the trial on the use of, and referral to, services such as VHC, community nursing and allied health for participants. Monitoring information has been useful for some specialist reviews. Monitoring had minimal impact on the use of pharmaceuticals however, the mean items per client per quarter increased more significantly for pre CVC compared to new CVC, potentially owing to the older mean age and complexity of condition(s) of the pre CVC group.
5 CLINICAL EFFECTIVENESS

This chapter provides an analysis of clinical effectiveness. This has been assessed using the AQoL-8D survey, the Kessler 10 (K10) survey, participant surveys, intervention reports and information sourced through our case study and practice survey activities. Analysis is further supported by health service utilisation data. The key tools for assessing quality of life (AQoL-8D) and psychosocial wellbeing (K10) are provided along with a summary of the more detailed analysis included in Appendix D and E. Findings of the pre-participation, interim and post-participation surveys exploring experiences and impacts for the trial participants are provided in Appendix F.

5.1 QUALITY OF LIFE AND PSYCHOLOGICAL WELLBEING

An objective of the trial was to support improved quality of life and psychological wellbeing for participants, and potentially their carers. Improved personal wellbeing, and perceptions of health, safety and future security were key findings in a 2011 Australian telehealth trial report for frail older people receiving post-acute care27. However, the Whole of System Demonstrator (WSD) Telehealth project in the UK, did not find improvements in quality of life or psychological outcomes for patients with COPD, diabetes and heart failure over a 12-month period.

The following provides the key findings for the trial in relation to quality of life and psychological wellbeing. These findings have been identified using standardised assessment tools with the trial participants and a matched control group of 300 participants, and from feedback through the case studies, practice surveys and other sources.

5.1.1 QUALITY OF LIFE

A standardised assessment and analysis of quality of life was undertaken using the self-reporting Assessment of Quality of Life (AQoL)-BD Multi-Attribute Utility Instrument (See Appendix D). The tool seeks information from respondents in relation to eight dimensions of quality of life. The tool provides an overall ‘utility score’ and ‘dimension score’ that enables comparison to other groups as well as measure change over time. This survey was administered to the participant group and control groups at pre-participation (baseline), interim and post-participation (end of trial) stages. Unweighted utility scores were generated by SPSS software and applied to unweighted population norms. The survey results were statistically analysed using SPSS and EpiTools software.

AQoL INDICATES QUALITY OF LIFE HAS NOT BEEN IMPACTED SIGNIFICANTLY

In summary, there were no significant differences found from baseline to interim or from baseline to post-participation for the participant group using the AQoL-8D tool. In addition, there was no statistically significant differences between the participant and control groups at baseline, or at post-participation.

Both the trial participants and the control group had a utility score, on average, less than that of the population norm (Figure 5.1) at each point of survey. This can be attributed to the selection of participants having a known chronic disease and higher health risk, and the matched control group (health conditions and demography). Additionally, the norm scores for the Australian population are for those aged 65 to 74 years and the mean age of the trial participants is 81 years.

The telemonitoring participant group had a slightly higher utility score than the control group and this was maintained between the baseline, interim and post-participation reporting. This difference may be attributed to the higher mental health and senses scores in the trial group.

**Figure 5.1: AQoL-8D utility scores—trial participants, control groups and ‘population norm’**

Similarly, analysis of the more granular scores recorded at baseline, interim and post-participation demonstrated there has been no significant change in any of the eight QoL dimensions for the telemonitoring participants and control group between baseline and post participation period. There was some improvement between baseline and interim for the happiness and relationships scores, but this decreased again at post participation. This early improvement (at the interim stage) may relate to perceived benefits of the trial (relating to increased support) in the short term and a changing baseline position, discussed further in the participant survey analysis. The specific findings in relation to each domain are provided in Appendix D.

Though the AQoL tool did not show a significant change for the whole group, there have been a range of anecdotal improvements in quality of life cited through the participant and practice surveys. Approximately 3 in 4 participants responding to the interim participant survey perceived that the trial led to improved quality of life, and 2 in 3 at post participation. Many participants (54% of those continuing until the end of the trial) also indicated that the trial led them to change diet and exercise behaviours, which then led to improved life quality.

The practice survey findings indicate that the practice respondents perceived that the majority of trial participants experienced no change in relation to health outcomes, however a significant proportion of participants experienced moderate to significant improvements in their health outcomes, at interim and post participation.
5.1.2  Psychological wellbeing

A standardised assessment and analysis of psychosocial wellbeing was undertaken using the self-reporting Kessler Psychological Distress Scale (K10) Instrument (See Appendix E). The tool seeks information from respondents to assess distress based on 10 questions relating to anxiety and depressive symptoms the respondent has felt in the most recent four week period. The tool provides an overall ‘K10 score’ that provides a measure of psychological distress, comparison to other groups as well as measure change over time. This survey was administered to the participant group and control groups at pre-participation (baseline), interim and post-participation (end of trial) stages. Scores were based on the Australian Bureau of Statistics method for scoring in line with primary healthcare settings (categories used by CRUfad and GPCare)28.

In addition to the K10 tool, we have collated a range of views from practices and participants on ongoing participant health and wellbeing through case studies, practice surveys and the participant surveys.

The K10 showed no significant difference in psychological wellbeing

In summary, the K10 survey responses show that, on average, both the telemonitoring participants and the control groups as a whole, were ‘likely to be well’ at the baseline, interim and post-participation surveys. There was a slight increase in the proportion of K10 survey respondents likely to be well from baseline (64%) to post-participation (68%) among the trial participants. This is a positive outcome for some respondents that may be linked to the trial since the proportion likely to be well in the control group decreased from baseline (63%) to post-participation (61%). It is also acknowledged however, that the number of trial participants categorised as ‘likely to have a severe mental disorder’ increased from 7% to 11% from baseline to post-participation, compared to a decrease in the control group from 15% to 11%.

There was little variance across means between baseline, interim and post-participation for the trial group, indicating no significant difference in psychological wellbeing attributable to the trial, based on this tool alone. A comparison of K10 scores between the two groups shows the following:

- trial participants had a slightly lower mean K10 score (18) than the Control Group (19) overall (at baseline, interim and post-participation indicating slightly less psychological stress in the participant group
- similarly, the mode of the trial participant group was collectively lower (for baseline, interim and post-participation) compared to the control group
- Figure 5.2 and Figure 5.3 below show the summary findings for the K10 surveys. Note that a K10 score of 10-19 suggests the respondent is ‘likely to be well’.

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The responses to each of the separate K10 questions for both trial and control groups across the three data collection periods showed little difference between the two cohorts. Additionally, there was no significant variance between baseline, interim and post-participation survey for either cohort. It is noted that any minor improvements for the telemonitoring participants were generally seen in the control group. Detailed results are presented in Appendix E.
Peace of mind a significant benefit for participants and families

While the results of the K10 showed that there was no significant change in distress levels and psychological wellbeing, the case study interview findings, participant surveys and examples in trial newsletters have demonstrated a significant benefit of telemonitoring has been the peace of mind for participants, carers and family members. The ‘peace of mind’ is linked to a reassurance that a participant’s health and health risks are being monitored on a regular basis, thereby reducing anxiety about their own health. There is also potential that some participants felt that the monitoring provided a level of ‘security’, however emergency surveillance was not an intended design element or outcome of the trial.

At the interim stage of participant surveys, 79% of respondents felt a major benefit of the trial was the reassurance it provided them, decreasing to 65% at post participation. Importantly, of those who continued on the trial to the end, 73% of survey respondents indicated that peace of mind and reassurance was one of the reasons they continued.

Most practices (27 of 28) interviewed in the second and third round of case studies cite improvements in peace of mind, confidence and feelings of security for the majority of their participants and carers/family. The interim and post participation practice surveys indicated approximately 75-80% of participants felt greater peace of mind, and were less stressed about their health, due to the monitoring.

Peace of mind is the overwhelming improvement for patients. - Practice Nurse, Darling Downs

Having had one heart attack, the trial satisfied and reassured me that all was well. Often one can have a pain in the chest, shoulder arm and question, “is it a heart attack?” The frequently monitored ECG gave me confidence not to panic but watch for more symptoms. – Veteran North Coast

I think that the telemonitoring should continue. I felt safe that other people were watching. – Veteran, Darling Downs

Whilst travelling Australia, it gives me reassurance and peace of mind on how my health is going. – Veteran North Coast

A similar result that trial participants’ partner/carer/family had a greater peace of mind was recorded in the practice survey, with 75-80% in both interim and post participation surveys.

Dad is 91 years of age and has multiple health issues. He lives in a separate residence on our property as he is keen to retain his independence. From my perspective, it is also reassuring to have readings to make informed judgements about Dad’s care. – Daughter of participant

Most participants and carers felt that that frequent monitoring was reassuring from a health perspective, but also that they knew the practice and the service provider staff were accessible and supportive.

I know when his blood pressure is high that I have support on hand to decide what to do – Do I take him to the hospital? Do I take him to the practice? Do I let him rest at home? I don’t feel alone; the practice is a great support. – Carer and wife of participant, New England
This is an interesting finding, and highlights the links between increased peace of mind and care seeking behaviour, which may have been a factor for those participants visiting the doctor less since commencing the trial, and also link to increased health-literacy provided by the trial’s interventions.

“It’s the reassurance that has been the greatest comfort for me and would probably have stopped me sometimes seeking medical attention. – Veteran, North Coast

Most participants interviewed in the case studies indicate they are less concerned about their condition because they know the practice and the service provider are monitoring any change.

“I like to know what is going on with my health – I know I can’t stop a lot of things but I feel the trial helps me a lot. – Veteran, North Coast

MONITORING CAUSED ANXIETY FOR SOME PARTICIPANTS

There were a small number of participants who felt the monitoring caused increased anxiety. In these cases, practices advised the participant to withdraw, or the participant or carer asked to withdraw from the trial. Withdrawal due to anxiety was less frequent, toward the end of the trial and the majority of active participants interviewed in the last round of case studies were coping well.

An analysis of reasons for withdrawing from the trial identified that at least 15 participants, (10% of those who withdrew before September 2016) had done so due to stress or anxiety. Granular analysis of the participants withdrawing due to stress or anxiety illustrated that the majority were female with most being 80-89 years old. Interestingly, all the participants that withdrew due to stress or anxiety had been on the CVC Program before the trial.

Further, whilst the practice survey showed peace of mind as being a significant benefit, a small number of participants did not report an increase in peace of mind as a result of participating in the trial. The evidence base notes that in relation to anxiety, older patients cite privacy and security as important elements when building confidence in telehealth technology.

THERE ARE RELATIONAL BENEFITS FOR PARTICIPANTS AND THE PRACTICE STAFF

The practice survey responses across interim and post participation surveys indicated that 86-88% of practice staff respondents considered that a key factor contributing to improved health and wellbeing outcomes for participants was a stronger relationship between trial participant, carer, practice nurse and GP. This was perceived as a more significant benefit by participants than peace of mind.

It has also been our observation and finding from the case study interviews that for a number of participants, that their relationship with the practice was enhanced from more regular contact with the practice and the additional focus of the trial. Both practices and participants have noted that health management became more holistic with a broader interest in patient needs, including regular contact and engagement, rather than a distinct focus just on the chronic condition. It is noted that increased social contact was not an objective of the trial, but improved social outcomes has been a benefit for some participants who may have had feelings of isolation previously.

“The service has strengthened the trust between the GP/nursing staff and the participant through daily monitoring of their vital readings. This in turn assures the participant that the staff are there for assistance, care and guidance. – Practice, North Coast

One of our participants says they feel less isolated and more supported because of the increased contact. – Practice nurse, Darling Downs

Stronger practice and patient relationships, and a more holistic approach that encompasses health and wellbeing including from a social perspective, have the potential to enhance clinical effectiveness, outcomes and quality of care for a patient.

5.2 **INTERVENTIONS**

This section provides an evaluation of the processes and outcomes of the trial’s clinical interventions, and recorded *ICP triage manager* interventions by both the practices and the service provider. For the purpose of this section, an intervention is the outcome of a monitoring alert. Quantitative and qualitative information has been collated from the Tunstall KPI and Safety Committee reports, *ICP triage manager* outputs, case studies, practice surveys, participant surveys and newsletters.

### 5.2.1 *ICP triage manager recorded interventions*

The number and type of clinical interventions as part of triaging and follow-up are indicators for the clinical effectiveness of the trial. Interventions were categorised (by Tunstall, the service provider) to support logical analysis. It is noted that interventions recorded by the service provider related to the clinical outcome (e.g. identified health risk or issue), whereas interventions recorded by general practices related to the clinical action taken (e.g. GP appointment booked), making comparison a challenge. It is noted; however, the majority of interventions were undertaken by the general practices as part of their primary monitoring role.

Following a high reading or alert, interventions were recorded in *ICP triage manager*. Where the service provider acted on an alert in their role of co-monitoring, the result was recorded in *ICP triage manager*. However, where the intervention was led by the practice, interventions were not routinely recorded in *ICP triage manager* but rather in the medical records system of the practice. Accordingly, a full record of the number of interventions was not available for analysis and interpretation requires caution.

The following sections describe the number and types of interventions provided by practices and the service provider.

### Tunstall led interventions

Tunstall reported 175 interventions over 1 July 2013 to 30 September 2016 for clinically indicated issues. Figure 5.4 below illustrates the clinical reasons for intervention over the trial period. Clinical issues were predominantly for cardiac related events such as high blood pressure, chest pain, ECG irregularity, shortness of breath (cardiac or respiratory) or heart failure. In addition, these classifications were in the moderate to high risk level. There were only 11 clinical interventions considered to be low risk across this period. On this basis, it appears that the monitoring is beneficial for early identification of cardiac related conditions, and potentially respiratory conditions. In addition, though intervention numbers were low overall for clinical issues such as Stroke/TIA, chest infection, and atrial fibrillation, early detection and intervention of these conditions can have a significant positive impact on health outcomes, and potentially decrease clinical complexity of hospitalisation (including length of stay) if an admission is required.
Of the 175 interventions, 73 (42%) were high severity risk and 84 (48%) were moderate severity risk. In addition, 11 interventions (6%) resulted in an ambulance being called, 20 (11%) resulted in hospitalisation, 33 (19%) resulted in medication adjustment and 82 (47%) resulted in a GP appointment booking. This early intervention is a very positive outcome from the trial.

The rate of selected interventions per active participants over time showed little change over time from a rate per participant perspective, remembering also that the total number of GP bookings or visits led by Tunstall was only 66 between July 2014 and October 2016, as shown in Figure 5.5.
Similarly, the rate of medication adjustment and other interventions by Tunstall remained relatively steady. There was a total of 20 medication adjustment interventions, 15 hospitalisation interventions and 8 ambulance calls led by Tunstall between July 2014 and October 2016, demonstrating overall very low rates. Rates of selected Tunstall led interventions are provided in Figure 5.6.

**Figure 5.6: Change in rate of selected Tunstall interventions per participant**

![Graph showing change in rate of selected Tunstall interventions per participant](image)

**GENERAL PRACTICE INITIATED INTERVENTIONS**

There were 2,413 interventions recorded between 1 July 2013 and 31 December 2016 (excluding end of trial interventions). From July 2014 to September 2016 there were an average of 77 general practice interventions per month (or one or two interventions per practice per month). In contrast, each participant had an average of 4.4 high readings per month, and 5.7 high alerts per month. In circumstances where there was an alert and no intervention, it is likely that the practice or Tunstall acknowledged the alert, and provided a follow-up phone call without recording an intervention, or recording only a ‘note’ in the ICP triage manager.

As described above, the practice-led intervention data presented the action taken, rather than the clinical risk or reason making it difficult to highlight the clinical effectiveness or the conditions that benefit most. The key findings of general practice-led interventions included:

- predominant practice-led interventions were having the participant attend the practice for GP review or booking an appointment (52%), review of the monitoring plan (18%) and medication reviews (8%)
- monitoring that resulted in referral to hospital (5%) and specialist review (4%)
- review by video-conferencing/consulting (intended to be a feature of the trial), only occurred on 43 occasions (2% of interventions) over the 42-month period.
The rate of selected interventions per active participants showed minor changes over time. For example, the rate of GP bookings or visits per participant decreased slightly from approximately 0.24 GP bookings or visits per participant to 0.21, based on the trend line from July 2014 to October 2016, as shown in Figure 5.8. There was also a peak for the rate of GP visits per participant in July 2015, likely due to the winter and ‘flu season’. There were a total of 1218 GP bookings or visits led by practices between July 2014 and October 2016, and the peak number of visits were in July 2015 (79).

**Figure 5.8: Change in rate of practice-led interventions – GP bookings or visits per participant**
Similarly, the rate of medication adjustment interventions and referral for specialist review decreased slightly over the time of the trial, shown in Figure 5.9. These changes over time may reflect the stabilisation of medication and chronic condition management resulting from frequent monitoring, particularly over the first 12 months, and are a positive outcome for the trial. It is noted there were a total of 173 medication adjustments over the analysis period, and 110 of these (or 75%) occurred in the first 12 months. The peak number of medication adjustments occurred in July 2015, in line with the highest number of GP visits, potentially due to ‘flu season’.

The rate of practice-led hospitalisation interventions per participant increased slightly, based on the linear trend line, between July 2014 and October 2016 (see Figure 4.8). There were a total of 102 practice-led hospitalisation interventions over this time. This slight change may reflect the impact of the trial on early detection, and the increasing acuity of chronic conditions as the participants age, leading to the need for acute care. It is noted that other data (including DMIS data) shows conflicting overall impact on public hospital utilisation.

### 5.2.2 Examples of Critical Interventions

There were several examples provided by practices through the case studies and newsletters of monitoring data leading to critical interventions:

- one participant recorded elevated blood pressure over a series of days. The practice was alerted and requested GP review. This led to modifications to his anti-hypertensive medication
- routine monitoring led to earlier detection and hence management of atrial fibrillation (AF) for a number of patients
- one participant rang the service provider to check if his readings had been received, whilst on the phone, the participant mentioned a range of symptoms he had experienced in the preceding days. The Tunstall nurse followed this up with a series of questions, which ultimately led to ambulance retrieval and a hospital admission to the Stroke Unit. The phone conversation led to an early intervention and was a very positive outcome for the participant
the availability of telemonitoring enabled earlier detection of AF in some participants and early detection of other critical health issues leading to hospitalisation

As a result of the trial, these veterans have promptly been started on medications, reducing their risk of heart failure and stroke .... the trial has the potential to have an enormous impact on the wellbeing of participating patients. – GP, North Coast

Quite a few times my doctor and the nurse at the clinic were quick to call me if there were concerns about things, blood pressure etc. One call reflected in a trip to hospital with the need for angioplasty and a stent inserted. So, thanks for telemonitoring. I can only add that living alone, it gave me more assurance that someone out there, cares. – Veteran, North Coast

It has enabled me to monitor oxygen saturation - I need to use nebuliser and different medication for asthma and when not improved, to call ambulance, or act when temperature flares. One flare that was really bad within the trial - turned out to be pneumonia hence long stay in hospital twice. The doctor organised medication so it was available at home (nebuliser and 3 different medications) as I now need to maintain care at home with home visits. - Veteran, Darling Downs

there are a number of cases of monitoring assisting in the introduction of new and/or adjustment of existing medication

one participant on the trial had a trend of low pulse rates that were declining over a week. This trend prompted an investigation into the patient’s medication. The doctor ceased this medication for three days and the pulse settled. The patient was completely asymptomatic the whole time and hence was only detected by the monitoring

monitoring for one participant identified shortness of breath through the spirometer readings and patient questionnaire. After contact from the practice, she was advised to attend for an appointment with the GP. Indications of this case suggest the symptoms may have been related to a carcinoma in the lung. Whilst her feeling unwell would have likely caused her to attend the practice within a short time frame, the availability of monitoring facilitated earlier intervention

the identification of suboptimal readings (and an associated alert) followed up by the practice-led to a review by the GP and then a transfer to the hospital. In this case, it was considered to have likely prevented a further stroke

a war widow placed on the trial to monitor her diabetes, was subsequently diagnosed with COPD as a result of irregular readings (and the associated alerts). She reportedly has had more than one potentially life-saving intervention as a result of the trial

a participant with COPD was monitoring weight change due to fluid retention. The readings enabled the practice to identify the change in pattern quickly, leading to an early intervention.

