

What is Needed for Telehealth to Deliver  
Sustainable Value to the Routine Operations of  
Health Care in Australia?

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# Table of Contents

<b>THESIS ABSTRACT .....</b>	<b>V</b>
<b>DECLARATION .....</b>	<b>VII</b>
<b>MANUSCRIPTS CONTRIBUTING TO THIS THESIS.....</b>	<b>VIII</b>
<b>CONFERENCE PRESENTATIONS ARISING FROM THIS THESIS .....</b>	<b>X</b>
<b>ACKNOWLEDGEMENTS .....</b>	<b>XI</b>
<b>STATEMENT OF CONFLICT OF INTEREST .....</b>	<b>XII</b>
<b>LIST OF TABLES.....</b>	<b>XIV</b>
<b>LIST OF FIGURES.....</b>	<b>XV</b>
<b>LIST OF ABBREVIATIONS .....</b>	<b>XVI</b>
<b>CHAPTER 1 - INTRODUCTION.....</b>	<b>1</b>
1.1 INTRODUCTION .....	2
1.2 ABOUT TELEHEALTH.....	3
1.2.1 <i>Defining Telehealth and Telemedicine</i> .....	3
1.2.2 <i>Telehealth in Context</i> .....	4
1.2.3 <i>The Dimensions of Telehealth</i> .....	5
1.2.4 <i>The History of Telehealth</i> .....	8
1.2.5 <i>The History of Telehealth in Australia</i> .....	9
1.2.6 <i>The Current Status of Telehealth in Australia</i> .....	11
1.3 ABOUT THIS THESIS.....	12
1.3.1 <i>Research Question and Logical Structure</i> .....	12
1.3.2 <i>The Research Program</i> .....	12
1.3.3 <i>Methodology</i> .....	14
1.3.4 <i>Epistemology</i> .....	15
1.3.5 <i>Outline of Chapters</i> .....	16
<b>CHAPTER 2 - THE VALUE OF TELEHEALTH: A REVIEW OF REVIEWS .....</b>	<b>19</b>
2.1 INTRODUCTION .....	20
2.1.1 <i>Measuring the Value of Telehealth</i> .....	20
2.1.2 <i>Scope of the Review</i> .....	21
2.1.3 <i>Aims of the Review</i> .....	21
2.2 METHODS .....	22
2.2.1 <i>Outcome Measures</i> .....	22
2.2.2 <i>Search Strategy</i> .....	24
2.2.3 <i>Narrative Synthesis</i> .....	25
2.3 RESULTS .....	25
2.3.1 <i>Reviews of Reviews</i> .....	25
2.3.2 <i>Search Results</i> .....	27
2.3.3 <i>Clinical Outcomes of Telehealth</i> .....	28
2.3.4 <i>Access to Health Care</i> .....	38
2.3.5 <i>Acceptability of Telehealth</i> .....	38
2.3.6 <i>Gap Analysis</i> .....	40