5.3 Other reported clinical benefits

This section describes a range of other clinical benefits for participants identified across a range of qualitative data sources including case studies, practice surveys, participant’s surveys, and newsletters. Clinical benefits described here include improved self-management, and improved lifestyle choices It is noted that many of the demonstrated improvements in self-management and healthy behaviours for some of the participants were identified early in the trial and were maintained throughout, rather than incremental changes reported over the longer term of the trial, suggesting that such benefits are felt in the short term rather than the longer term.
MONITORING ENHANCES SELF-MANAGEMENT OF THE CHRONIC CONDITION

The introduction of monitoring led some participants to take a greater interest in self-management of their chronic condition and their broader health and well-being due to increased knowledge and feelings of control. The most common perceived benefit cited by participants in the participant survey (91% at interim and 79% at post participation) was that they felt they now had a better understanding of their condition. This often led to proactive self-management. In addition, 79% of participant respondents who continued to the end of the trial indicated that the trial had improved their health management, including medication management, managing symptoms, or increased communication about health issues.

A number of participants monitored a particular vital sign when they were “not feeling 100%” to ascertain whether this could be explained by the vital sign. For example, a participant who felt faint may record blood sugar level (BSL) or blood pressure (BP), dependent on their primary condition, to determine whether the faintness was explained by the reading. Where that was the case, they ate or rested, as a remedial action and a follow-up reading showed that action to have been sufficient. In some instances, they contacted the practice (or service provider co-monitoring team) and routinely received similar advice to the action taken.

Practice staff also believed that participants became more aware of their condition and increased their interest and responsibility in their health since joining the trial. Some participants perceived an increase in accountability of their own health and health management due to the regular self-monitoring, and for at least one participant this increased medication compliance. Others felt they increased knowledge and control of their condition due to the monitoring, however most participants felt their knowledge and control of their condition was good before the trial too.

The practice survey analysis indicated that 80% (at interim) and 86% (at post participation) practice staff respondents believed that one or more of their participants took greater responsibility for their own health due to the trial. Similar findings were recorded for improvements in understanding and awareness of the participant’s health condition, 93% of practice staff respondents at post participation.

Practices also indicated that there had been no to little change in the level of risk for participants on the trial. Most practices interviewed in the second and third round of case studies perceived a slightly lower risk for participants since starting the trial due to telemonitoring, increased access to support, increased accountability, and improved practice access to a broader context of the patient’s condition.

This is an important and positive outcome with regard to increasing cost-effectiveness of the model over time, discussed further in Chapters 8 and 9.

MONITORING IS A CATALYST FOR BEHAVIOURAL LIFESTYLE CHANGES

The qualitative data collection and analysis demonstrates there were a number of participants who made lifestyle changes as a result of participating in the trial. This included one participant who reduced his alcohol consumption to reduce his weight and have better control over his diabetes. Other participants described dietary adjustments, increasing their exercise and significantly improved health behaviours after commencing on the trial.

This trial is the best thing that could have happened to me! Like a lot of veterans, I let myself go. It changed my life as it empowers you to take responsibility for yourself as you can see how changes to your diet, exercise and medication can affect your readings. It is a tool that helps you get back control. My blood sugar levels have reduced from 17 to 7, blood pressure has now normalised and lung function has improved. – Younger Veteran with diabetes, COPD, North Coast
Further to this, an increased awareness led to improved diet and weight for other participants:

Knowledge of my condition is now much better...especially my knowledge of how much sugar is in foods like cereals! I have made big improvements to my diet since being on the trial and am exercising more. – Veteran, North Coast

I have taken control of my weight. I have lost 5kg all due to the telemonitoring... I now go to the gym twice a week. – Veteran, Darling Downs

My blood pressure levels were playing up a bit before the trial. This has now settled down. I take less tablets now. The trial has also helped me lose weight. I used to be 80kgs but this morning I was 74.3kgs. Weighing myself all the time now makes me be more careful about what I eat! – Veteran, North Coast

I have recently returned the Tunstall equipment. If I would have been able to I would have kept it. It gave me a lot of feedback in relation to my diet and what foods to eat to control my diabetes type 2. I also found, as I attend a gym through DVA, how important exercise was in this area. – Veteran, North Coast

A few participants reported they are now using more technology for other daily tasks and hobbies due to their new confidence from using the telemonitoring equipment. There were no negative impacts on lifestyle and health behaviours reported through our data collection.

**Unexpected Clinical Benefits**

Of interest, many participants reported through case studies that a key motivator for participating in the trial was to support benefits for other veterans and war widows into the future, not necessarily to benefit themselves. This is in line with known veteran characteristics of a willingness to support other veterans and their families who have served their country, and a loyalty to DVA. This was also a major reason cited for continuation of participants until the end of the trial. Seventy three percent of post participation respondents that continued to the end of the trial indicated the main reason for continuing was to support DVA to help other veterans.

Though coaching was not a key focus of the trial, follow up phone calls from the practice and the service provider nurses as part of the telemonitoring process inherently included clinical advice and tele-coaching (e.g. strategies to remedy blood sugar levels or blood pressure if readings were outside the parameters). For example, 3% of all GP-practice interventions were categorised as coaching. These contextual and educational conversations, though difficult to record and objectively measure (in relation to benefits to the participants) are an important intervention, and demonstrate a potential enhancement to pre-trial services.

Potential impacts of these follow-up phone calls alone (beyond the monitoring and social aspects of conversation) include an enhanced relationship with the participant, increased participant knowledge of their chronic condition, and improved health outcomes (e.g. through advice that supports early detection, increased medication compliance and health promotion). Supporting this, a telehealth and tele-coaching trial in Leicester (UK), focussed on keeping patients with COPD out of hospital in the UK, found that their project led to the prevention of more than one hospital admission a week in the winter months (saving 355,000 GBP over 26 weeks). This was primarily attributed to the coaching element where respiratory nurses would ensure patients had taken their medication and taken preventative steps to keep warm and healthy30. In addition, recent studies in Australia have suggested

30 https://www.digitalhealth.net/2013/03/telehealth-helps-during-cold-snap/
that a telephone consult post hospital discharge can reduce 28 day re-admissions substantially for patients with chronic disease\textsuperscript{31}.

Similarly, practices reported, through the online surveys, a range of unexpected benefits for participants:

- increased patient’s confidence to call their practice
- increased confidence in patient’s ability to use technology
- increased accessibility to their practice without increased travel
- feeling like a valued member of society
- reassurance for an anxious patient.

\section*{5.4 Overall Health and Wellbeing Impact of the Trial on Carers}

Very few of the participants interviewed during the case studies had partners or others acting as a formal carer. Participants who did have a carer, indicated that the trial provided a positive and convenient support for them in their role as a carer. Our finding from interviewing partners was that the monitoring also provided them with peace of mind (i.e. linked to reassurance about health and health risks), and on most occasions, it had not been a burden for them. The trial caused some stress for a small number of partners/carers only. Information on the carer perspective was also collected through the practice case studies and surveys and the trial newsletter articles.

Findings from the practice survey indicate the trial provided peace of mind for carers (29\% at interim and 33\% at post participation), and for many it had reduced the burden on them (16\% at interim and post participation). It had also enabled carers and family to learn more about their loved one’s health condition and support them to more confidently assist with taking regular readings. A small number of practice staff felt the equipment caused increased stress for carers (9\% at interim, 4\% at post participation), consistent with early case study findings. In addition, 4\% practice survey respondents at interim and 11\% practice survey respondents at post participation felt the trial made no difference to carers. Other family members indicated through newsletter articles, that the trial brought them greater peace of mind knowing that the participant was being monitored. This was particularly the case for children who live in a different location and/or when the participant did not live in a major centre close to services.

\begin{quote}
This trial has improved the quality of life not only for my father, but for his family. – Son of participant
\end{quote}

\section*{5.5 Clinical Effectiveness and Participant Characteristics}

This evaluation aimed to analyse factors impacting the clinical effectiveness and benefits of the trial including particular conditions, age and location. Data supporting this analysis is sourced from the intervention data, practice surveys, case studies and newsletters.

\begin{quote}
\end{quote}
5.5.1 Do some conditions benefit more from telemonitoring?

As reported in section 5.2 above, the intervention data suggested that the monitoring is beneficial for early identification of cardiac related conditions and less so for respiratory conditions. Examples of interventions from practices support the effectiveness of monitoring in cardiac and respiratory conditions, and also in diabetes. The survey of practices was mixed and generally inconclusive regarding which conditions benefits more:

- 30% of practice survey respondents at interim and 25% at post participation perceived CHF patients to benefit the most.
- 27% of practice survey respondents at interim and at post participation perceived COPD patients to benefit the most.
- 26% of practice survey respondents at interim and 21% at post participation perceived diabetes patients to benefit the most.
- More than half (61%) of practice survey respondents (at interim) felt there was no condition that the trial could not support.

Conclusions in relation to which condition(s) experience greater clinical benefits from monitoring are limited, suggesting that the benefits are specific to the participants' and/or practice nurses' variable experiences with the trial. Qualitatively, practices report that the trial has the capacity to benefit any chronic condition. Examples of success included improved management of diabetes, blood pressure, COPD, CAD, oxygen, and weight control, fluid retention management, chest pain, and respiratory issues.

Monitoring enabled early intervention of all health conditions on the trial. – Practice Nurse, post - participation practice survey

5.5.2 Are there greater clinical benefits for certain age groups?

The telemonitoring participants had a mean age of 81 years. The potential impact of the trial (particularly reductions in health service utilisation) is limited by the trial participants' age and ageing (particularly in combination with complex chronic condition(s) and their baseline high risk of hospitalisation. For example, ageing can affect a person's health and wellbeing, increase the risk of multiple chronic conditions and reduce their ability to recover as quickly compared to a younger population. Impacts of the trial in certain age groups is discussed below. Note that younger participants were more likely to complete the trial compared to the older age groups (see 5.5.3).

Practice survey responses regarding benefits or barriers of age varied between practices and their particular experiences with participants. Practices generally reported that age was not an important factor. One practice indicated that telemonitoring was used differently for different age cohorts in their practice, i.e. a focus on early detection for the younger cohort, and a focus on controlling and managing symptoms for older groups. Other practices considered that age did impact on participant engagement in the trial:

Age was more of an issue than the condition. As some trial participants felt they were taking the opportunity from another veteran if they were stable, and some of the older patients thought they were too old to be bothered with. – Practice Nurse, post-participation practice survey

32 Victorian Dept. of Health and Human Services (2016) Healthy Ageing Literature Review
At the second and third round of case studies, most practices reported that age has not been a factor in the success of the trial. Instead, the attitude, active nature, willingness and compliance of the participant, and support from family had been influential. In contrast, some practices reported that the trial was less suitable for very frail and/or anxious participants.

One would also assume that the benefits for younger participants (e.g. more likely longer-term quality of life impacts) are different to the benefits for older participants (e.g. social interactions, reassurance and peace of mind), where health and the capacity to recover is more likely to decline over time. Direct feedback from practices illustrates examples of clinical benefits for both the younger and older age cohorts. In fact, one GP indicated that the older, more isolated participants with co-morbidities are a group that benefit more, clinically and socially, from the trial. This highlights again the variable experiences of different practices and different participants.

In terms of making lifestyle behavioural changes, the case study visits and interviews, supported by participant examples in the trial newsletters, that it is the younger participants where the trial has been more of a catalyst for change. Younger participants making positive lifestyle changes are potentially more likely to realise greater health gains over the longer term and reduce their health service utilisation should these changes be sustained.

Analysis of the participant group by age group and average number of days on trial indicated that the younger cohort remained on the trial for longer, potentially due to improved health circumstances throughout (compared to the older cohorts). We also note that an average of 506 days for the 90-99 years age group is substantial and supports the suitability of the trial model across all age groups (see Figure 5.10).

5.5.3 Veteran characteristics and analysis of early withdrawal from the trial

A comparative analysis between the telemonitoring participants who remained on the trial until the end, and those who withdrew earlier illustrates that the older cohort, particularly women were more likely to have ceased participation. It is noted, however, that females are underrepresented in the 50-
69 years’ age group of all participants (withdrawn and active), i.e. 18% or six of 34 female participants. Key findings as at 30 September 2016 include:

- 68% (of 34) 50-69 years old were still active on the trial (majority of males)
- 57% (of 63) 70-79 years old were still active on the trial
- 46% (of 99) 80-89 years old were still active on the trial
- 45% (of 96) participants aged 90 years and over were still active on the trial
- 45% (of 137) female participants (all ages) were still on the trial
- 55% (of 155) male participants (all ages) and 61% (of 105) males aged 50-89 years were still on the trial. The retention rate for males only falls below 50% for those aged over 90 years (44% of 50 male participants).

The figures below (Figure 5.11, Figure 5.12, Figure 5.13) demonstrate the differences between the end of trial participant group and early withdrawal participant group, by gender, age and location. As discussed above, there was a larger proportion of males (58%) in the end of trial group compared to females (42%), in line with the overall demographic split of the trial cohort, but the ratio of females in the withdrawn group was higher than their representation in the overall trial group. The end of trial participant group also had a higher proportion of the younger cohorts (50-69 years, and 70-79 years) compared to the early withdrawal group. Conversely, the early withdrawal group had higher proportions of the older cohorts compared to the end of trial group. Sixty four percent of the end of trial group were from New South Wales, compared to 58% in the early withdrawal group. Though Victorian (Bayside) residents composed 20% of the trial cohort overall, 24% withdrew early (see also 5.5.4). These data demonstrate very little difference between withdrawn and end of trial groups by location. It does appear that females and older people were more likely to withdraw, mostly attributed to deterioration in health, or stress/ anxiety (e.g. with equipment).
From the case study visits, there were a small number of participants interviewed who lived a considerable distance from their practice and who appeared to be benefitting from the trial in relation to reducing their need to attend the practice. In addition, at least one participant in Darling Downs enjoyed the flexibility to be mobile and not need to attend the practice in person while travelling at a distance.

The direct feedback from practices and newsletter items also supports an enhanced level of service for patients living in rural areas, as they were not frequent attenders at the practice. Likewise, case studies indicated monitoring for those participants also provided much greater peace of mind for the patient,

5.5.4 Is distance from the practice or other access difficulties a factor in effectiveness?
partners/carers and significantly family members who may be living some distance away (e.g. interstate).

It was anticipated that the practice survey responses would identify the benefits for those with difficulties accessing the practice, however, this was not the case. There was a good response rate from the rural practices to the survey, however additional benefits from living more remotely were not evident. This may be because only a small number of participants live a long distance away from the practice. In addition, contrasting experiences of each practice and their participants suggest local context and service networks are bigger factors for access.

It was also observed in the first round of case study visits that participants in the Bayside area of metropolitan Melbourne perceived few benefits. As we noted in analysis on GP service utilisation, many participants were already routinely seeing the GP and/or practice nurse due to the CVC visits or for other health conditions. In this metropolitan region, this was even more pronounced with participants reporting that they generally visit the practice whenever they have any health concerns as they are easily accessed. Survey responses from the Bayside practices also questioned the value of the trial for their participants at the time because of their location (i.e. good access to services).

Because all six patients on the trial live in close proximity to the clinic, all drive, all are self-caring, it has made little difference to their health outcomes. - Practice Nurse, Bayside

Within the second and third round of case study interviews, practices and participants reported that the trial would likely be more beneficial to isolated and regional patients compared to those living closer to a practice. Most participants interviewed lived less than 15 minutes’ drive from their general practice, and access to the practice had not been a limiting factor. In addition, most of the participants reported good to very good timeliness of access to care throughout the trial, this relates to immediate follow-up after alerts, proximity to the practice, support through DVA transport subsidies, and reliable and timely support over the phone as they require it.

### 5.6 Avoidance and Delayed Entry to Residential Age Care Facility

An analysis between average age of control group cohorts and the trial participants entering RACF between January 2014 and May 2017 has been undertaken, and indicates delayed RACF entry for trial participants:

- the average age of RACF admission was higher (by 1.25 years) for the trial participants than it was for the matched control group (*difference in means was not statistically significant based on two sample t-test)*.
- the average age of RACF admission was higher (by 1.34 years) for the trial participants than it is for Gold Card Holder control group (*difference in means was not statistically significant based on two sample t-test)*.

Table 5.1 provides a summary of the available data.
Table 5.1: Summary data for RACF admissions, 24 January 2014 to May 2017

<table>
<thead>
<tr>
<th>Group</th>
<th>Average Age</th>
<th>Standard Deviation</th>
<th>Minimum Age</th>
<th>Maximum Age</th>
<th>Clients Admitted</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gold Card control group</td>
<td>86.98</td>
<td>5.45</td>
<td>47.83</td>
<td>103.38</td>
<td>727</td>
</tr>
<tr>
<td>Matched control Group</td>
<td>87.07</td>
<td>5.41</td>
<td>72.00</td>
<td>93.00</td>
<td>28</td>
</tr>
<tr>
<td>Trial Participants</td>
<td>88.32</td>
<td>4.76</td>
<td>76.00</td>
<td>96.00</td>
<td>25</td>
</tr>
</tbody>
</table>

We note that the AQoL utility scores were slightly higher (i.e. higher self-assessment of quality of life) for the trial group compared to the matched control group, building the case for a decreased likelihood of RACF admission for trial participants. Note that the available data does not enable a comparison of pre CVC and new to CVC trial participants.

Qualitatively, around a third of practices indicated that (in the interim practice survey) telemonitoring improved the potential to avoid admission to residential aged care for some of their participants, and this decreased to around 20% at post participation. Other qualitative data collected through case studies with practices, and trial newsletters indicate that the trial likely led to delayed entry to RACF for a few participants. In addition, a few participants interviewed expressed that the monitoring enabled them to stay in their home longer, particularly if their families live at a distance. Importantly, many participants aimed to maintain their independence and stay at home, had supportive families and care providers that may alleviate entry to an RACF, or consider themselves stable and healthy enough to stay home. We note also, that one of six participants who died at home during the trial had terminal cancer. The potential for the trial to enable clients to palliate at home is discussed in Chapter 9.

(The trial) is certainly a valuable way of being able to keep patients in their own homes, possibly longer and in familiar surroundings, making it less likely for the patient to suffer from problems such as depression and stress. – Practice Nurse, North Coast NSW

5.7 Summary – Clinical Effectiveness

From a clinical effectiveness or health outcome perspective, it was our observation that the monitoring and interventions have not impacted significantly on the majority of participants. However, there were benefits to specific participants including: condition stabilisation, early identification of exacerbation of existing conditions or the emergence of new conditions, and potential delay into RACF for a small number of participants. This evaluation has not found significant improvements in quality of life or psychological outcomes for the trial participants using standardised tools, as has been found in other telehealth trials.

While the results of the K10 showed that there was has been no significant change in distress levels and psychological wellbeing, the case study interview findings, participant surveys and examples in trial newsletters have demonstrated a significant perceived benefit of telemonitoring has been the peace of mind for participants, carers and family members. We note that this may be linked to improved health literacy. In addition, it is possible that this was linked to the perception by some participants that the telemonitoring provided an ‘emergency monitoring and response’ service, an unintended outcome of the trial. In addition, a key factor contributing to improved health and wellbeing outcomes for participants was a stronger relationship between trial participant, carer, practice nurse and GP. Stronger practice and patient relationships, and a more holistic approach that
encompasses health and wellbeing, have the potential to enhance clinical effectiveness, outcomes and quality of care.

Trends of practice-led interventions over time demonstrated limited change and a peak in July 2015 (potentially due to winter flu season). Similarly, the rate of practice-led medication adjustment interventions and referral for specialist review decreased slightly over the time of the trial, potentially due to stabilisation of conditions through monitoring.

Other benefits include one or more critical interventions (such as hospital avoidance or less complex admissions) related to the trial across each practice, and an increase in self-management due to an increase in understanding of the chronic condition relating to the trial. This benefit has ongoing advantages in the form of earlier detection and improved lifestyles (e.g. diet and exercise), and improved health management, with great potential for improved cost benefits over the long term. Further, the increased level of engagement for participants has led to feelings of appreciation and value for many participants.

An unexpected benefit was the impact of coaching. Though coaching was not a key focus of the trial, follow up phone calls from the practice and the service provider nurses opportunistically included clinical advice and tele-coaching. These contextual and educational conversations, are an important intervention, and demonstrate an enhancement to pre-trial services. Potential impacts of this coaching element include enhanced relationship with participant, increased participant knowledge of condition, and improved health outcomes.

Of interest, many participants also reported through case studies that a key motivator for participating in the trial was to support benefits for other participants into the future, not necessarily to benefit themselves, in line with known veteran characteristics of a willingness to support other veterans.

Analysis of demographic factors and impacts of the trial suggests that younger and older groups gained different benefits from the trial overall. For example, potential benefits for younger participants include longer term quality of life and early detection, leading to hospital avoidance, compared to potential benefits for older participants being increased opportunities for health literacy, improved control of symptoms, reassurance and peace of mind. In addition, it is acknowledged that the experience and perceived benefits of the trial at an individual level for participants, and practice level for practice staff was highly variable regarding factors such as participants’ age, type of condition, and distance from practice; and practices’ size and available resources.
PATIENT AND PROFESSIONAL EXPERIENCE

This chapter provides an analysis of the personal experience of participants, their carers and health professionals who were involved with the trial. Qualitative data to support this assessment has been sourced from:

1. The participant surveys of their expectations and experiences during the trial, conducted initial, interim (6-12 months after trial commencement), and end stages of participants’ trial experience.

2. Case study interviews with practices and participants undertaken in the initial, interim and end stages of the trial.

3. Online practice surveys provided at interim and end stages to each of the participating practices.

4. Other forms of feedback from trial participants and their general practices (e.g. newsletters), and where relevant, DVA and Tunstall.

6.1 EXPECTATIONS FROM PARTICIPATION

The pre-participation survey asked participants about their expectations of the trial what each participant wanted to achieve from the trial. A response to this question was received from all 218 survey pre-participation respondents with the top responses being ‘a better understanding of my condition’ followed by ‘feel more relaxed about my health state’, ‘convenient health care for me’ and ‘improve my general wellbeing’ (see Figure 6.1).

![Figure 6.1: What telemonitoring participants were looking to achieve from the trial](image)
Whilst 53% pre-participation respondents had expectations of convenient healthcare, only 30% expected that monitoring would save them time. Similarly, very few expected to save on health care costs, noting DVA subsidises health care costs for veterans and war widows involved in the trial.

The case studies also identified the following perspectives of practices on expectations:

- most practices felt their expectations of the trial were met
- unexpected benefits include that the trial provided participants’ with: a sense of purpose, social benefits, increased peace of mind, and increased health literacy.

### 6.2 Recruitment to Trial

The trial aimed to, and was successful in, recruiting 300 veterans and war widows to participate in the trial. A total of 292 participants proceeded, and for the purposes of our evaluation were considered ‘trial participants’. Challenges for recruitment were identified early in the process and were driven by a delay in the NBN roll out. As such, the process of selection through GPs and practices was broadened (e.g. based on care plans rather than practice access to NBN), alternative internet technologies were included, and local Primary Health Networks were engaged to support achievement of the recruitment target. A specified recruitment support role was also engaged through the service provider, to liaise with practices, and this made a significant impact on recruitment.

Tunstall cited recruitment as a key challenge for the trial, where additional face-to-face education sessions (with practices and participants) beyond that anticipated were required to progress to enrolment and installation. It was noted also, that this initial engagement helped build rapport, particularly between the service provider and the participants, a key factor in the success of the trial.

Approximately one in three practice survey respondents indicated at interim that patient selection did not work well. This was generally related to perception that selection of patients should be related to those who would benefit the most. Many practice staff respondents indicated that age and location of the participants tended not to be a factor in recruitment compared to attitude to compliance and willingness to embrace technology.

Some practices reported to DVA that communication related to recruitment at the start of the trial, caused fatigue due to its intensity. DVA were able to focus on streamlining and minimising communication with practices, while focusing on managing participant’s expectations and need for information.

### 6.3 Use of the Equipment

Concerns regarding participants’ capacity to manage the trial’s technology, given the aged cohort, were considered at the time of the trial’s design. A key finding is that most managed the technology with limited difficulty and this had not been a barrier to participation. Some participants were initially anxious about using the equipment until the service provider provided training and installation. Figure 6.3 depicts the overall experience of using the equipment at interim and post participation.
Key findings regarding use of equipment include:

- prior to the commencement of the trial, 77% of participants thought they would like using the telemonitoring equipment to monitor their health, and post participation 76% of participants reported liking using the telemonitoring equipment

- pre-trial, a majority (95%) of participant respondents, were unconcerned about the amount of time it might take to record all the measurements. At post participation, only 10% reported it took a lot of time to take all the measurement required

- 89% of post participation respondents rated their overall experience with the equipment as either ‘satisfactory’ (15%), ‘good’ (25%) or ‘very good’ (49%). For the interim survey, this was 97%

- 84% felt the telemonitoring equipment assisted them in seeking help with health care needs at the interim period (falling to 67% post participation)

- at the interim participant survey, 88% reported seeking assistance to use the equipment from Tunstall and 84% at post participation. Of those seeking assistance from the service provider:
  - over 75% of participants reported the quality of the help as good to very good
  - 91% (interim) and 84% (post trial) of participant respondents reported they got help quickly
  - 84% of post participation responses indicated the help provided was useful

- approximately 85% of participants expressed no concern pre-trial with being able to use the telemonitoring equipment. The majority of pre-trial participants thought it would be okay- easy (61%) to enter data onto the tablet and reported post trial that is was easy to very easy (71%). Using the measuring equipment overall was thought to be okay – very easy by 91% of pre-trial participants.33

Participant’s assessment of the level of difficulty with using the specific equipment (for those participant respondents using them) is provided in Figure 6.3 and in Appendix F. At the end of the trial

33 It is noted also that early trial design included a feature for participants to enter survey information into the tablet as well as their ICP triage manager answers and information. Some participants had challenges using the tablet for the initial (baseline) survey entry (e.g. difficulty scrolling, enlarging text), so paper surveys were used for the majority of participants at baseline, and for all participants at the interim and post-participation surveys. This highlights the limitations of navigating the technology for some participants. This also meant the tablet could only be used for ICP triage manager data entry across the whole trial period.
participants found the use of the blood pressure equipment to be easy-very easy (80%), pulse oximeter easy-very easy (69%), and for weight scales, 80% found it easy-very easy. Over half of the post-trial participants had not used the blood sugar device, spirometer or thermometer instruments, and of those that did the majority reported their use as very easy. Regarding the spirometer, for those that did use it, 78% (interim) and 88% (post participation) found it easy or very easy to use. We note also, that the thermometer was deemed superfluous for many participants based on feedback from the service provider.

The practice survey at interim and post participation indicated a small number of participants had difficulty with their equipment. About one quarter of practice staff at interim, and no staff at post participation reported that the technology was a challenge at the practice end.

### 6.4 USE OF TELE-CONSULTING AND OTHER TECHNOLOGY

The pre-participation survey found that between 24% and 35% of participants had never used a personal computer, mobile telephone, the internet or an automatic teller machine (ATM). This rate did not change over the period of the trial nor was there a change in the frequency of use of other technology for those that did use technology occasionally.

Over the course of the trial, tele-consultations were used regularly by the service provider (745 videoconferences between participants and the service provider co-monitoring team) compared to low utilisation by practices (43 videoconferences between participants and practices).

At commencement of the trial, 11% of participant respondents had little concern about using the video-conferencing technology, and for the interim and post participation surveys, only 3% of participants expressed concern. It is noted also that 18% at interim and 22% at post participation did not use the videoconferencing technology. Figure 6.4 details the level of difficulty in using the videoconferencing function without assistance. Where used, the participants generally reported the videoconferencing was easy to very easy to use.

It is noted also, that a number of practices indicated that the lack of incentive payments for conducting a tele-consultation was a barrier for GPs and nurses to use the technology with their participants. In addition to this barrier, the practice survey analysis indicates that that tele-consultations were not used due to the preference by participants for face to face contact, the sufficiency of telephone consults, or technical issues.
6.5 SERVICE DELIVERY AND SUSTAINABILITY

This section provides an overview of our analyses relating to perspectives on service delivery and sustainability. In particular, it explores the technical services provided by the service provider and how these were received, the impacts of the trial’s processes on practice productivity; and factors impacting the sustainability of the trial’s design relating to service delivery. Perspectives of participants, carers, practices and service providers have been considered. Note that delivery and sustainability of clinical services by the third-party service provider are detailed further in sections 5.2 and 2.3.

6.5.1 TECHNICAL SERVICE DELIVERY AND SUPPORT

Throughout the trial, there has been an overwhelming positive response (e.g. through case studies and surveys) regarding the service provider’s technical service support, particularly from participants, but also from practices. Participants reported that the support from the service provider was good or very good (more than 75% at interim and post participation surveys). In addition, most participants reported receiving help quickly (84-91%) and that the support was useful (84% respondents at post participation).

I found sometimes the equipment played up. But when I rang Tunstall, they were very good in fixing my problems quickly. I found the nurses at Tunstall very responsive to my needs. A pity the service stopped. I found it most helpful with my condition. – Participant, New England

There was a small number of equipment and technical service-related complaints, and a significant number of technical issues reported to the service provider over the course of the trial. Complaints were followed up positively and in a timely manner. There were 159 service incidents related to equipment (63% of all service incidents); 125 (78.6%) of these were categorised as major and 3 (1.8%) as critical. Reported reasons for the equipment service incidents included equipment error, user error or frustration, and weather-related equipment damage. Through the case study interviews there was very positive feedback in relation to the installation, training and support provided by the service provider. There were initial difficulties with the number of emails and contacts from the service provider.

![Figure 6.4: Participant’s perceived level of difficulty for using videoconferencing](image-url)
provider to the practices, however, this was resolved. An analysis of the service provider incidents is provided in section 7.2.5.

Though service incidents relating to equipment issues were relatively frequent (though predominantly not critical), the service provider technical team were quick to respond, and found to be helpful. Some participants however, reported that the information they were provided (e.g. training and handbooks) was not sufficient to help them solve some of the equipment issues without assistance, and this was a frustration. In addition, the service provider’s nursing staff developed strong relationships with many of the participants, particularly from practices where co-monitoring continued through the trial. These close relationships became a concern for DVA, identified through the Safety Monitoring Committee, early in the trial regarding the unsustainable nature of the relationship after the trial, and potential impacts on the participant, and their relationship. For this reason, DVA introduced the ‘7 day pick up’ to improve practice engagement with the model, and reduce over-servicing (through co-monitoring), that was occurring past the initial three-month support phase, by the service provider (see section 2.1.3 for further detail)

Practice staff indicated throughout the second and third round of case studies, and the post-trial practice survey, that communication and service provision by the service provider was very good. It was also noted by some practices in the post-trial online survey that that communication was better earlier on in the trial. One practice reported in the post-trial online survey that collaboration with a third-party service provider made the trial “too complicated”, and others felt that the trial led to an overabundance of data It is noted that most concerns with over-involvement by the service provider were reported earlier in the trial.

Participants and practices reported variable experiences with the delivery and sustainability of clinical services of the service provider, and these are detailed in sections 5.2 and 2.3.

**Perspectives of the service provider**

The service provider cited that there was a high level of support required across their organization (administrative, project management, training, data analysis, technical support and clinical support) throughout the trial. There were some challenges training the participants (noting that participants were expected to use and manage the equipment after a day’s training, compared to months or years of training for nurses). The service provider felt the level of resourcing for their service delivery was appropriate, but that service provider nurses were needed earlier than expected to assist with the initial recruitment of veterans. The high turnover of practice nurses across the course of the trial also impacted on the resources needed for training.

The service provider also cited that, though data security and management were adequate, there were challenges with efficiency of data collection and reporting due to the lack of interoperability between the service provider and practice software and databases.

**6.5.2 Impact of trial on practice productivity**

The trial anticipated improved productivity through increased coordination of multiple patients (e.g. through combined ICP triage manager outputs) and providing a more coordinated and efficient approach to triaging (i.e. through prioritisation of most at risk patients through the alert system and identifying those who did not need any interventions or practice visits). Other potential outcomes, in line with the trial’s evaluation questions, included increased practice productivity and workforce capacity over the longer-term due to the potential for less face to face visits. A recent German telemonitoring trial reported positive impacts on the GP based on less travelling for home-visits. It also
reported access to monitoring devices at home enabled the nurse to undertake monitoring and follow up, increasing capacity and productivity of the GP.\textsuperscript{34}

Impacts of the telemonitoring trial tended to depend on the level of engagement of practice staff, and the size of the practice. For example, some smaller practices were relieved the trial had finished, feeling that telemonitoring had added ‘extra work’, but some of the larger, well-resourced practices (with more participants, and staff) were able to embed and more easily absorb new processes, and use the telemonitoring data to streamline triaging for participants, impacting their overall productivity. Additionally, most practices reported monitoring became more convenient and less time-consuming for most practices to integrate into daily tasks over time, than at the trial onset (where there was a perceived higher burden).

The practice survey analysis showed that 56\% of respondents at interim and 72\% of respondents at post participation considered that the practice efficiency had improved moderately to significantly. This was predominantly attributed to the availability of vital signs data to enable early detection, the ability to deal with issues quickly (e.g. over the phone), and the capability to respond more quickly through telemonitoring. Most practice respondents felt that the number of diagnostic tests and face to face practice reviews did not change, and therefore did not impact on practice productivity. A small number of practice staff respondents at interim felt that trial processes were time consuming and negatively impacted practice efficiency, compared to no staff respondents experiencing this at post participation.

Most practices interviewed reported administrative and follow-up tasks amount to between 5 and 30 minutes per day (depending on the number of participants), and monitoring is done two to five times a week, depending on the practice. One practice with 6 active participants, and another with 10 active participants cited that integration of the trial tasks was challenging when the practice was particularly busy.

Later in the trial, by the second and third round of case studies, some practices highlighted the sharing of monitoring and follow-up tasks resulted in improved coordination and efficiency for the practice. These efficiencies were not attributed to less face to face visits with the GP, but rather by streamlining of tasks and for some practices, a collaborative approach (e.g. the service provider and practice). Collaboration was not part of the trial’s intended design, and this is an unintended outcome, likely related to practice staff misconceptions around roles and responsibilities for monitoring. Importantly, most practices agreed the readings supported the practice to monitor their patients closely, identify trends and changes more quickly, potentially avoid clinic visits, and collate information to inform decisions.

\textit{The trial has cut down on the number of clinic visits for participants – most seem happy to have a chat over the phone. – Practice Nurse, Bayside}

Other practices reported no to little impact on efficiency linked to using the telemonitoring equipment. Limited positive impacts on productivity were apparent in smaller practices, and/or practices that had a small number (e.g. less than 3) of participants, which of course was a common element toward the end of the trial due to withdrawn participants over time. This was generally due to limited capacity, noting that practice nurses were very supportive of using the available data to help with patient management over the longer term. The qualitative evidence also indicated that the trial did not negatively impact on the efficiency of practices to deliver health services to participants, other than occasional time-consuming phone calls.

\textsuperscript{34} http://journals.sagepub.com/doi/abs/10.1258/135763307780908003
In addition, practices were triaging relatively fewer participants toward the end of the trial (with generally stable readings), compared to the first round of case studies (e.g. most practices interviewed for the second and third rounds only had one to three active trial participants). At the onset of the trial, practices needed to spend more time adjusting equipment settings (with support from the service provider) for some participants before monitoring parameters were stabilised. This suggests that practices experienced less issues with trying to integrate monitoring tasks into their daily routine as the trial progressed.

Most practices acknowledged that integration of telemonitoring with an e-health record system could work well and support coordinated care.

**MANAGING CHANGE IN PRIMARY HEALTH CARE**

It is acknowledged that new processes and change are managed differently across any population, and primary health services providers are no different. Engagement of GPs is known to vary, and an approach to use change to drive innovation varies also. This will no doubt continue into the future. DVA acknowledge that ongoing communication and training is a key factor, for example where there is staff turnover, and that variance in engagement is a representation of all populations. As engagement increases, so too will opportunities for increased productivity and workforce efficiency. Engagement and approach to change management are further discussed in Chapter 9.