2.4	DISCUSSION .....	40
2.4.1	<i>The Value of Telehealth</i> .....	41
2.4.2	<i>The Quality and Scope of the Evidence</i> .....	42
2.4.3	<i>Limitations of this Review of Reviews</i> .....	43
2.5	CONCLUSIONS .....	45
<b>CHAPTER 3 - A SYSTEMATIC REVIEW OF ECONOMIC ANALYSES OF REAL TIME VIDEO TELEHEALTH .....</b>		<b>46</b>
3.1	PREFACE .....	47
3.2	PUBLICATION: A SYSTEMATIC REVIEW OF ECONOMIC ANALYSES OF TELEHEALTH SERVICES USING REAL TIME VIDEO COMMUNICATION .....	49
3.3	AFTERWORD: UPDATE AND COMMENTARY .....	62
<b>CHAPTER 4 - HOME MEDICATION MANAGEMENT BY VIDEOPHONE: TRANSLATION FROM PILOT PROJECT TO INTEGRATED SERVICE .....</b>		<b>63</b>
4.1	PREFACE .....	64
4.2	BOOK CHAPTER: HOME MEDICATION MANAGEMENT BY VIDEOPHONE: TRANSLATION FROM PILOT PROJECT TO INTEGRATED SERVICE .....	66
<b>CHAPTER 5 - A MIXED METHODS EVALUATION OF A SUSTAINABLE TELEHEALTH SERVICE .....</b>		<b>89</b>
5.1	PREFACE .....	90
5.2	PUBLICATION: HOME VIDEOPHONES IMPROVE DIRECT OBSERVATION IN TUBERCULOSIS TREATMENT: A MIXED METHODS EVALUATION .....	92
<b>CHAPTER 6 - THE TELEHEALTH SERVICES STUDY: INTRODUCTION AND METHODS .....</b>		<b>106</b>
6.1	INTRODUCTION .....	107
6.2	LITERATURE REVIEW .....	108
6.2.1	<i>The Problem of Telehealth</i> .....	108
6.2.2	<i>Explaining the Problem of Telehealth</i> .....	111
6.2.3	<i>Understanding Uptake</i> .....	111
6.2.4	<i>Understanding Sustainability</i> .....	116
6.2.5	<i>Comparing Success and Failure</i> .....	118
6.2.6	<i>Achieving wide-scale uptake</i> .....	120
6.2.7	<i>Summary of the Research</i> .....	121
6.2.8	<i>Theories of Uptake and Sustainability</i> .....	122
6.2.9	<i>Approach to the Development of a Theoretical Model for the Uptake and Sustainability of Telehealth Services</i> .....	125
6.3	TSS METHODS .....	126
6.3.1	<i>Ethics Approval</i> .....	126
6.3.2	<i>Sampling</i> .....	126
6.3.3	<i>Recruitment</i> .....	127
6.3.4	<i>Interview Schedule</i> .....	127
6.3.5	<i>Follow Up</i> .....	128
6.3.6	<i>Timeline of the Study</i> .....	128
6.3.7	<i>Grounded Theory Methods</i> .....	128
<b>CHAPTER 7 - THE STATUS OF TELEHEALTH SERVICES IN AUSTRALIA .....</b>		<b>130</b>
7.1	INTRODUCTION .....	131

7.2	RESULTS FROM THE TELEHEALTH SERVICES STUDY.....	131
7.2.1	<i>Identification of Australian Telehealth Services</i> .....	131
7.2.2	<i>Characteristics of Telehealth Services</i> .....	133
7.3	LITERATURE ON THE STATUS OF TELEHEALTH IN AUSTRALIA .....	134
7.4	MEDICARE DATA.....	135
7.5	DISCUSSION AND CONCLUSIONS.....	138
<b>CHAPTER 8 - THE UPTAKE OF TELEHEALTH SERVICES IN AUSTRALIA .....</b>		<b>139</b>
8.1	PREFACE .....	140
8.2	PUBLICATION 1: THE ROLE OF THE CHAMPION IN TELEHEALTH SERVICE DEVELOPMENT: A QUALITATIVE ANALYSIS.....	144
8.3	PUBLICATION 2: A QUALITATIVE STUDY OF ETHICAL, MEDICO-LEGAL AND CLINICAL GOVERNANCE MATTERS IN AUSTRALIAN TELEHEALTH SERVICES .....	147
<b>CHAPTER 9 - THE SUSTAINABILITY OF TELEHEALTH SERVICES IN AUSTRALIA.....</b>		<b>153</b>
9.1	PREFACE .....	154
9.2	PUBLICATION 1: A QUALITATIVE STUDY OF SUSTAINABILITY AND VULNERABILITY IN AUSTRALIAN TELEHEALTH SERVICES ..	157
9.3	PUBLICATION 2: CLINICIAN ACCEPTANCE IS THE KEY FACTOR FOR SUSTAINABLE TELEHEALTH SERVICES .....	171
<b>CHAPTER 10 – DISCUSSION AND CONCLUSIONS .....</b>		<b>200</b>
10.1	INTRODUCTION .....	201
10.2	THE FOUR SPECIFIC RESEARCH QUESTIONS.....	201
10.2.1	<i>Can telehealth deliver value to health care?</i> .....	201
10.2.2	<i>What is the status of telehealth services in Australia?</i> .....	202
10.2.3	<i>What is needed to increase telehealth uptake?</i> .....	203
10.2.4	<i>What is needed for telehealth to become sustainable?</i> .....	204
10.3	DISCUSSION OF THE THEORETICAL MODEL .....	205
10.4	FUTURE RESEARCH ON THE THEORETICAL MODEL.....	207
10.5	LIMITATIONS OF THE RESEARCH PROGRAM.....	209
10.6	FUTURE DIRECTIONS .....	211
10.6.1	<i>Current Trends and the Future of Telehealth in Australia</i> .....	211
10.6.2	<i>Recommendations for Telehealth Research</i> .....	212
10.6.3	<i>Recommendations for Practice</i> .....	213
10.7	CONCLUSIONS .....	214
<b>APPENDIX A - REVIEWS MEETING THE INCLUSION CRITERIA FOR THE REVIEW OF REVIEWS .....</b>		<b>216</b>
<b>APPENDIX B – MIXED METHODS CASE STUDY MATERIALS.....</b>		<b>222</b>
<b>APPENDIX C – TELEHEALTH SERVICES STUDY MATERIALS .....</b>		<b>238</b>
<b>APPENDIX D – LETTER OF ACCEPTANCE FOR PUBLICATION SUBJECT TO REVIEW .....</b>		<b>246</b>
<b>REFERENCES.....</b>		<b>250</b>