**6.5.3 SUSTAINABILITY**

The trial’s limitations and challenges (detailed in Chapter 2) highlight several considerations for the appropriateness and sustainability of the model design, and its improvement over time. A key issue raised by DVA and the service provider was the reliance on a third party to provide immediate response to high-risk alerts, the case for around a quarter of the practices in the trial, due to staff engagement or capacity (e.g. part time, on leave). This provision of co-monitoring by a contracted service provider adds a significant cost to the delivery of telemonitoring, particularly over a longer term, and challenges the cost to benefit ratio. It is noted however, that some practices may not be engaged enough or may not have the resource capacity to take on the role of monitoring without back up support from a third-party service provider, despite the availability of incentive and on-going payments to practices for each telemonitoring trial participant.

Other issues impacting on the sustainability of the model, if implemented over the longer term, including resources needed for the continuation of training for practice staff (e.g. due to turnover) and participants, and encouraging GP and practice engagement. It is anticipated that variance in engagement will continue in relation to adoption of health technology by practices for some time in Australia, noting that many practices are run as a business model with a priority on revenue and resourcing.

The practice survey analysis indicates most respondents believe the general practice centre model worked well, with benefits cited as increased strength of relationship and communication with participant, and capability of integrated care. It is noted also that some practices in the trial may have misinterpreted their role of monitoring, despite the comprehensive efforts of DVA and the service provider.

Sustainability of the trial model is further discussed in Chapter 9.

**6.6 OVERALL EXPERIENCE OF THE TRIAL**

This section provides an analysis of the overall experiences of participants, carer and practices. Specifically, it highlights the experience of participants who completed the trial, and those who
withdrew early; as well as experiences of practice staff and the impacts of the trial on their professional roles.

6.6.1 **Experience of Participants**

Participants were surveyed at the commencement of the trial about their expectations from the telemonitoring process. The interim and post participation responses then recorded their experiences throughout the trial. The most common benefit cited at the interim and post participation periods was having a better understanding of their condition, followed by improved overall general wellbeing. Key benefits cited by participants included:

- improved understanding of their condition (most common benefit cited at interim and post surveys)
- improved overall general wellbeing (second most common benefit cited at interim and post surveys)
- improved relationship with practice (noting that most participants felt this was also good at baseline)
- increased empowerment and feeling of independence in managing own health
- increased early detection and follow up (reported by a small number of participant respondents).

Responses suggest that quality of life had improved more significantly than expected (from baseline to interim). Survey respondents also felt more relaxed at interim than expected before participation, but this decreased slightly by the end of the trial. It is noted however, that a feeling of reassurance remained relatively high across the interim and post participation surveys. We note that only a very small proportion (5% at interim, 3% at post participation) felt that none of the options provided were relevant to them from a benefit perspective. As Table 6.1 indicates, much of the perceived benefits were more significant from baseline to interim than they were from baseline to post participation, suggesting that benefits were more significant over a shorter term and/or that the baseline expectation had shifted after starting on the trial.

**Table 6.1: Perceived benefits of the telemonitoring trial over time**

<table>
<thead>
<tr>
<th>Experienced benefit to participant</th>
<th>Baseline</th>
<th>Interim</th>
<th>Post</th>
<th>% Change (interim to post)</th>
</tr>
</thead>
<tbody>
<tr>
<td>More convenient for me</td>
<td>53%</td>
<td>58%</td>
<td>48%</td>
<td>-17%</td>
</tr>
<tr>
<td>More convenient for carer</td>
<td>20%</td>
<td>25%</td>
<td>25%</td>
<td>0%</td>
</tr>
<tr>
<td>Saves money on healthcare</td>
<td>13%</td>
<td>10%</td>
<td>12%</td>
<td>20%</td>
</tr>
<tr>
<td>Saves me time attending my healthcare needs</td>
<td>30%</td>
<td>28%</td>
<td>26%</td>
<td>-7%</td>
</tr>
<tr>
<td>Saves carer time attending to my healthcare needs</td>
<td>20%</td>
<td>9%</td>
<td>8%</td>
<td>-11%</td>
</tr>
<tr>
<td>Gives reassurance / peace of mind</td>
<td>-</td>
<td>79%</td>
<td>65%</td>
<td>-18%</td>
</tr>
<tr>
<td>I feel more relaxed</td>
<td>56%</td>
<td>66%</td>
<td>47%</td>
<td>-29%</td>
</tr>
<tr>
<td>Improved quality of life</td>
<td>36%</td>
<td>76%</td>
<td>66%</td>
<td>-13%</td>
</tr>
<tr>
<td>I have a better understanding of my condition</td>
<td>61%</td>
<td>91%</td>
<td>79%</td>
<td>-13%</td>
</tr>
<tr>
<td>I have more say in how my healthcare needs managed</td>
<td>31%</td>
<td>78%</td>
<td>64%</td>
<td>-18%</td>
</tr>
<tr>
<td>Has assisted me to seek help with healthcare needs</td>
<td>39%</td>
<td>84%</td>
<td>64%</td>
<td>-24%</td>
</tr>
<tr>
<td>Improved overall general wellbeing</td>
<td>53%</td>
<td>85%</td>
<td>67%</td>
<td>-21%</td>
</tr>
</tbody>
</table>
In response to the question of whether they would recommend telemonitoring to their family or friends, 93% of respondent in the interim survey agreed they would recommend the use of telemonitoring to family and friends for the post trial survey it was 80%. This suggests that the trial was a positive experience for the majority of participants.

Participants in the second round of case studies reported an overall positive experience on the trial, from no problems to very good. Most participants remained highly satisfied with the support from both the practice staff and the service provider staff. Approximately half of participants interviewed in the second and third round of case studies felt they were receiving more frequent care (21 of 42), higher quality care (23 of 42), and more personal care (24 of 42). The remaining participants predominantly expressed that the frequency, quality and personal nature of their care had remained steady at a high level before and throughout the trial. A small number (2 of 42) felt that the level of personal care had decreased due to less face-to-face contact. Most participants remained happy with the flexibility of care provided by the trial, with only a few preferring face-to-face contact for their vital sign monitoring. This may reflect the long-term experience for those participants still active on the trial. Receiving care at home is convenient for participants, and many like to maintain face-to-face check-up consults in conjunction with the telemonitoring and phone calls. One participant reported her preference for monitoring at home compared to visiting the clinic:

>I like monitoring at home, I don’t get nervous and I can avoid the ‘white coat syndrome’ that affects my blood pressure. – Veteran, North Coast

Some participants reported negative experiences due to the trial, and a small number withdrew due to their negative experience. These experiences were more likely to be reported at the interim stage of the trial and included:

- increased level of stress
- pressure from family to continue on the trial
- challenges with the technology and equipment
- resentment toward the service provider due to intrusive phone calls “telling (her) that she was sick” (1-2 participants).

>Too many cooks and too much focus on little things increased anxiety and reduced health and wellbeing. (Our patient) has been much better since we took him off the trial. – Practice Nurse, North Coast

6.6.2 Experience of participants who withdrew from the trial early

Analysis of responses of participants (n=58) who left the trial early and participated in a post participation survey (see also Table 6.2) indicated:

- 63% met their expectation of having a better understanding of their condition compared to 79% for all post participant surveys
- 41% felt they had more say in their own health care, compared to 64% for all post participation surveys
- 45% felt they had more assistance to seek help for their health care needs at post participation, compared to 64% for all post participation surveys
- 15% experienced more contact with their practice nurse and 74% experienced a similar amount of contact
12% had less contact with their GP, none had more contact and 88% experienced about the same level of contact.

38% of the withdrawn survey respondents reported improvement in their wellbeing compared to 67% of all post participation survey respondents. This may impact participants’ decision to opt out of the trial. That is, whilst being categorised as not wanting to participate in the trial extension, it is possible that no perceived change or improvement to date was a factor in that decision. We note, though, that non-technical and health related withdrawal reasons for this analysis group are most common.

34% withdrawn participants responded that ‘reassurance’ (or peace of mind) was a key benefit of the trial, compared to 65% for all post participation survey respondents.

### Table 6.2: Reasons for ceasing on trial

<table>
<thead>
<tr>
<th>Reason for ceasing on Trial</th>
<th>Percentage (of 58)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patient Opt-Out – Non-technical related</td>
<td>48%</td>
</tr>
<tr>
<td>Patient Opt-Out - Issue/s with technology</td>
<td>19%</td>
</tr>
<tr>
<td>Did not want to continue with the trial extension</td>
<td>17%</td>
</tr>
<tr>
<td>Patient moved out of area (outside trial location)</td>
<td>7%</td>
</tr>
<tr>
<td>Improved Health - Service no longer required</td>
<td>2%</td>
</tr>
<tr>
<td>Other: Palliative Care</td>
<td>3%</td>
</tr>
<tr>
<td>Patient moved out of area</td>
<td>2%</td>
</tr>
<tr>
<td>Third Party Opt-Out</td>
<td>2%</td>
</tr>
</tbody>
</table>

(Source: Tunstall)

**EXPERIENCE OF PARTICIPANTS WHO CONTINUED UNTIL THE END OF THE TRIAL**

At the conclusion of the trial, participants were asked for the main reasons for continuing on trial to the end. These responses are shown in the figure below, noting more than one response was allowed. The most common reasons for continuing were cited as supporting DVA to help other veterans into the future (73%), and participant reassurance and peace of mind that monitoring brings them (73%), followed by encouragement from practice staff. Thirty five percent of end of trial survey respondents cited that social contact with the practice or the service provider was an important factor. It is noted that increased social contact was not an objective of the trial, but improved social outcomes has been a benefit for some participants who may have had feelings of isolation previously.

This provides evidence for how important it is to veteran and war widows to support the health and wellbeing of their fellow veteran community. It also reiterates the key findings from practice surveys and case studies that the monitoring reassured participants about their health and health risks on a regular basis (to reduce anxiety). Encouragement from practice staff to continue, supports the theory that the ‘coaching’ element of practice and patient relationships is important and effective. It is also evident that social engagement is an important factor for this cohort, potentially due to isolation from family and friends as members of the veteran community age or become less mobile, or family and friends move away.
Other feedback on trial experiences was collected by free text in the post participation survey. These have been categorised by theme in Figure 6.6, some participants provided text on more than one theme.

**Figure 6.6: Summary of other feedback for participants continuing to end of trial**

Further analysis on experience of participants is provided in Appendix F.
6.6.3 EXPERIENCE OF PRACTICES

A summary of practice experiences is provided below. Practices also provided perspectives on opportunities for improving the delivery and outcomes of the telemonitoring model, and these are provided in section 9.3.

Perspectives of practice staff considered in the third round of case studies include:

- the trial provided significant social benefit and peace of mind (or reassurance) to patients
- the trial has strengthened relationships between the practice and the participants
- the trial has been somewhat valuable to very valuable. One practice indicated it had only been valuable for one participant that monitors their International Normalised Ratio (INR) for blood coagulation
- the trial was generally successful. Some practices cited examples of critical interventions, others felt it was useful, but had not dramatically impacted their patients
- the trial’s general practice-centred model has benefits, but tasks generally sit with the practice nurse, particularly if the GP is not engaged. Challenges in workforce capacity impacted on the level of involvement in telemonitoring for some practices (and a reliance on the service provider)
- support from the service provider throughout the trial was very good
- training and support in the use of the equipment was effective.

Practices consistently cited that factors impacting the experience for participants included:

- participants’ age (noting that different age groups experienced different benefits, where younger participants were perceived to benefit from early detection and older participants from improved control of symptoms)
- variable personal traits relating to cognition, level of activity, level of independence, and capacity and/or attitude to using technology.

Practices reported (57% survey respondents at post participation) that involvement with CVC prior to the trial benefited participants more (compared to those joining CVC concurrently) due to the established relationships (e.g. with CVC nurse) and an existing concept of preventative health. Other practices felt prior involvement with CVC was not beneficial. In contrast, some survey respondents in the post-participation practice survey also identified that prior involvement with CVC made no impact on outcomes.

Practices noted contradictory reports on the trial’s impact relating to specific chronic conditions and participant distance from practice. Importantly, practices report variable experiences based on their specific participants and practice features (e.g. workforce capacity). This is an important aspect to consider in future planning, to increase benefits (mapped to meaningful and feasible goals) for individual participants and practices.

IMPACT ON PRACTICE STAFF ROLES

The majority of practice staff survey respondents (56% at interim and 58.3% at post participation) felt the trial had changed or enhanced their role due to the increase in analytic skills required, a greater level of empathy for the participant (e.g. due to more holistic view of care), improved access to data to inform patient care, and a strengthened relationship with the participant. It was also reported that the trial changed roles of staff negatively through the overabundance of data produced which became time consuming to process.
The second and third round of practice case studies found similar results. Most practices reported the predominant differences in their role were the monitoring and following-up responsibilities, and having broader knowledge of their patients. One practice nurse spoke about enhancements in her capacity to use technology, and to having opportunities for more comprehensive communication with the GP about the participants due to the availability of readings and trends. It is noted that GP engagement in the trial varies across practices.

6.7 Reasons for Early Participant Withdrawal from the Trial

Though 300 participants were initially enrolled on the trial, eight withdrew before one day of enrolment, leaving 292 participants. Of these 292, 144 withdrew earlier than the targeted end of trial date at 30 September 2016. Only a small number (22) did not continue with the extension of the trial at July 2015. The figures below show the reasons for withdrawal (excluding the 147 that continued past September 2016) over the course of the trial.

Figure 6.7: Reasons for withdrawal to September 2016

Analysis shows that of the withdrawn participants, 48 (34%) withdrew due to either death or deterioration, again indicating the potential impact of an older age cohort managing chronic conditions and deteriorating health over a long trial period. Other observations included:

- of the 14 that were ‘dissatisfied’ or had difficulty/frustration with technical issues or the equipment:
  - eight were male
  - age at withdrawal was between 65 and 91 years (i.e. age not a factor)
  - seven were from the North Coast, and five were from Bayside
  - five withdrew after less than six months on the trial.

Of the 15 participants who withdrew due to feeling stress or anxiety caused by the trial:

- twelve were female
• twelve had been on the CVC Program before joining the trial (for more than 90 days)
• fourteen were over 80 years of age.

Of the 12 participants that withdrew due to a perception the trial was no longer required (e.g. due to improved or stable health):

• ten were female
• seven had been on the CVC Program previous to joining the trial
• eleven had been on the trial for less than 12 months
• age range at withdrawal was 74 to 92 (suggesting this was not only relevant to younger participants).

Further findings from Tunstall’s Safety Monitoring Committee reports include:

• 35% of withdrawn participants had CHF general, and 66% had CHF with or without another condition
• 15% of withdrawn participants had diabetes
• 14% of withdrawn participants had COPD
• of the 43% of participants who withdrew due to non-technical related reasons (patient opt out), more than two thirds had CHF with or without another condition
• of the 66% of withdrawn participants with CHF with or without another condition, 16% withdrew due to death or admission to an RACF.
• of the 17 participant deaths recorded over the course of the trial, six participants died at home, and seven died in hospital.

6.8 SUMMARY – PATIENT AND PROFESSIONAL EXPERIENCE

Key findings relating to patient experience were that the trial strengthened the relationship between practice and participant, and increased peace of mind and health literacy for the participants and their families. Findings also suggest that quality of life had improved more significantly than participants expected.

A further outcome of the trial is that most participants managed the technology with limited difficulty, despite initial concerns, and this has not been a barrier to participation, or necessarily related to age. Participants had an overall good experience with using the equipment, and liaising with the service provider as required for equipment issues and maintenance. In the majority of cases, the technical service provider provided a high quality and timely service. It is noted that tele-consulting was not used significantly between participants and practices, but tele-consultations between the service provider and participants were well received and manageable for participants.

The findings indicate that the impacts of the trial tended to depend on the level of engagement of practice staff, and the size of the practice. For example, smaller practices were challenged more by capacity and ongoing resources to undertake monitoring and incorporate it into practice processes that the larger practices. Regardless, the practice survey showed that the majority of practice staff considered that the practice efficiency had improved moderately to significantly due to the trial. This was predominantly attributed to the availability of vital signs data to enable early detection, and the capability to respond more quickly through telemonitoring. Most practice respondents felt that the
number of diagnostic tests and face to face practice reviews did not change, and therefore did not impact on practice productivity.

From the perspectives of the practices, the trial led to an enhancement of their practice roles. This included increased skills (data analysis), greater level of empathy for participants, increased information available to plan services and care and increased communication and relationship building between patient and practice. In addition, a small number of practice felt the trial produced an overabundance of data which was time consuming to review.

In addition, the general practice centre model worked well and was well accepted by practices, with benefits cited as increased strength of relationship and communication with participant, and capability of integrated care. It is also noted that some practices in the trial may have misinterpreted their role of monitoring, resulting in poor engagement and relay of monitoring data. Engagement of GPs is known to vary across similar studies, and an approach to use change to drive innovation varies also. Further challenges to the trial model for practices include workforce capacity and availability, and lack of interoperability of software systems (as highlighted in section 2.3).

For participants, the most common benefit cited at the interim and post participation periods was having a better understanding of their condition, followed by improved overall general wellbeing. Of note, much of the perceived benefits were more significant from baseline to interim than they were from baseline to post participation, suggesting that health and wellbeing benefits were more significant over a shorter term and/or that the baseline expectation had shifted after starting on the trial, a ‘changing baseline’ (e.g. due to increased health literacy).

Analysis of those participants that withdrew from the trial early, shows that 48 (33%) withdrew due to either death or deterioration, again indicating the potential impact of an older age cohort managing chronic conditions and deteriorating health over a long trial period. Factors impacting the experience for participants are likely to include:

- the participants’ age (noting that different age groups experienced different benefits, where younger participants were perceived to benefit from early detection and older participants from improved control of symptoms)
- variable personal traits relating to cognition, level of activity, level of independence, and capacity and/or attitude to using technology.

The variable experiences and outcomes for individual participants and practices is likely to be based on their specific participant and practice features and traits. This will be an important aspect to consider in future planning, to increase benefits (mapped to meaningful and feasible goals) for individual participants and practices.
This chapter presents analysis of the service delivery model, systems and processes with a focus on the model design and governance as well as initiation, implementation and step-down phases. These data has been sourced from case study interviews, online practice surveys, participant surveys, stakeholder consultations with DVA and the service provider, and service provider data and reports.

7.1 Model design and governance

As discussed in Chapter 2, the trial model had a range of benefits and limitations. The model was predominantly implemented as intended, with minor adaptations to recruitment processes (due to delayed roll out of NBN). The overall model design and its governance processes have led to a successful longitudinal trial with few critical incidents, and a range of positive impacts linked to patient’s health and wellbeing, discussed above. It is acknowledged that the model seemed more suitable for well-resourced practices that had existing processes to support the CVC Program, given the trial was an extension of the CVC model.

It has been acknowledged that due to the age of the cohort, the potential for this particular trial models to decrease hospitalisations is reduced, and that future models should target a younger cohort to improve health outcomes from a ‘return on investment’ perspective.

It is noted that a clinical reference group, technical advisory group and e-health project board was available for the course of the trial, but ongoing roles were not required beyond initiation and early trial development. In addition, plans for a local steering committee that included state government, DVA and Medicare Local representatives was also deemed unnecessary.

7.2 Trial systems and processes

This section provides an analysis of the systems and processes implemented at different trial stages.

7.2.1 Installations and discharges

The table below presents the key summary statistics related to installations and implementation of the monitoring equipment. Whilst this trial started as a NBN technology-centred activity, subsequent Government policy changes meant that the use of a range of different broadband technologies were added to the trial scope. This included 3G, 4G and ADSL technologies as well as NBN connections where available. The internet connection type for the participant installations has been significantly weighted (90%) toward 3G/4G. NBN installations only realised a total of 7% (see Table 7.1).

We understand that this change in technology focus only potentially caused limitations in the quality of video-conferencing. However, video-conferencing has largely not been used by practices, and we have had no negative feedback through our evaluation processes regarding the type of internet connection.
Table 7.1: Key installation and implementation statistics

<table>
<thead>
<tr>
<th>Activity</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Preparation of practices at outset</strong></td>
<td></td>
</tr>
<tr>
<td>Overview presentations to GP Clinics completed</td>
<td>50</td>
</tr>
<tr>
<td>GP Clinic setup telemonitoring</td>
<td>55</td>
</tr>
<tr>
<td>Nurses trained</td>
<td>83</td>
</tr>
<tr>
<td><strong>Enrolment and installation</strong></td>
<td></td>
</tr>
<tr>
<td>Veterans ‘enrolled’</td>
<td>325</td>
</tr>
<tr>
<td>Veterans ‘installed’</td>
<td>300</td>
</tr>
<tr>
<td>Veterans connected to NBN</td>
<td>21 (7%)</td>
</tr>
<tr>
<td>Veterans connected to 3G/4G</td>
<td>270 (90%)</td>
</tr>
<tr>
<td>Veterans connected to ADSL</td>
<td>8 (3%)</td>
</tr>
<tr>
<td>Veterans connected to Cable</td>
<td>1 (0.3%)</td>
</tr>
<tr>
<td>Veterans actually proceeding (beyond 1 day)</td>
<td>292</td>
</tr>
<tr>
<td>Veterans discharged at 30 September 2016</td>
<td>144</td>
</tr>
<tr>
<td>Veterans active until end of trial (off boarded)</td>
<td>147</td>
</tr>
</tbody>
</table>

Analysis of internet connections by region indicates that only a small number of connections used the NBN (21), and these were concentrated in New South Wales, both North Coast and New England (see Figure 7.1).

Figure 7.1: Internet connections by trial region
As discussed above, recruitment of participants onto the trial took longer than anticipated. Accordingly, a policy decision was made that alternative technology solutions could be used. As is illustrated in Figure 7.2 below, there were a significant number of participants joining the trial in the period March – October 2014. Recruitment formally ceased from the end of October 2014. The peaks in decommissioning occurred at the trial extension (July 2015) and at the end of the trial (after September 2016).

**Figure 7.2: Installations and decommissions to the Telemonitoring Trial**

**Claims processes**

In general, without an incentive, health service providers are unlikely to be engaged in a research or technology trial where there are additional daily tasks. For this reason, DVA provided a comprehensive package of funds through a claims process for practices throughout the trial, noting also that all Gold Card Holders are eligible to claim for healthcare and transport support outside of the trial setting.

The claims approach was similar to the CVC Program. As has been reported and demonstrated throughout the trial, however, a number of practices were not making regular claims to DVA for subsidisation of the telemonitoring services. Those practices that were not claiming were also those that were less engaged in the trial’s other processes. It has been suggested that the role of the practice in the trial in relation to the claiming process (i.e. linked to telemonitoring) was poorly understood by some practices. This is an important lesson for future trials where more intuitive claims processes, and an increased focus on communication and education regarding practice role may be required. Of note also, is the more significant impacts of spending on smaller practices compared to bigger practices, where costs can be absorbed more readily.

A small number of practices indicated that there were no incentive payments for GPs to claim a tele-consultation. About 10 percent of respondents in the post participation practice survey indicated that the claims process was working well, one practice indicated the payment schedule needed to be simplified.

**Off-boarding**

After September 2016, a step-down process was implemented to support participants coming off the trial (off-boarding). This was in response to a number of participants who had concern or were anxious about their ongoing health and wellbeing beyond the trial. These concerns were related to the telemonitoring equipment being removed, and the frequent monitoring and telephone contact returning to pre-trial levels. These concerns do however, support the trial’s impact on participant’s
health literacy, peace of mind, and the value they placed in telemonitoring to support their health management.

The off-boarding process was resource intensive for DVA and the service provider. The service provider indicated that the process could be improved by better communication with practices and participants about options and strategies for managing participant concerns, and a ‘recommended off-boarding plan’ to support the GPs decision making. In addition, the relationship built up over time between the service provider nurses and participants was difficult to disengage from for some participants and Tunstall nursing staff. This was not cited, however, as a reason for concern for the participants as the trial ended.

It is noted that at the time of off-boarding, a community nursing option was offered to participants (as an extension of care past the trial period), but there was little interest from practices. Instead, ongoing access to equipment was arranged through the Rehabilitation Appliance Program (RAP) for 35 participants. This allowed them to continue a manual form of monitoring at home and in consultation with their GP.

### 7.2.2 Delivery of training

The service provider evaluated the training they provided to practices through post-training surveys with practice staff. A small number of people were not confident they would be able to carry out the telemonitoring role, but overall, the training was very well received, and rated good to excellent for the following:

- How did the training meet your expectations?
- How do you rate the training content?
- How do you rate the training materials?
- How do you assess the Instructor(s) performance?
- How do you rate the Instructor(s) knowledge of the topic?
- Was the information provided so that it was easy to understand?
- How were your questions answered?
- How confident are you in being able to carry out the role following your training?

Toward the end of the trial, turnover of staff at practices meant that a small number of practices relied on co-monitoring by the service provider instead of additional short-term training for local practice staff to support the trial.

### 7.2.3 Monitoring compliance

Each participant had a monitoring plan developed at the start of the trial, in line with advice from their GP, their history, chronic condition, care plan and outcomes of their installation interview with the service provider. This monitoring plan (e.g. outlining equipment needed, frequency of monitoring and parameters for readings) was reviewed as required. Tunstall have indicated that cost effectiveness of the trial would benefit from a more planned approach to reviewing the monitoring plan, and this is discussed further in Chapter 9.

Participants generally monitored between one and seven times a week. The averages per month until August 2016 are shown in Figure 7.3, indicating limited change over the course of the trial for all readings, but a decrease over time for high readings and high alerts, reflecting the earlier period of the trial’s stabilization leading to reviews of monitoring plans.
Further analysis shows the difference in monitoring compliance over the course of the whole trial, by region. Of all readings, 54% were taken in North Coast, 10% in New England, 20% in Bayside and 17% in Darling Downs, in line with the demographic split of the trial cohort across these regions, see Figure 7.4.
MONITORING AND ALERT ACKNOWLEDGEMENTS

As mentioned above, there was been an overlap in the roles of monitoring and co-monitoring. The second and third round of case studies with practices and participants and Tunstall data sources indicated that the initial trend of monitoring and alert follow-up by Tunstall, rather than the practice, continued through the trial. Most telemonitoring participants interviewed indicated they had more contact with the service provider than the practice regarding their high readings. It is noted however, that a few of the 42 participants interviewed suggested they were contacted by the practice for reading alerts and follow-up in the first instance.

At the onset of the trial, the service provider, understandably (and as part of the 3-month integrated co-monitoring role), responded to approximately 80% of red (high risk) alerts, and from January to June 2016, the service provider was the initial responder to 38% of red alerts. Over the trial (to 31 December 2016), the service provider acknowledged and responded to 69% of all alerts and 57% of red alerts. The Figures below detail the acknowledgement of alerts by the service provider and practices (GP-led), and the distribution of alerts by acknowledgement type. Of the 820 orange (moderate risk) alert acknowledgements by practices to end December 2016 (66% of all orange alert acknowledgements), three of the larger practices responded to 86% of these. The bulk of alerts acknowledged by practices overall were also by the larger practices on the trial (with more participants). Trends in proportion of triaging over the last 12 months of the trial showed a shift downwards for triaging by Tunstall for red and orange alerts (and an increase by practices), detailed in Figure 7.5. This is a positive outcome for the sustainability of the model.

Figure 7.5: Trends in triaging July 2015 to September 2016

| Alert Key: All readings = High + Moderate + Low + Missed + Lost readings; High Readings (Red) = overall high risk; Moderate Readings (Orange) = overall moderate risk; Low Readings (Green) = overall low risk; Missed Readings (Blue) = missed readings in scheduled timeframe; Lost Contacts (Grey) = ICP system lost contact with the telehealth hub (due to internet connection unavailability, or telehealth hub being switched off); High Alerts (Red) = vitals and/or answers with a high risk; Marginal Alerts (Orange) = vitals and/or answers with a marginal risk |

35
Though the service provider acknowledged the larger volume of high risk alerts, practices acknowledged a higher proportion of high risk alerts (37.8%) compared to the service provider (22.3%) of all their respective acknowledgements. Similarly, 14.7% of all service provider acknowledgements were for low risk alerts compared to 2.9% of all alerts acknowledged by the practices. This may demonstrate the practice’s increased knowledge and holistic context of their patients compared to an external provider, or reflect a higher 7-day pick rate for lower level alerts. Figure 7.6,

Figure 7.7 and Figure 7.8 below provide a summary of the volume and distributions of acknowledgements by the service provider (Tunstall) and the practice to 31 December 2016.

*Figure 7.6: Acknowledgement of telemonitoring alerts to 31 December 2016*

<table>
<thead>
<tr>
<th>Alert Type</th>
<th>Acknowledged by Tunstall</th>
<th>Acknowledged by Practice</th>
</tr>
</thead>
<tbody>
<tr>
<td>Red alert</td>
<td>12395</td>
<td>820</td>
</tr>
<tr>
<td>Orange alert</td>
<td>16353</td>
<td>410</td>
</tr>
<tr>
<td>Green alert</td>
<td>32683</td>
<td>1993</td>
</tr>
<tr>
<td>Blue alert</td>
<td>3918</td>
<td>10834</td>
</tr>
<tr>
<td>Yellow alert</td>
<td>9325</td>
<td>71576</td>
</tr>
<tr>
<td>Grey alert</td>
<td>52822</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>73576</td>
<td></td>
</tr>
</tbody>
</table>

*Figure 7.7: Distribution of alerts acknowledged by Tunstall across trial period*
The volume of acknowledgements by the service provider was very high at the start of the trial (4,068 in October 2014), and decreased significantly by March 2015 (1,785), as the volume of acknowledgements increased for the practices (2,273 in March 2015). The volume steadily then decreased, as monitoring stabilised, and participants withdrew, shown in Figure 7.9.

The rate of acknowledgements per participant (Figure 7.10 and Figure 7.11) also provide an indication of the trends over time and rate of alerts per participant acknowledged by the service provider and practices.

Rates of red alerts per participant over time decreased for both the service provider and the practices, and rates for orange alerts increased for both. Importantly, the more significant decreased rate of red alerts per participant acknowledged by the service provider and the increased rate of orange alerts by
practices, suggest that practices were more engaged in acknowledgements by the end of the trial. These findings suggest that as participants’ parameters were adjusted and conditions stabilised over time, alerts also stabilised.

Figure 7.10: Trends in rate of acknowledgements per participant (orange alerts) to 31 December 2016

![Graph showing trends in rate of acknowledgements per participant (orange alerts)](image)

Figure 7.11: Trends in rate of acknowledgements per participant (red alerts) October 2014 to September 2016

![Graph showing trends in rate of acknowledgements per participant (red alerts)](image)

Of note, for a number of months across 2016, the service provider provided 100% triage support for 14 practices involved in the trial. According to the service provider, these practices were smaller in size, and/or had a single part time practice nurse, or the original trained nurse had left or was on leave without replacement, leading them to seek assistance proactively from the service provider. Many practices interviewed for the second and third round of case studies were also small, with only one
practice nurse, often working in a part time capacity. This highlights the reliance on the service provider co-monitoring team, particularly for small practices and those with part time staff, to ensure the telemonitoring trial could be sustained.

### 7.2.4 Use of Videoconferencing/ Tele-Consulting

As an enhancement to care, the trial offered practices the facility to triage and follow up routine monitoring data with participants via video-conferencing or tele-consulting through the IHT tablet. This element of the trial design used high-definition cameras over high speed broadband (initially NBN). The design saw tele-consultations replacing many of the in-practice reviews. In this trial, video-conferencing and tele-consulting between the practice and the participant has been minimal. Of the 156 video-conferences (including tele-consultations) from 1 January 2016 to 30 September 2016, only 6 (3.8%) were initiated by a practice. These six were initiated by one practice only across one month in that period.

Through the practice survey, trial newsletters and our case study interviews we have explored the reasons why practices did not use the video-conferencing facility:

- it was considered too time-consuming by the practice to establish a specific time to connect with participant (with no significant benefit compared to telephone contact). Normal telephone contact with the participant was considered sufficient
  
  _We put a concerted effort into implementing the video conferencing aspect of telemonitoring. It wasn’t ideal for us. It used a considerable amount of time for not a lot of outcome, and we were also not able to bill anything for our time. We had technical difficulties, especially with veterans not being able to hear the doctor._ – Practice staff, Darling Downs

- more effort was required than a phone call. A few participants felt there was pressure to be ‘groomed’
  
  _I would prefer the contact be just over the telephone, I check my readings first thing in the morning and am still in my pyjamas! Wouldn’t want to have video contact then._ – Veteran, New England

- participants presented frequently enough for review of their condition(s) or for other reasons at the practice to make it unnecessary

- trial participants preferred in-person contact (at general practice). Though social capital is not a key element of this trial, it has been reported that face-to-face meetings are preferred by older patients over telehealth services due to the opportunity for social interaction

- video-conferencing facilities weren’t available or were unavailable on the practice nurse’s computer (notwithstanding that some of the initial funds were allocated to practices for upgrading video facilities)

- limited practice nurse availability

- no financial burden for participants by visiting the practice (e.g. services covered by Gold Card) so no significant incentive to use tele-consultation as replacement

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• lack of clarity around use of video-conferencing for follow-up chat vs. tele-consultation, and impacts on Medicare reimbursement

• technical issues such as difficulty for participants to hear audio.

It is acknowledged that practices were compensated for the costs of upgrading their video facilities and time needed for training. Cost was not a barrier to using the equipment.

As indicated above, the service provider in their role of co-monitoring and as a dedicated monitoring service has used tele-consulting to a much larger extent with participants. This occurred at the onset of the trial as participants were introduced to the technology and trial processes, and then as part of their routine follow up as the trial continued. The Tunstall Clinical Services team initiated 150 of the 156 (96.2%) video-conferences from January to September 2016. Feedback from our case study interviews with participants indicated that they:

• enjoyed this form of contact as they became familiar with the service provider nurses and equipment at the start of the trial

• found it easy and convenient as a follow up method when initiated by the service provider

• would use it again if required.

In further support of video-conferencing/consulting, a few participants have highlighted their preference in seeing faces over the phone to make communication more personal. This was especially important for one participant who reported benefits for those with PTSD and a distrust of voices whereas rapport and trust could be established through video-conferencing. Another participant was also impressed by the video-conferencing feature that enabled the nurse to quickly observe a swollen ankle as part of triaging after the telemonitoring interview question on the tablet. It is noted that high definition cameras and high-speed internet can enable visualisation of symptoms such as dilated pupils or skin colouration.

General feedback on the usefulness of video-conferencing/consulting indicates most participants, and particularly those who had not used video-conferencing/consulting since the start of the trial, felt video-conferencing was no more beneficial than a telephone call and would likely be more useful for less mobile patients.

Monthly reports from the service provider and the second and third round of case studies with practices and participants indicated that there has been no increase in the uptake of video-conferencing between June 2016 and the end of the trial. Of the 69 participant and practice case study interviews undertaken over April to May and September to October 2016 (where video-conferencing was encouraged as a preference for the consultation activity), only one was undertaken using video-conferencing technology. A further eight video-conferences were planned, but did not go ahead due to technical (e.g. lost internet connections) or coordination issues (April to May).

Of note, one practice in the third round of case studies, though not having used the video-conferencing equipment (due to poor internet connectivity at participant’s home), felt it would provide valuable context for extending the meaning of the monitoring data.

It is anticipated that into the future, and with ongoing exposure to tele-consulting and other innovative healthcare technology, primary health care practices, and the healthcare sector in general, will increase their understanding and use of such technology to support individualised care preferences, efficiency and cost-efficiency. We would suggest that the rate and volume of new technologies entering the healthcare market requires a change management approach to improving the engagement of practice staff and patients in the community.
7.2.5 Service Incidents

Since the start of the trial, until 30 December 2016, the service provider reported on 254 incidents (excluding end of trial records). The service provider tracked and acted on each of these service incidents, and continued to improve their services through a ‘lessons learned’ log, issue register and ongoing feedback mechanisms for participants and practices throughout the trial.

Of these incidents (excluding end of trial incidents):

- 120 (47%) were clinical incidents (e.g. related to clinical equipment), and 114 (45%) were project incidents (e.g. internet connectivity issue)
- 4% (11) of incidents were critical. The majority were technical or personal issues with equipment or internet issues, or a lack of confidence in telemonitoring processes and services. Two incidents were related to lack of triaging by the practice due to closure or staff on leave
- 63% (161) of incidents were categorised as major.

The distribution of incidents by category is provided in the Figure 7.12 below. The majority (63%) of incidents were related to equipment, software or peripherals. Further incidents were related to internet connectivity (15%), feedback (7%) and confidence in Tunstall service (3%). As mentioned earlier in the report, the majority of participants were satisfied with the quality and timeliness of responses to telemonitoring equipment issues.

![Figure 7.12: Distribution of service incidents reported by Tunstall to 30 December 2016](image)

Figure 7.13 details the trend of service incidents category over the period of the trial. The increase in major incidents were attributable predominantly to equipment and software incidents. A consistently small number and proportion of critical incidents is a good outcome for the trial. Of note, four incidents relating to end of trial were categorised as critical due to the concern for equipment being collected.
A more granular analysis of specific types of incidents over time is provided in Figure 7.14. This figure shows the distribution of equipment and internet connectivity incidents over time, and the end of trial logs kept by Tunstall in the last three quarters of the trial. Recalibration of equipment in the second half of the trial is represented within ‘equipment/software/peripherals’ incidents. Interestingly, incidents of feedback and confidence in service were more prevalent in the first half of the trial (in line with our interim findings from participants). It is also noted that internet connectivity incidents were not just a feature of the start of the trial, but continued up until the off-boarding stage.
7.3 SUMMARY – SERVICE DELIVERY AND ORGANISATION

There were a range of key findings relating to service delivery and organisation of the trial, relating to DVA claims process, off-boarding for participants, monitoring and co-monitoring, acknowledgement of alerts and tele-consulting.

As has been reported and demonstrated throughout the trial, a number of practices were not making regular claims to DVA for subsidisation of the telemonitoring services as expected. Of note, those practices that were not claiming were the practices less engaged in the trial’s other processes.