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## Thesis Abstract

Telehealth is the delivery of health care services at a distance, using information and communications technology. Telehealth can improve access to health care services through remote consultations, extend care for chronic diseases to the home, make more efficient use of the health workforce, and deliver savings in some aspects of health care. Despite this, telehealth implementation has been slow, fragmented, and frequently short-term. The central research question of this thesis is “What is needed for telehealth to deliver sustainable value to the routine operations of health care in Australia?”. This question is answered using a mixed methods approach, combining systematic and narrative reviews, economic analysis and a qualitative interview study of key informants.

The central research question contains four sub-questions:

### **1. Can telehealth deliver value to health care?**

A literature review of reviews synthesised the research evidence, concluding that telehealth can contribute positively to health care, although much research was of low quality and not generalisable. Two further pieces of research make an original contribution to this literature:

- a) A systematic review of economic analyses of the use of real time video communication in telehealth established that this was cost-effective for home care and on-call specialists, whereas results for rural service delivery were variable.
- b) A mixed methods evaluation of a service using home video communication to observe patients with tuberculosis was compared to the traditional in-person home visiting observational service. The telehealth service significantly improved the proportion of medication ingestion episodes that were observed, and the economic analysis showed cost-effectiveness.

### **2. What is the status of telehealth services in Australia?**

Data were obtained from the published literature, by searching MedLine, CINAHL and Informit databases post-2000, from 37 telehealth services investigated through the qualitative interview study, and from the Australian Government Medicare statistics. Analysis

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showed that Australian telehealth services are small, fragmented and low volume, comprising a very small percentage of total health care activity.

### **3. What is needed to increase telehealth implementation?**

Thematic analysis was conducted on data obtained during interviews with 39 clinicians, managers or researchers associated with 37 telehealth services. Analysis revealed that champions were the key factor in initiating telehealth services; these enthusiastic individuals drove the uptake of telehealth by persuading clinicians of the legitimacy of telehealth, and by building relationships between clinicians. As ethico-legal matters were regarded as a barrier to the uptake of telehealth, these were analysed separately, finding that privacy, security and consent were identified as issues, but that they were manageable in practice.

### **4. What is needed for telehealth to become routinely sustainable?**

Further qualitative data analysis using grounded theory methods produced an explanatory model proposing that clinician acceptance was the key factor in achieving sustainability. Clinician acceptance could overcome the major barriers of workforce pressure, low demand, limited resourcing and technology problems.

In conclusion, telehealth in Australia remains in an early stage of development. Supporting champions, plus engaging and building relationships between clinicians will enable telehealth to contribute to the overall sustainability of an effective and efficient publicly funded health care system.