A step-down process was implemented to support participant’s off-boarding the trial after September 2016. This was in response to a number of participant’s who had concern or were anxious about their ongoing health and wellbeing beyond the trial without their monitoring and/or equipment. The off-boarding process was resource intensive for DVA and the service provider. Tunstall have since indicated that the process would be improved by better communication with practices and participants about options and strategies for managing participant concerns, and a ‘recommended off-boarding plan’ to support the GPs decision making. We note that the trial’s Safety Monitoring Committee decided against a recommended off-boarding plan for participants as it was considered too prescriptive, given the external nature of the service provider’s role in the trial.

At the onset of the trial, the service provider understandably (and as part of the three-month integrated co-monitoring role) responded to the majority of high risk alerts. Of note, the bulk of all alerts acknowledged by practices were acknowledged by the larger practices on the trial (with more participants). Trends in the proportion of triaging over the last 12 months of the trial showed a shift downwards for triaging by Tunstall for high risk and moderate risk alerts (and an increase by practices), a positive long-term outcome for the trial, potentially related to increased streamlining and integration of telemonitoring processes by practices over time and by the end of the trial. Findings also suggest that as participants’ parameters were adjusted and conditions stabilised over time, alerts and acknowledgements also stabilised.

Of the 156 video-conferences (including tele-consultations) from throughout the trial, only six (3.8%) were initiated by a practice. Significantly, these six were initiated by one practice only across one month in that period, suggesting most practices did not use the tele-consulting facilities. Reasons cited by practices for the lack of tele-consulting included: too time consuming, telephone call was sufficient, participant preference for clinic visit, participant visiting clinic for other reasons anyway, staff capacity, no significant financial incentive to use tele-consultations as replacement, and lack of clarity around use of video-conferencing versus tele-consultation regarding impacts on Medicare reimbursement.
An important component of the evaluation was to assess the economic benefits of the trial. The results of that analysis are summarised in this chapter and detailed calculations are included in Appendix I.

8.1 EVALUATING THE ECONOMIC BENEFITS OF TELEMONITORING

Most evaluations that have assessed the impact of telemonitoring have focused on the calculation of direct health benefits, rather than seeking to quantify the economic benefits of this technology. However, there is a strong argument to be made for including both the costs and benefits of telemonitoring to support decisions regarding the mainstream implementation of these technologies. The meta-analysis published of the limited available literature recording economic costs and benefits of telemedicine in the management of congestive heart failure, shows ten studies which identified savings of between 1.6% and 68.3% comparing telemonitoring with usual care. Each of these studies used a different set of criteria to assess savings. 37

The key findings of the limited economic impact evaluation studies 38,39,40,41 that have been undertaken are summarised below:

- most studies identified direct cost savings to the healthcare system due to the reduction in hospital admission rates and reduced number of outpatient occasions of service
- only one study assessed the direct costs to the patient (transport costs avoided) and there has been limited research to estimate the indirect costs associated with in-home telemonitoring
- the most significant cost savings (approximately 40%) were reported where only hospital, medical and nursing visits were reported
- cost savings decreased as other services were included into the cost modelling process such as nursing and technician travel time, patient travel costs and nursing administration costs
- these studies all used existing telecommunications infrastructure and as a result the associated costs and benefits were not included.

It was agreed that the primary focus for the evaluation of the in-home telemonitoring trial would be a cost effectiveness analysis (CEA) which is generally considered to be a component of an overall

economic analysis. CEA is used to compare the costs per unit of outcome between alternative models of care.

8.2 COST EFFECTIVENESS EVALUATION AND RESEARCH QUESTIONS

The evaluation of cost effectiveness supports an assessment of four of the trial objectives, that is to determine:

1. If telemonitoring is a safe, effective and efficient way to complement conventional health services (objective (a)).
2. There is increased health workforce productivity (objective (d)).
3. If there is a return on investment (realising net budget savings) (objective (h)).
4. If the telemonitoring trial is suitable (and economically feasible) for further development and/or delivery to a broader cohort (scalable) (objective(k)).

Against these objectives, the cost effectiveness analysis considered a range of research questions examining the extent to which clinical outcomes have improved as a result of introducing in-home telemonitoring relative to traditional CVC services. Any decline in clinical outcomes in the telemonitoring sites would be considered an unacceptable outcome. Questions considered were:

1. What are the total costs of operating the in-home telemonitoring trial?
2. What are the net costs and outcomes associated with CVC, and how does this compare to the net costs and outcomes associated with in-home telemonitoring services offered within a trial context?
3. Does the telemonitoring service model provide a cost-effective service to participants and what are the key factors for the sustainability of the model?
   - Have costs decreased as a result of implementing in-home telemonitoring to support the delivery of CVC services to participants? Assuming that health and potentially other outcomes have improved (or at least not declined) such a result indicates that the telemonitoring model is cost-effective
   - Have costs remained the same as a result of implementing in-home telemonitoring? If outcomes have improved, then telemonitoring is cost effective. If costs are the same as the traditional CVC service model, then it will be deemed that the two models are equivalent
   - Have costs increased as a result of implementing telemonitoring? If outcomes have not improved, then telemonitoring would not be cost-effective. If they have improved, then a comparison of the relative improvement in outcomes to costs would be required to provide an indication of cost effectiveness
4. What are the barriers to providing a cost-effective telemonitoring service model from the perspective of service providers, participants and their carers?
5. What is the cost-effectiveness of enhancing existing CVC support service practice with the in-home telemonitoring interventions?
8.3 Costs of IHT Trial

The methodology for cost effectiveness relied on collecting data across three domains:

1. Costs of the IHT Trial (source: DVA cost centre reports). Data relating to the costs associated with the establishment of the in-home telemonitoring services (e.g. equipment, staff recruitment and training etc.) as well as recurrent costs of service delivery were analysed.

2. Broader service utilisation costs. Service utilisation costs for both trial and control site participants is critical to understanding the broader cost impacts (and potential benefits derived) from the trial. This included analysis and quantification (in expenditure) of the following:
   - General Practitioner visits (source: DMIS data)
   - Utilisation of acute hospital services (source: DMIS data)
   - Utilisation of specialists (source: DMIS data)
   - Pharmaceutical use (source: DMIS data)
   - Allied health services (source: DMIS data)

3. Outcomes Assessment of the outcomes has been provided in the preceding chapters and included here in the context of its application to the cost effectiveness analysis.

Detailed calculations are provided in Appendix I and a summary of the findings are provided below.

8.3.1 IHT Trial Costs

The trial operational costs were considered as costs that would be incurred should IHT be adopted as an ongoing service and cover the provision, maintenance and calibration of equipment and the cost of monitoring patients via the quarterly payment/client to practices (using the UP20/UP21 item numbers). The analysis excluded medical and related services for the care of participants.

Based on the trial data there were 150,316 days of IHT provided through to 30 June 2016 (including those days for participants that exited early) at the equivalent approximate operational cost of $1,524/quarter or $16.93/day for each participant.

The cost for managing the 167 “in-scope” IHT participants over the two-year period was $12,190/participant.

8.3.2 IHT Service Utilisation—Non-Hospital

To identify an estimate for the impact on service utilisation a cost differential pre- and post-trial was derived for GP services, specialist services, pharmaceuticals and allied health services. These service streams represented the vast majority of services (and costs) for participants. Variations in the changes in service utilisation (and costs) for the IHT group were compared with the changes observed for the two comparator groups (GCH and CVC). Across all comparator groups, utilisation of services was observed to increase. Critically, with the exception of allied health services and pharmaceutical services, these increases in service utilisation for the IHT group were lower than the increases observed for the GCH and CVC comparator groups. Estimated savings for the IHT group were measured on the basis of deriving what the IHT service utilisation costs would have been had the increases been consistent with the CVC comparator group (since it was the closest comparator group) and the following conclusions were drawn:
• for GP services, this would have represented an additional $59,200 (i.e. this was a benefit for the trial group)

• For specialist services, this would have represented an additional $70,028 (i.e. this was a benefit for the trial group)

• For pharmaceutical services, no adjustments were made as service utilisation was largely unchanged

• For allied health services, the IHT group incurred additional costs of $63,400 (i.e. this was a cost for the trial group)

8.3.3 IHT SERVICE UTILISATION—ACUTE HOSPITAL

Acute hospitalisations represent a significant cost to DVA and disruption to the day to day lives of participants. Where these can be reduced for participants due to early alternative interventions, such reduction is of benefit to both parties. Similarly, if the complexity of hospitalisation is lower, the time spent in hospital is also likely to be less.

In relation to public hospital admissions, the IHT average costs/participant/quarter and clinical complexity increased by less than the CVC control group. Based on the trial derived costs and adjusting for this variation in complexity provided for an estimated saving to the IHT group of $274,100.

In relation to private hospital admissions, the IHT average costs/participant/quarter increased by less than the CVC control group. Clinical complexity reduced for the IHT group (but increased for the comparator groups). Based on the trial derived costs and $1,610,900.

8.3.4 SUMMARY OF TRIAL COST EFFECTIVENESS

Table 8.1 summarises the identified costs and modelled potential savings. It is noted that the net result is almost break even for the 167 clients analysed throughout this final report (small net cost of $84,835 or 4.2%). However, it is noted that the modelled potential private hospital savings is heavily weighted due to the increase in the complexity of admissions for the CVC comparator group. These findings should be read in conjunction with the conclusions drawn around the trial’s process, outcome and impact evaluations, and consider the potential confounding of the introduction of the CVC Program for the ‘new to CVC’ trial participants. We note also that fees for all medical and allied health services were not indexed over the duration of the trial (due to whole-of-government budget measures), and changes in costs over the same period cannot be attributed to inflation or indexation.

Importantly, more granular analysis indicates there were savings for the trial participants who had joined the CVC Program at the same time of the trial, but these were not enough to offset the additional costs for the participants already on the Program. We assume therefore, that some of these cost savings are attributed to the increased coordination and planning provided through the CVC Program. We also conclude that IHT led to increased cost effectiveness of care for some trial participants (based on quantitative service utilisation data), but not the majority of the cohort. In addition, there are likely to be ongoing cost benefits (e.g. earlier detection of health issues, reduced hospitalisations) for participants whose health literacy and self-management has improved due to the trial (and the CVC Program). Importantly the application of the telemonitoring technology and monitoring did not appear to negatively impact on the delivery of treatment or care coordination provided under the CVC Program.

Whilst noting that the trial did result in additional costs, there was sufficient evidence to suggest that these additional costs could be significantly improved by recognising that:
• the DVA IHT model encompassed a high-end full monitoring capability (not all of which would be applicable to all clients)
• more cost-effective equipment options have emerged
• broader implementation of IHT (and subsequent economies of scale), coupled with standard competitive tendering processes, are likely to reduce the cost/client
• GP payments were made to encourage practice participation in the trial and it would be appropriate to consider that some component of these payments could be eliminated and/or incorporated into the current CVC payment made to GPs.

Table 8.1: Summary of trial costs and potential benefits for 167 trial patients

<table>
<thead>
<tr>
<th>Item</th>
<th>Cost</th>
<th>Benefit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Telemonitoring operational costs</td>
<td>$2,035,663</td>
<td></td>
</tr>
<tr>
<td>(including payments to GPs)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Trial costs</td>
<td></td>
<td></td>
</tr>
<tr>
<td>GP services payments</td>
<td>$59,200</td>
<td></td>
</tr>
<tr>
<td>Specialist services payments</td>
<td>$70,028</td>
<td></td>
</tr>
<tr>
<td>Pharmaceutical services</td>
<td>Negligible change</td>
<td></td>
</tr>
<tr>
<td>Allied health services</td>
<td>-$63,400</td>
<td></td>
</tr>
<tr>
<td>Private hospital costs</td>
<td>$1,610,900</td>
<td></td>
</tr>
<tr>
<td>Public hospital costs</td>
<td>274,100</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>$2,035,663</td>
<td>$1,950,828</td>
</tr>
</tbody>
</table>

8.4 COST IMPACT OF TELEMONITORING FROM PATIENT OUTCOMES

A number of clinical measures and indicators have been identified to determine whether the in-house telemonitoring innovative initiatives have been successful or not in comparison with alternate health services. These measures have been collected throughout the trial and are identified as follows:

• **Quality of life.** For the evaluation, the AQoL-8D survey (a self-report tool) was used to seek information from survey respondents in relation to eight dimensions of quality of life.

• **Psychological wellbeing.** The psychological wellbeing of telemonitoring participants (and the matched control group) was assessed using the K10 questionnaire and qualitative feedback received through case studies and practices (at baseline and interim stages).

• **ICP triage manager recorded interventions.** The number and type of interventions are indicators for the clinical effectiveness of the trial.

The findings from these patient outcome instruments has been discussed elsewhere in this report. In the context of cost effectiveness, the measures derived can be linked to cost effectiveness. However, as noted elsewhere in this report, no statistically significant differences were identified for IHT participants. Consequently, it was concluded that the application of weighted scores for application to cost effectiveness measurement would not identify relevant statistically valid adjustments to the derived service utilisation-based findings as set out in the previous section.
8.5 ANNUALISED FINANCIAL IMPACT OF IHT

The calculations in the previous sections identified the cost effectiveness of the overall trial that indicated approximate cost neutrality. An additional consideration was to analyse the impact on the annual cost of providing health care to DVA clients should an IHT service be available through the CVC Program. Based on continuous IHT the previous analysis suggests that cost neutrality would continue (since daily IHT costs would be constant and the observed reductions in service utilisation and/or lower complexity hospital episodes would not change).

An alternate approach is to contemplate the impact of introducing IHT for a defined period. Such an approach was highlighted by the positive impact of IHT (from a cost perspective) for those clients who were simultaneously enrolled in the CVC Program (‘new to CVC’) and the anecdotal feedback from clinical staff suggesting that the benefits of IHT tended to plateau once the condition of the participant stabilised. Although the trial did NOT seek to test the impact of variability with IHT monitoring periods, two alternate scenarios are presented below in Table 8.2-the first for the use of IHT for the first of three months and the second for the use of IHT for the first six months. Further consultation with clinicians would need to be undertaken to ascertain the appropriateness and criteria for using IHT on a time-limited basis.

<table>
<thead>
<tr>
<th>Item</th>
<th>Per Day Impact</th>
<th>Annualised Cost/Benefit Per Client (Year 1)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Ongoing Monitoring</td>
</tr>
<tr>
<td>Telemonitoring operational costs</td>
<td>-$16.93</td>
<td>-$6,179</td>
</tr>
<tr>
<td>(including payments to GPs)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>GP services payments</td>
<td>$0.49</td>
<td>$179</td>
</tr>
<tr>
<td>Specialist services payments</td>
<td>$0.58</td>
<td>$212</td>
</tr>
<tr>
<td>Pharmaceutical services</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Allied health services</td>
<td>-$0.52</td>
<td>-$190</td>
</tr>
<tr>
<td>Private hospital costs</td>
<td>$13.40</td>
<td>$4,891</td>
</tr>
<tr>
<td>Public hospital costs</td>
<td>$2.28</td>
<td>$832</td>
</tr>
<tr>
<td>Total</td>
<td>-$0.70</td>
<td>-$256</td>
</tr>
<tr>
<td>Return on Investment (ROI)</td>
<td>-</td>
<td>-0.04</td>
</tr>
</tbody>
</table>

From Table 8.2 we note that based on the costs/benefits identified from the overall trial:

- full ongoing monitoring would incur an annual additional cost to DVA of $256 per client, representing a negative return on investment of 0.04 in each year of IHT
- monitoring for the first six month period could provide a net cost benefit to DVA of $2,877 per client-a return on investment of 0.94 for year 1 of IHT
- monitoring for the first three month period could provide a net cost benefit to DVA of $4,400 per client-a return on investment of 2.89 for year 1 of IHT

It is noted that if limited-time IHT was found to be clinically acceptable and assuming the reduced service utilisation is continued beyond year 1, IHT would not be used in year 2 and beyond and therefore additional savings would be achieved in these subsequent years. It is also noted that these
calculations do not take account of any DVA internal costs for managing an IHT program or any costs incurred by clients.

Excluding GP services payments (an option could be to incorporated these payments into the existing CVC payment) would improve the derived financial benefits as set out above. The cost accounted for approximately $3.03/participant/day. Thus, with full monitoring and no separate GP service payments, the ROI would improve from -0.04 to a positive ROI of 0.16.

An alternate consideration is to recognise that the annual additional net cost for full IHT monitoring was found to be $256/client. Based on the operational costs of $6,179 (and achievement of the adjusted service utilisation) a saving of 4.2% on the cost of operating IHT would achieve a cost neutral outcome but with a range of accumulated benefits to some clients (e.g. greater piece of mind, reduced hospitalisation and a reduction in other service utilisation).

8.6 SUMMARY OF COST EFFECTIVENESS OF IHT

The cost effectiveness analysis for the trial as a whole demonstrated an essentially cost neutral position (the additional costs incurred were estimated at around 4.2% ($84,835) or around $500 for those participants who remained in the trial for the full two years).

Translating these findings to an annualised cost, and on the basis of alternate models using time-limited IHT enabled the following conclusions to be drawn:

- full ongoing monitoring would incur an annual additional cost to DVA of $256 per client- negative return on investment of 0.04 in each year of IHT
- monitoring for the first six-month period could provide a net cost benefit to DVA of $2,877 per client- a return on investment of 0.94 for year 1 of IHT
- monitoring for the first three-month period could provide a net cost benefit to DVA of $4,400 per client- a return on investment of 2.89 for year 1 of IHT

Full ongoing monitoring could be achieved as a cost neutral service through a 4.2% reduction in the annual cost of the IHT service (assuming the identified service utilisation reductions as found during the trial were maintained). Opportunities to achieve would recognise that:

- the DVA IHT model encompassed a high-end full monitoring capability (not all of which would be applicable to all clients)
- more cost-effective equipment options have emerged
- broader implementation of IHT (and subsequent economies of scale), coupled with standard competitive tendering processes, are likely to reduce the cost/client
- GP payments were made to encourage practice participation in the trial and it would be appropriate to consider that some component of these payments could be eliminated and/or incorporated into the current CVC payment made to GPs.
CONCLUSIONS AND FUTURE CONSIDERATIONS

This chapter details conclusions based on mapping the aims of the trial to evaluation questions, indicators and outcomes, and the future of the telemonitoring trial design.

9.1 CONCLUSIONS

Overall, the trial has provided a range of beneficial impacts for participants and practices. Benefits included:

- minor reductions for some trial participants in the number and/or complexity of health services (e.g. public hospital admissions)
- smaller increases in utilisation of health services compared to the increases observed for control groups (e.g. GP visits)
- slightly more benefit (relating to impacts of the trial on health service utilisation) for participants who were younger and/or had joined the CVC Program at the same time as enrolling on the trial (compared to those participants who were older or were already on the CVC Program)
- increased peace of mind and reassurance about one’s health, improved health literacy and self-management, and improved relationships between participants and their general practice.

From a cost effectiveness perspective, the analysis of trial operational costs demonstrated a cost-neutral conclusion across the duration of the trial. Of note, the trial participants who had joined the CVC Program at the same time as enrolling on the trial, demonstrated positive financial benefits through reduced utilisation of services and severity of hospitalisations (compared to those participants who were older or were already on the CVC Program).

Overall, there was no significant difference between baseline and trial for the trial participants’ use of hospital and GP services indicating the risk of hospitalisation has not reduced for the majority of participants. There were indications however that the trial reduced service utilisation for some participants.

Our findings indicate that the evaluation of the impacts of the trial may be confounded by the impacts of the CVC Program. Specifically, telemonitoring, in conjunction with the increased coordination provided by the CVC Program, may have contributed to decreased lengths of stay and complexity, and a stabilisation of the participant’s condition. In addition, the higher baseline risk of hospitalisation for the trial group compared to the data control groups may confound the overall relative impacts of the trial relating to hospital utilisation (where older participants’ risk of hospitalisation is unlikely to be reduced). Other conclusions include:

- the trial provided a safe and acceptable complementary service to conventional health care
- compared to the broader veteran community, telemonitoring reduced the need for some trial participants to visit their GP
- Telemonitoring may support some participants to delay their entry into RACF, or where relevant, palliate at home.
- Availability of monitoring data may support a decision to admit a participant to hospital for serious and/or potentially life-threatening events for some participants.
- Some participants benefited from early identification of changes in existing conditions or the identification of new conditions.
- Increased pharmaceutical use may be related to increased compliance, potentially linked to the trial’s impact on health literacy and self-management, and coaching from clinicians.
- Improved health literacy, attributed to the trial, led to lifestyle changes, improvements in condition and changes (including reduced dosage) to medication regimes.
- Availability of monitoring data supported patient adaptation to medication changes and introduction of new medications and doses for some participants.
- The trial contributed to improved wellbeing, stronger relationships between the trial participant, carer and the practice and increased health literacy and interest in their health and condition.
- Younger and older participants gained different benefits from telemonitoring. For younger participants, potential benefits included: longer term quality of life and early detection of medical issues leading to hospital avoidance. For older participants, potential benefits included: increased control of symptoms, reassurance and peace of mind (with limited potential for hospital avoidance).
- Increased planning and coordination (e.g. as part of an introduction to the CVC Program) may have led to increased cost of allied health services, but this was potentially offset by less complex hospitalisations (for example, alternative care pathways where a lower complexity of care does not require an acute admission, or leads to a less complex admission).
- Overall, the general practice-centred model demonstrated a range of benefits including improved relationship and communication with participants, and capability of integrated care.
- Experiences of practices varied based on their size, resourcing capacity and capability, number of participants, and the attributes of their specific participants.
- Some practices experienced challenges with resourcing to undertake monitoring (e.g. due to practice size, limited staffing, lack of GP engagement, and limited existing technology capability to support streamlining of processes).
- Practice efficiency was reported to improve moderately to significantly for some (larger) practices, due to the availability of vital signs data to enable early detection and the capability to respond to participant’s care needs more quickly.
- Many practice staff felt the trial changed or enhanced their role due to the increase in analytic skills acquired, a greater level of empathy for the participant, improved access to data, and a strengthened relationship with the participant.
- Factors impacting the experience for participants included variation in personal traits relating to cognition, level of activity, level of independence, and capacity and/or attitude to using technology.
- Most participants, regardless of age, managed the telemonitoring equipment and technology with limited difficulty and had an overall good experience using the equipment.
- There were identified financial benefits for the trial group across most service categories based on the reduced utilisation and/or average costs when compared to changes for the CVC control group.
over the four-year period of the trial the operational aspects were essentially cost-neutral. However, evidence indicates the trial and CVC interventions are likely to provide ongoing and long-term cost benefit beyond the completion of the trial (e.g. through earlier detection, reduced hospitalisations) for participants whose health literacy and self-management has improved, particularly driven by those in the younger age groups, and who continue to benefit from introduction to the CVC Program.

9.2 Achievements of the Trial

The key achievements of the trial against the evaluation objectives are provided in Table 9.1.

Table 9.1: Key achievements of the trial against evaluation questions and indicators

<table>
<thead>
<tr>
<th>Evaluation question</th>
<th>Indicators</th>
<th>Conclusions</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Is telemonitoring a safe, effective and efficient way to complement conventional</td>
<td>• no harm to intervention group participants</td>
<td>Telemonitoring is safe, effective and somewhat efficient in complementing conventional health</td>
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<tr>
<td>health services?</td>
<td>• telemonitoring equipment functioning optimally</td>
<td>services</td>
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<td></td>
<td>• quantity and quality of telemoitoring consultations meets or exceeds expectations</td>
<td>No harm was caused to the participants by the trial</td>
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<td></td>
<td>• more convenient and timely access to healthcare services for intervention group participants</td>
<td>Majority of participants and practice staff suggest equipment function was adequate</td>
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<td>• the existence of the technology in the home does not cause participants to overuse the</td>
<td>Majority of equipment issues were dealt with appropriately and in a timely manner by the</td>
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<td>technology (i.e. they become overly focussed on their health and wellbeing and constantly</td>
<td>service provider</td>
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<td></td>
<td>use the available monitoring equipment)</td>
<td>Quantity of telemoitoring consultations for most participants met expectations</td>
</tr>
<tr>
<td></td>
<td>• healthcare providers continue to meet, or exceed, relevant healthcare standards for services</td>
<td>Quality of telemoitoring consultations for most participants exceeded expectations</td>
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<td></td>
<td>provided to intervention group participants</td>
<td>Participant survey indicates around half of participants felt access to services was more</td>
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<td></td>
<td></td>
<td>convenient and timely</td>
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<td></td>
<td>Case studies indicate trial led to more convenient and timely integration of daily tasks into</td>
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<td></td>
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<td>workload</td>
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<td></td>
<td>Majority of participants monitored vital signs as per their monitoring plan. A small number used</td>
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<td>the equipment more than required</td>
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<td>Most practices indicated the trial made minimal impact on ability to provide quality care.</td>
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<td>Some practices reported that access to additional information through vital signs enhanced</td>
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<td>practice role and efficiency</td>
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<td></td>
<td>There is some evidence that the telemoitoring model did provide cost-effective outcomes</td>
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<tr>
<td>Evaluation question</td>
<td>Indicators</td>
<td>Conclusions</td>
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</table>
| 2. Is there an improvement in monitoring and management of selected complex chronic conditions? | - access to high quality healthcare for intervention group participants, at least equivalent to current levels of care  
  - each intervention group participant receiving regular monitoring of their condition, education and feedback from the practice nurse and/or the relevant health services provider  
  - appropriate intervention by practice nurses, and assessment by the participant’s GP  
  - examples of reduced financial, physical and time commitments for carers  
  - improved self-management through on-going monitoring and care of intervention group participants  
  - reduced physical visits to health professionals by intervention group participants in correlation with uptake and usage of in-home telemonitoring | - For many participants, there is improved monitoring and management of conditions (including early identification, medication titration, improved health literacy and self-management)  
  - Participant surveys and case studies indicate that trial participants feel the trial has led to the same or better quality of care  
  - Compliance for monitoring and follow up through acknowledgements, triaging and interventions were recorded by the service provider. Missed readings were followed up and actioned for all participants  
  - Intervention and follow up assessments appear appropriate to participant needs and were in line with monitoring plan and a collaborative approach to care. All incidents were recorded and followed up by the service provider. No harm to participants, and positive health and wellbeing outcomes for many indicate that appropriate interventions were undertaken  
  - 16% of practice survey respondents indicated that the trial led to a lower burden for carers. 4-9% respondents indicated the trial increased stress for carers. 11-14% respondents indicated the trial increased physical requirement (relating to use of equipment). 25% of participant survey respondents felt the trial was more convenient for the carer, and 8-9% felt it saved the carer time. No reports on increased financial commitment for carers  
  - 64-78% of participants felt their ability to manage their health had improved. Improved self-management was a key finding across most participants  
  - No statistically significant reduction in GP visits or hospital admissions per client per quarter, but significant change (increase) in mean GP consultation costs per client per quarter. The trial appears to reduce physical visits for younger participants new to CVC compared to the older participants already on CVC prior to the trial |
<table>
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<tr>
<th>Evaluation question</th>
<th>Indicators</th>
<th>Conclusions</th>
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<tbody>
<tr>
<td>intervention group participants?</td>
<td>• reduction in emergency admissions</td>
<td>client per quarter. There is a slight decrease in public admissions for the trial group compared to the control groups, and this is attributed to the (younger) new to CVC sub group&lt;br&gt;&lt;br&gt;• Anecdotally, most practices indicate that at least one of their participants has either avoided hospital, or detected a health issue earlier due to the trial&lt;br&gt;&lt;br&gt;• Emergency admission data not available</td>
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<tr>
<td>4. Was there increased health workforce productivity?</td>
<td>• an increase in health workforce productivity between GPs and other healthcare service providers&lt;br&gt;&lt;br&gt;• more efficient use of GP resources and time with greater attention being directed to those with more complex health needs rather than routine monitoring</td>
<td>56% of practice survey respondents at interim and 72% at post participation indicated a moderate to significant improvement in efficiency due to availability of vital signs and ability to manage identified issues more quickly&lt;br&gt;&lt;br&gt;• There were no significant changes reported regarding practice interaction with other services. 59% respondents at interim and 67% at post participation indicate no change&lt;br&gt;&lt;br&gt;• Role of GP not significantly impacted (due to key telemonitoring roles played by practice nurse, poor GP engagement). Anecdotally, a few practice nurses indicate the trial enabled improved integration of information and a more holistic approach to collaborative practice and care</td>
</tr>
<tr>
<td>5. Does broadband optimise opportunities for client healthcare?</td>
<td>• participants report in-home telemonitoring equipment is easy to manage, fast and facilitating positive outcomes for themselves and their carers, e.g. increased speed of diagnosis, increased ability to respond to any change in condition, greater convenience through reduced travel time and costs in relation to visits to their primary health provider for routine monitoring or review of healthcare plans, increased control over health choices, and improved wellbeing&lt;br&gt;&lt;br&gt;• the appropriateness of various broadband technologies, such as NBN fibre, ADSL 2+, ADSL, 3G and 4G wireless, to deliver beneficial telehealth services and the relative performance</td>
<td>Participants and practices indicate that the trial has provided opportunities for enabling a more holistic approach to participant care, improving peace of mind, and providing opportunities for engagement (through monitoring and follow up phone calls)&lt;br&gt;&lt;br&gt;• Majority of participants reported equipment was easy to manage, adequately fast and led to good outcomes. 89% of participants (post trial) report that experience with equipment was satisfactory, good or very good. A small number of participants felt stressed and frustrated by the equipment. These incidents were managed by the service provider effectively, although a few participants withdrew from the trial because of the associated stress/anxiety&lt;br&gt;&lt;br&gt;• Travel time and health service costs were not impacted for the participants&lt;br&gt;&lt;br&gt;• Majority of participants (67-85%) indicated</td>
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<td>Evaluation question</td>
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<td></td>
<td>of each technology in doing so</td>
<td>the trial led to improved wellbeing</td>
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<td>• The majority of installations (90%) used 4G internet connections due to the delay in NBN rollout. A small number of participants experienced internet connection issues and these were attended to successfully by the service provider in a timely manner. Majority of participants very satisfied with Tunstall as a service provider</td>
<td></td>
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<tr>
<td>6. Do participants experience reduced pain and suffering?</td>
<td>• intervention group participants report reduced pain and physical/psychological suffering at a noticeable level</td>
<td>To date, there is little evidence to support reduced physical pain and suffering in the majority of participants</td>
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<td>• mapping prescription usage patterns and measuring the changes</td>
<td>• Standardised health and wellbeing assessment tools have shown no significant change in trial and control groups, across baseline to end of trial, except for a statistically significant difference in the means between control and trial groups at the interim survey point</td>
</tr>
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<td>• an overall clinical view provided the GP</td>
<td>• A majority of participants indicate the trial has led to an increased peace of mind. 65-79% participants believe the trial has provided reassurance. 73% of participants indicated that peace of mind was the reason for continuing until the end of the trial</td>
</tr>
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<td></td>
<td>• To date, there is little evidence to support reduced physical pain and suffering in the majority of participants</td>
<td>• A number of participants have indicated that the monitoring has led to quick change in medication or immediate follow up, which may indirectly lead to reduced pain and suffering</td>
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<td>• Though improved medication management was a key outcome for some participants, there were no significant changes in use and costs of condition specific pharmaceutical</td>
<td>• Practices report that the key benefits for participants were increased peace of mind, improved relationship with practice, increased stabilisation of condition, increased patient responsibility for health, early interventions, improved patient understanding of condition, potentially saved life and medication titration or change</td>
</tr>
<tr>
<td>7. Do clients using the in-home telemonitoring equipment remain in their home longer</td>
<td>• reduction in preventable admission and/or length of stay in hospital</td>
<td>There are a small number of participants who have come to rely on the monitoring and follow-up. The practices believe that this has enabled them to stay in their</td>
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<td>• reductions in premature</td>
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<td>Evaluation question</td>
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<td>than those not using the telemonitoring equipment?</td>
<td>admission to aged care facilities</td>
<td>homes longer and avoid RACF</td>
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<td></td>
<td>• present/historical rates of admissions of the comparison cohort</td>
<td>• Note that detailed data for entry to RACF has not been made available for quantitative analysis. It is acknowledged that age for entry is one year higher for the trial group compared to the control group based on the limited data available</td>
</tr>
<tr>
<td>8. Is there a return on investment?</td>
<td>• a cost effectiveness analysis</td>
<td>• The cost effectiveness analysis demonstrated that from an operational perspective there was a potential to demonstrate a break-even position (excluding trial management costs)</td>
</tr>
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<td></td>
<td>• return on investment over two years and predictions over 5 and 10 years</td>
<td>• Enhanced returns may be achievable through specific shorter-term use of telemonitoring for the targeted conditions (particularly at the time of enrolment onto the CVC Program)</td>
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<tr>
<td></td>
<td>• identifying potential for use in DVA’s broader treatment population</td>
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<td></td>
<td>• identifying the factors of the trial that work well and those that could be improved</td>
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<tr>
<td>9. Were there any systemic issues?</td>
<td>• N/A</td>
<td>No significant systemic issues have been reported</td>
</tr>
<tr>
<td>10. Was the trial managed effectively?</td>
<td>• governance established and functioning effectively</td>
<td>Practices and participants indicate that the trial has been managed very well, particularly support from practice and the service provider staff</td>
</tr>
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<td></td>
<td>• the relevant key stakeholders being engaged in the trial</td>
<td>Governance of the project reported to go well. Overall governance structure and advisory group roles adapted as required (e.g. technical advisory group used initially only)</td>
</tr>
<tr>
<td></td>
<td>• finances managed effectively</td>
<td>Effective engagement between DVA, the service provider and participants.</td>
</tr>
<tr>
<td></td>
<td>• sufficient participants engaged and maintained in the intervention group</td>
<td>Engagement with practices challenged initially by access to GPs and their level of interest and engagement. DVA liaison role improved recruitment and ongoing management of stakeholder engagement</td>
</tr>
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<td>• sufficient numbers of conditions are included in the intervention group to be able to measure the changes for each condition</td>
<td>Economic evaluation demonstrated some potential benefits through reduced utilisation</td>
</tr>
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<td></td>
<td>• sufficient participants in the comparison cohort engaged and maintained</td>
<td></td>
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<td></td>
<td>• effective stakeholder communication strategies are in place</td>
<td>300 participants targeted and recruited. 292 proceeded with enrolment and installation. 147 participants active at the trial’s end. Analysis of trial impact data based on 167 participants who were on the trial for 18 months or more</td>
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<td>DMIS analysis indicates increasing service utilisation as number of conditions increases, suggesting confounding is likely</td>
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8. Note that detailed data for entry to RACF has not been made available for quantitative analysis. It is acknowledged that age for entry is one year higher for the trial group compared to the control group based on the limited data available.
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<tr>
<th>Evaluation question</th>
<th>Indicators</th>
<th>Conclusions</th>
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</table>
| 11. Is the telemonitoring trial suitable for further development and/or delivery to a broader cohort (scalable)? | • the participant profile most suited to using telemonitoring services  
• equipment suitability  
• appropriateness of the business process model for general practices | due to complexity of comorbidities, and therefore difficult to attribute changes to the trial, based on impacts on specific conditions, in a relatively small trial cohort  
• GCH and CVC data control group sizes adequate and maintained. Matched control group (for AQoL and K10 analysis) adequate and maintained for analysis  
• DVA used a comprehensive and effective stakeholder communication strategy using a multi-method approach. Majority of practices reported that communication with DVA worked well  
• The trial model has a number of design elements with the potential to benefit a broader cohort, for example in relation to age, complexity of condition, rurality  
• Our findings suggest that different age cohorts experience different benefits from telemonitoring. For example, younger participants have a greater long-term impact relating to improved health literacy and early detection, whereas older participants cite key benefits as peace of mind and a better understanding of one’s condition  
• In addition, DMIS data analysis suggests those new to the CVC Program may benefit more than those who have already been receiving CVC services  
• Practices report the trial benefits a range of conditions, and understandably could only relate the trial to their own local participants  
• The telemonitoring equipment was reported to be easy to use and manage. Of note, it reflected the capabilities of the time (2012 to 2013). Future implementation should consider emerging technologies, including personal devices as a more cost effective and sustainable alternative  
• Practices report that the trial has had varying impacts on their business processes. For example, smaller practices cite that additional tasks are challenging to accommodate due to limited resources (including part time staff). Larger practices with more staff, practices with an existing CVC model, and practices with existing integrated software capability found the
<table>
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<th>Evaluation question</th>
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<th>Conclusions</th>
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<tr>
<td>trial to be less burdensome, and were able to absorb additional tasks into their process model more easily • A discussion on future options for the trial to improve sustainability for practices is reported in section 9.2</td>
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<tr>
<td>12. Are there improvements to be made to enhance the outcomes achieved by the trial? N/A</td>
<td>As above. Practices suggest telemonitoring may benefit patients with less stable conditions, who live more remotely or who access the practice less (e.g. travelling). A number of suggestions have also been made to enable more tailored questioning via the tablet to support a broader context • A discussion of key considerations and future options is presented in section 9.2. These include considerations around relating to improving engagement with GPs, optimising DVAs established knowledge base, impacts of emerging technologies, and acknowledgement of the importance of psychosocial benefits and relationships</td>
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<tr>
<td>13. What risks are reduced or increased by telemonitoring? N/A</td>
<td>Practices report that being on the trial reduces the participant’s risk (e.g. of hospitalisation) to some extent due to the monitoring (i.e. practice and the service provider nurse being aware of their vital signs on a regular basis, close monitoring of health and symptom patterns)</td>
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<tr>
<td>14. What telemonitoring technology could DVA consider into the future to enhance client services? N/A</td>
<td>Using technology to support social connectedness, including integration with other services. Many of the participants and practices cite that the biggest benefit for participants on the trial is the daily/weekly contact they have with the practice (e.g. over the phone with the service provider or practice nurse). Having someone to talk to about their health, and knowing that someone is ‘monitoring’ them from afar brings peace of mind, and an opportunity for social contact and engagement • A discussion of emerging technologies is provided in section 9.2</td>
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<tr>
<td>15. What were the unintended consequences both positive and negative that arise from in-home N/A</td>
<td>Positive unexpected benefits include significant social benefits (e.g. increased engagement in health, social contact) for many participants, particularly older participants with fewer local family and social connections, increased health</td>
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<th>Evaluation question</th>
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<tr>
<td>telemonitoring and how could this be used for learning both within the trial and more widely?</td>
<td></td>
<td>literacy, and impacts of opportunistic coaching on participant’s health literacy, thereby improving self-management&lt;br&gt;&lt;br&gt;- Early socialisation between the service provider nurses and some participants became a concern for DVA. This was a result of the continued and concentrated co-monitoring efforts of the service provider clinical staff early in the trial. DVA reduced this risk through a change to a ‘7 day pick up’ where the practice increased engagement with primary monitoring, and the service provider stepped back to a purely co-monitoring/back-up role for the majority of practices&lt;br&gt;&lt;br&gt;- Limited use of available data by GPs was an unexpected outcome, relating to their level of engagement&lt;br&gt;&lt;br&gt;- Practices report that the level of confidence and competence in which the older participants were able to use and manage the equipment was unexpected&lt;br&gt;&lt;br&gt;- Practices have not cited any other significant unintended consequences (positive or negative). Noting that video-conferencing has not been utilised to the level the model initially aimed. Practices indicate, in general, scheduling and planning for video-conferencing has been a challenge and a phone call is usually sufficient</td>
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### 9.3 Recommendations and future considerations

The trial has highlighted some important considerations for broader implementation of telemonitoring for veterans and war widows into the future, or implementation of future trials. We have also identified key considerations relating to improving engagement with GPs, optimising DVAs established knowledge base, impacts of emerging technologies, and acknowledgement of the importance of psychosocial benefits and relationships.