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## Declaration

I certify that this work contains no material which has been accepted for the award of any other degree or diploma in any university or other tertiary institution and, to the best of my knowledge and belief, contains no material previously published or written by another person, except where due reference has been made in the text. In addition, I certify that no part of this work will, in the future, be used in a submission for any other degree or diploma in any university or other tertiary institution without the prior approval of the University of Adelaide.

I give consent to this copy of my thesis when deposited in the University Library, being made available for loan and photocopying, subject to the provisions of the Copyright Act 1968. The author acknowledges that copyright of published works contained within this thesis resides with the copyright holder(s) of those works.

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## Manuscripts Contributing to this Thesis

### **Published**

Wade V, Elliott J, Karnon J and Elshaug AG. A qualitative study of sustainability and vulnerability in Australian telehealth services. *Studies in Health Technology and Informatics* 2010; 161: 190-201

### **Published**

Wade VA, Karnon J, Elshaug AG and Hiller JE. A systematic review of economic analyses of telehealth services using real time video communication. *BMC Health Services Research* 2010, 10:233 doi:10.1186/1472-6963-10-233

### **Published**

Wade V, Littleford A and Kralik D. Home medication management by videophone: translation from pilot project to integrated service. In *Handbook of Digital Homecare: Successes and Failures* (Communications in medical and care computing) 2011 Bos L, Goldschmidt L, Verhanneman G and Yogesan K (eds) Springer-Verlag Berlin Heidelberg doi:10.1007/978-3-642-19647-8

### **Published**

Wade VA, Elliott JA and Hiller JE. A Qualitative study of ethical, medico-legal and clinical governance matters in Australian telehealth services. *Journal of Telemedicine and Telecare* 2012; 1-6.

### **Published**

Wade VA, Karnon J, Elliott JA and Hiller JE. Home videophones improve direct observation in tuberculosis treatment: a mixed methods evaluation. *PLoS ONE* 2012; 7(11):e50155.

### **Published**

Wade V and Elliott J. The role of the champion in telehealth service development: A qualitative analysis. *Journal of Telemedicine and Telecare* 2012; 18(8):490-492.

### **Accepted for publication 22<sup>nd</sup> May 2013, subject to revision**

Wade VA, Elliott JA, Hiller JE. Clinician acceptance is the key factor for sustainable telehealth services. *Qualitative Health Research*.



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An explanation and justification for the positioning of these publications is as follows:

*Studies in Health Technology and Informatics* is a book series (2011 impact factor 0.27) and this article, which had originally been accepted through a peer review process to be presented at the Global Telehealth 2010 conference, was subsequently chosen for inclusion in a volume of selected papers from the conference.

*BMC Health Services Research* (2011 impact factor 1.66) was the preferred option for the systematic review of economic analyses, and was chosen instead of a specialist health economics journal because it was aimed at health providers and administrators who are considering the value of telehealth for their services. This review was marked by the journal as 'Highly Accessed', and has been cited 19 times as recorded in the Web of Knowledge (accessed 8 June 2013)

A book chapter was submitted to the *Handbook of Digital Homecare* (no impact factor) because this format allowed for a detailed description of the development and operations of the home telehealth service which forms the major case study of this thesis.

Two articles, about ethico-legal issues in telehealth, and the role of the champion in telehealth uptake, were published in the *Journal of Telemedicine and Telecare* (2011 impact factor 1.207) as this is one of the two leading specialist journals in telehealth, and these articles would be of interest to those directly engaged in the field.

*PLoS ONE* (2011 impact factor 4.09) was selected for the mixed methods evaluation of the home telehealth service. There were two reasons for this choice: firstly as the article was about direct observation for tuberculosis and may be of international interest, open access was considered to be important, and secondly, as the article contained three separate studies, it was relatively lengthy.

Finally, *Qualitative Health Research* (2011 impact factor 2.188) was chosen for the article presenting a grounded theory model of telehealth sustainability. Besides being the premier journal for qualitative research in health, this journal takes longer articles with a strong theoretical focus.