In addition, an important consideration of our key findings is the potential confounding of the CVC Program on the impacts of the trial for those who joined the CVC Program at the same time as the trial. Changes in service utilisation and costs for those in this group are difficult to attribute to the trial alone. Updated information on the impacts of the CVC on participant service utilisation and costs will be an important element of further telemonitoring evaluations. In addition, the difference in baseline risk of unplanned hospitalisation is likely to have reduced the potential impact of the trial in reducing service utilisation for some participants.
Of note, the specific future opportunities cited by practices included:

- improve planning for patient selection and recruitment (to maximise benefits)
- improve and maintain quality of equipment to reduce anxiety for participants
- broaden eligibility (e.g. clients with PTSD, depression, arthritis, or other chronic conditions) and reach for participation (e.g. pensioners, socially isolated, families with children with high needs, home dialysis patients, non-mobile clients) to maximise benefits for more people
- reduce frequency of monitoring in line with individual needs
- increase GP engagement
- consider capabilities of practice and capacity of staff.

9.3.1 BROADEN APPLICATION OF TELEMONITORING FOR THE VETERAN COMMUNITY

The trial had a specific focus on improving and enhancing existing health services for clients with chronic conditions. Our analysis has shown a range of benefits for the participants, and these could be extended to support improved health and wellbeing and a cost-effective care management model for other populations and health conditions. Supporting a flexible, efficient and client specific model of delivery, areas for consideration identified by practices in the practice surveys and case studies include telemonitoring for:

- other long-term illnesses (e.g. those on dialysis)
- mental health monitoring and psychological/psychiatric appointments
- monitoring post-discharge from hospital to reduce readmissions (transition care)
- maintaining contact for both clinical and emotional support for end of life (at home)
- focussing on those who are geographically and socially isolated and would benefit from both health and social monitoring
- families with children with special needs (e.g. beyond the veteran community)
- older people with chronic conditions whose family do not live close by
- ‘grey nomads’ (access to care while travelling).

Expansion of the current model to these additional populations would need to consider the impacts on cost-effectiveness, sustainability relating to workforce and co-monitoring, and the potential for integration with other DVA, health and social services. Such expansion may also provide opportunities to significantly enhance how other DVA services (particularly social services) or other health services are integrated into this model. Broader system impacts on the roles of practitioners in primary care, including potential partnerships with other service providers (e.g. Primary Health Networks), also need to be considered if the model’s application expands, to support well-coordinated care. A general practice-centred model with a change or expansion in focus from chronic disease management could still be considered fit for purpose.

Importantly, the return on investment will be an important consideration into the future, and DVA acknowledge that longer term impacts on health expenditure will be realised for younger clients through primary health care rather than for older ‘frequent flyers’ of acute care. In the shorter term, a focus on early detection, improved self-management, health literacy, peace of mind, and wellbeing as

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part of a primary health and prevention model, remain important goals, and important benefits to portray to primary care providers if the model is implemented further.

9.3.2 PROVIDE FLEXIBLE OPTIONS FOR FUTURE TELEMONITORING TRIAL MODEL DESIGN

The benefits of a GP-practice-led model have been significant. In general, the participating practices in the trial agreed that an integrated approach to care, and an existing relationship with their patient were key drivers to the model’s success. The challenge for many smaller practices was the part time nature of staff, and reliance on co-monitoring, which would be unsustainable over time. Our analysis has also shown, that from a health gain perspective, improvements in wellbeing were more pronounced in the earlier stages of the trial, and then tapered or were maintained from the interim period (after 6-12 months) to the end of the trial.

Recommendations for future telemonitoring models include the following:

**Flexible nursing workforce model.** A range of nursing workforce models could deliver the same outcomes, and can be adapted based on the practice's workforce capacity and local networks. This flexibility may result in a ‘blended model’ where some practices have the capacity to undertake an additional telemonitoring role utilising its' existing staff and resources, other practices may need to outsource only the monitoring, and further practices seek support for both the monitoring and triaging.

One option is the recruitment of a dedicated and local ‘telemonitoring nurse(s)’ (this could also be integrated into the community nursing model) to monitor across several small practices (with few participants) within a local geographical area to improve sustainability and reduce issues with practice staff turnover. The role could be focussed on monitoring and initial follow-up with the participants, with subsequent liaison and hand-over to the practice's nominated CVC nurse. A local telemonitoring nurse/s could focus on establishing and maintaining a relationship with the practices and have more contextual awareness of broader local services, thereby supporting integration with other local services (e.g. the Primary Health Network) and enhancing the model from a health outcomes perspective.

Another option, used by some practices successfully in this trial, is to extend the CVC nurse role to incorporate telemonitoring, where the practice nurse has limited capacity. An extension of this option is to collaborate with other local health service providers (e.g. community nursing, Primary Health Network) and provide a shared resource that includes a telemonitoring role.

A co-monitoring role by a private third party like the service provider, may remain an option for some practices.

Each practice should have a role in designing and planning which telemonitoring nursing model would work best based on the local context and staffing capacity. This would support increased engagement and sustainability. It is considered that such alternative workforce models, or a ‘blended model’ would:

- maintain the benefit of having the practice and GP central to the patient’s healthcare management
- address the social and emotional wellbeing needs of members of the veteran community
- provide a local monitoring service and workforce solution, and
- address the issues of practice nurse availability and reliance on a co-monitoring team.

DVA acknowledge the benefits of a flexible model based on the feasibility of what practices can provide in way of telemonitoring and triaging, and this has been a key learning regarding the trial’s design.
A further option may be a centralised workforce model where a central (‘hub’) monitoring team (e.g. external third-party provider) provides services to a number of ‘spoke’ communities and practices. This model may provide sustainability and efficiency benefits where there is minimal practice capacity to support telemonitoring, however a centralised team would not be able to optimise the existing relationship between the practice and patient, and would potentially require substantial external and long-term resourcing (in addition to technical services).

**Options for short and medium term telemonitoring care and review plan.** Many participants in this trial experienced benefits early in the trial from a health and wellbeing perspective (e.g. peace of mind, improved knowledge and management of condition), rather than over the longer term. These improvements to wellbeing did not necessarily result in lower health service utilisation, and therefore a return on investment (based on cost-effectiveness), but it does highlight the importance of social and wellbeing outcomes, particularly for older people.

An individualised monitoring plan, with input from the veteran and GP, would include specific short, medium and long-term goals for each patient, would align with their care plan (e.g. for their specified chronic condition(s)) and would clearly define roles of the practice and any external service providers. A planned approach to reviews of equipment and frequency of monitoring, for example every three to six months, would also be recommended to ensure telemonitoring is focused on actual patient need. An individualised telemonitoring care and review plan could be seamlessly integrated into the CVC Program approach (for example at the time of assessing eligibility and commencement of the CVC Program). Planning should include an assessment of likely benefits for all stakeholders, including benefits (and cost benefit ratio) at an individual level for (and in consultation with) the veteran (e.g. based on age, distance from practice, condition, attitude to technology, goals) and at a practice level (e.g. benefits to productivity, resource capacity, supportive infrastructure and leadership, feasibility, potential integration with CVC). Also consider the goals of the participant with relation to psychosocial needs such as social connectedness and peace of mind relating to management of their chronic condition, and how these goals may be met, e.g. by other support services (see also 9.3.6). This approach would also support planning for palliation at home.

This approach would need to be complemented by a focus on providing health literacy and self-management strategies early in the plan, for example through coaching, which was an important benefit of this trial. This would also support shorter timeframes with equipment and improved cost-effectiveness (through a planned approach to reviews) after equipment is no longer deemed necessary, given the expense of loaning and maintaining equipment, potentially leading to self-monitoring (e.g. with own device). A number of trial participants withdrew from the trial believing the technology had ‘done its job’ and their health had improved to a point where it was no longer making a difference to them. For example, telemonitoring enabled them to reduce fluctuating symptoms through medication adjustment leading to stabilisation of their health. We acknowledge that this scenario is not the case for all members of the veteran community, and that a review may indicate that the monitoring is still required for a longer term. We also acknowledge that monitoring and subsequent critical interventions can make a significant impact through early detection and intervention, and that this may lead to positive health outcomes and cost savings in the longer term for some clients.

We have observed in this trial, that telemonitoring can improve health literacy at an individual level, and an individualised approach to telemonitoring planning may lead to improved efficacy of self-management after telemonitoring equipment has been removed. We have also observed that age may be a factor in health service utilisation, but is not related to the level of engagement with technology, or ability to better understand one’s condition.
Importantly, an assessment at the initial care planning and review stages should include consideration of any medical, legal or social risks associated with provision of services by external providers to support a ‘no harm’ approach, and be incorporated within specified roles.

### 9.3.3 Continue to optimise DVA knowledge and data

It is acknowledged that DVA have a comprehensive working knowledge of the health needs of the veteran community, and supports improvements in health through a range of health and social support services. This has been a key factor in the successful engagement and recruitment of participants, and indeed the reason so many participants continued to the end of the trial. Some of the key considerations for designing technology for older people, relevant for many of the DVA clients, have been identified in a recent article:

- know the people you’re designing for (e.g. how they use technology, relationships)
- consider vision, hearing and motor skills (e.g. font size, button size, simple navigation)
- help strengthen relationships (e.g. focus on long-term trust, connect isolated/less mobile patients, and focus on a few strong relationships rather than a large unimportant social network).

This trial has also identified the need for ongoing monitoring of veteran health through access to reliable and integrated data sources to enable robust and multi-factor analysis. Access to data relating to emergency admissions, and hospital readmissions is not comprehensively linked to the DMIS data set. In addition, limitations on the availability of public hospital data and updated DRG and cost weight codes led to some delays in data collection and limitations in analysis.

Future program and service development should:

- acknowledge and optimise the strengths and competencies of DVA in understanding the unique needs of its clients
- support innovative data usage that informs service planning and development (e.g. monitoring and understanding current and projected veteran community health needs to support more efficient planning and resource allocation).

Importantly, to support ongoing evaluations, DVA should continue to monitor the impacts of the CVC Program on service utilisation and other health and wellbeing outcomes, to enable a clearer picture of the impacts of telemointoring on outcomes and costs. Consideration should also be given to trialling telemonitoring without CVC.

### 9.3.4 Enhance engagement with GPs into the future

As we have discussed in this report, the level of engagement by GPs in this trial varied across practices, and this reflects the ongoing pressures of capacity (prioritising clinical work over research), a focus on revenue, diverse approaches to change, and a fatigue associated with the constant stream of new technologies and developments in the health sector. It is noted in a range of studies that GP adoption of telemedicine has been ‘slow and patchy’, and that this may continue. Sector engagement with telemonitoring and other health technology is increasing however, as the healthcare market becomes more discerning around opportunities for efficiency, and meeting client expectations.

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44 Armfield NR, Edirippulige SK, Bradford N, Smith AC (2014) Telemedicine – is the cart being put before the horse? MJA 200 (9) · 19 May 2014
DVA acknowledge the importance of clear and consistent communication with practices about processes and roles, while being cognisant of their clinical priorities and capacity issues. This is also important in relation to involving practice staff in decision making at the trial design stage to support feasible options for role delineation and capacity for additional tasks. This approach also enables increased engagement and appreciation for the benefits an opportunities trials and/or technology can provide for the practice as a whole.

9.3.5 Monitor impacts of emerging telehealth technologies

This trial represented the technology capabilities of the time, including access to NBN (supporting low-cost high bandwidth communication, security, and ubiquity45), and the existing data compression capabilities. These technologies were aimed at increasing access, improving early detection, reducing costs and facilitating team-based and multidisciplinary models of care, enabling health professionals to deliver comprehensive, integrated and appropriate care (including through peer support)46. The NBN technology also enabled telehealth to be used for professional development and accessing after hour GP services (e.g. online triaging)47.

Just a few years on, technology and the choices it enables, is now changing the way health care is provided, and the way clients use health services. The rate and volume of emerging technology is exciting for the sector, but at the same time, there continues to be limited evidence supporting improved outcomes and cost-effectiveness. New technologies entering the market have the potential to increase competition, drive down costs, build the evidence base over time, and thereby increase adoption by providers.

Though changes in service utilisation have not been a significant finding of this trial, it is likely, that over time, with increased engagement, improved interoperability of systems, and reduced technology costs, that cost-effectiveness could improve substantially.

Emerging telehealth technologies and impacts across the sector include:

- plans to implement national telestroke network building on the success of the Victorian Stroke Telemedicine Program. This aims to support increased access to timely care for rural patients with stroke symptoms
- patients are now more discerning about controlling their own health (including owning and managing their own data), and acknowledge that technology is part of the future of healthcare (particularly those generations with earlier exposure to technology – e.g. Millennials). There will be more options for self-monitoring from connected personal devices into the near future
- increasing investment in digital and mobile health, particularly direct-to-consumer technologies48
- the rate at which technology is entering the market impacts the rate of redundancy for older technologies, which can be a frustration for technology consumers (cost, training, change). For example, Tunstall estimate that technology used to depreciate through a three-year plan, but that has now changed to 12 months

47 Australian Government (date unknown) Connecting health services with the future: Modernising Medicare by providing rebates for online consultations. A discussion paper from the Australian Government.
• emerging mobile software applications to support self-management (health and wellbeing) and enable health professionals to provide better care (e.g. impacting on screening program uptake, monitoring fitness, monitoring alcohol consumption, continuing education for professionals)

• the shift to engaging technology as a tiered care system for primary health – i.e. triaging through technology (e.g. Tier 1 – mobile app outputs and linkage; Tier 2 – real-time online messaging from a nurse; Tier 3 – teleconsulting; Tier 4 – clinic review). It is noted that this approach optimises efficient use of resources where the cost of lower tiers is less than the cost of a clinic review. This approach also supports increased stewardship from the patient’s perspective

• adaptation of health system to cater for increased choice and consumer directed care or individualised care models. For example, the Health Care Homes Trial that is supporting people with chronic disease to access timely and convenient care, and increasing choices for appropriate services

• use of post-discharge phone surveys to support re-admissions (potentially allowing health insurers to reduce premiums over time)

• a shift to states and territories funding telehealth infrastructure and services (i.e. beyond Australian Government)

• support for telehealth consultations outside of the traditional clinical setting (including provider benefits through Medicare Benefits Scheme, Medicare) 49

• increased implementation of high-speed broadband across Australia (including remote areas)

• as technology enters the primary health care market more, practices will need to engage more with it to keep a competitive advantage

• as technology is used more by patients, GPs and practices’ role will shift from collecting data to interpreting data in order to provide care and management

• as technology is used more by patients, the health insurer role may shift to helping clients manage financial accountability and risk preferences 50.

As the sector adopts further technology, and potentially shifts to a new health service delivery model over time, supports such as policy (and quality and safety standards and guidelines), a structured financing system (including MBS), workforce development, infrastructure development, feasibility assessments, and ongoing appraisals of stakeholder needs and expectations will also need to be reviewed.

9.3.6 Acknowledge need and impacts of psychosocial benefits

Psychosocial benefits such as reassurance and peace of mind, have been a key outcome of the trial, and this aligns with the sectoral shift to more holistic and an individualised care approach. Though these were not objectives of the trial, it will be important to consider and monitor clients’ future needs relating to peace of mind and existing social connectedness, and how broader services can be developed to meet this need. Measuring the return on investment for psychosocial benefits is challenging due to the complex nature of mental health and wellbeing, and presence of confounders for clear measurement. This is an area where further evidence (quantitative and qualitative) will benefit adoption of technology over time.

49 National Rural Health Alliance Inc (2013) E-Health and Telehealth in Rural and Remote Australia (Fact Sheet, August 2013)
Importantly also, broader application should acknowledge the significant benefits technology enables for improving social and emotional contact for isolated clients, and a feeling of reassurance to support peace of mind regarding their health, an important focus of life as people age.

9.3.7 Acknowledge Impacts on Relationship Benefits

Another important benefit highlighted across the course of this trial is the importance of relationships, and their impact on social health and wellbeing of members of the veteran community. DVA acknowledge that its clients have unique health needs, and the relationship with their health care provider is an important one, built on trust. This relationship has strengthened over the course of the trial for many of the participants through frequent communication, also resulting in improved health literacy and self-management (e.g. through opportunistic coaching), described above.

Further implementation or trials will need to be cognisant of the risk and impact of socialisation and short-term relationships between clients and a third-party service provider. Though most participants had a very positive experience with the service provider in the trial, there was a concern, that for older participants who often rely on ongoing relationships, that negative impacts such as isolation and despair would be experienced as the trial ended. The detailed off-boarding process and assessment of risk helped alleviate this potential risk for most participants in the trial.

In addition, the DVA liaison role working with practices was an important relationship and significant factor in improving engagement (including conveying benefits and anticipated outcomes, and building rapport and confidence) with practice staff, and should be maintained and developed for further implementation.
APPENDICES

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