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## Conference Presentations Arising from this Thesis

1. Wade VA Videophone delivery of home medication management; making the transition from a telehealth pilot project to an ongoing service. Health in Transition conference, Adelaide 16-20 August 2009
2. Wade VA Elliott, J, Elshaug A, Karnon J and Hiller J. How does telehealth change healthcare delivery? – a qualitative study. 40<sup>th</sup> Public Health Association of Australia Annual Conference, Adelaide, 27-29 September 2010
3. Wade VA A qualitative study of sustainability and vulnerability in Australian telehealth services. Global Telehealth 2010, Perth, 10-12 November 2010
4. Wade V, Hiller J, Karnon J, Elliott J and Elshaug A Home telehealth improves the effectiveness of Directly Observed Therapy for tuberculosis. Communicable Disease Control Conference, Canberra, 4-6 April 2011
5. Wade V, Hiller J, Elliott J, Karnon J and Elshaug A The organisational consequences of introducing telehealth – a qualitative study. Successes and Failures in Telehealth, Brisbane, 1-2 December 2011
6. Wade V, Hiller J, Karnon J and Elliott J Home telehealth improves directly observed therapy for tuberculosis. 9<sup>th</sup> HTAi Annual Meeting, Bilbao, 25-27 June 2012.
7. Wade V The role of the champion in telehealth service development: a qualitative analysis. Global Telehealth 2012, Sydney, 26-28 November 2012.

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I would like to thank my supervisory panel, who have been models of stability, responsiveness, and intellectual support. Janet Hiller, as primary supervisor, is generous with her time, ruthless with lack of clarity, and has generously concerned herself with my future academic career. I am not a natural born health economist, but Jon Karnon did his best with me, and has greatly advanced my knowledge in this field. Jaklin Elliott joined the panel later to take up the post of qualitative supervisor, and has provided excellent guidance in this area as well as being a very good editor. Adam Elshaug was my most constant support in the early years, and introduced me to many of the nuances of my new role.

I also want to thank Jeremy Hamlyn, who began this journey as my business partner and is now my academic colleague. It is partly his fault that I commenced this PhD in the first place. We also entered The University of Adelaide's entrepreneurs' challenge together, which was a very interesting and major diversion from timely completion.

Thank you Vicki Xafis; we had the kind of relationship that every PhD candidate needs; someone to share your data, talk over the minutiae of the methodology, and have long detailed sessions about one's developing theory.

Thank you Brita Pekarsky; who opened a blank Excel spreadsheet and invited me to free myself from fear when developing an economic model.

Thank you to the Qualitative Methods Discussion Group, who gave me confidence and enabled all of us beginning qualitative researchers to reach the next level.

And finally, thank you also to Belinda, who started a long and arduous period of study at about the same time as I did; our friendship has survived and grown as we have travelled together through long dark tunnels with occasional glimpses of high ground and breathtaking views.

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## Statement of Conflict of Interest

Throughout much of my PhD candidature, from July 2008 until the 30<sup>th</sup> June 2012, I had an association with a company that was offering telehealth services to the market on a commercial basis, and my decision to undertake a PhD was related to this association. A conflict of interest is therefore an important part of the context to this thesis, and a detailed discussion of the issue is warranted. The history and background to the conflict of interest is described first, followed by a formal statement.

### Background

I am a psychologist and general medical practitioner, and from 2000 to 2007, I was employed by the SA Divisions of General Practice Inc (SADI), an incorporated association which acted as the peak body for the Divisions of General Practice in the state of South Australia. SADI was funded by both the Australian Government and South Australian Government to implement projects and programs aimed at introducing new models of care in general practice which would improve patient health outcomes.

I was the Medical Director and then became the CEO of this organisation. In this role, I judged that e-health development would be a key factor in achieving these aims, which were supported by both levels of government, professional associations and many individual clinicians. The difficulties of implementation were, however, substantial, and in an attempt to overcome these I employed a network design engineer, Mr Jeremy Hamlyn, to implement a managed health network for general practice and primary care in South Australia, which could be used for secure transmission of health data and video communication. Grant applications to set up such a network were unsuccessful, and it further appeared that without ongoing external funding there was no business model that would encourage a diverse group of small health services to become part of such a network, or to continue to fund it once any initial grant was concluded.

From mid-2007, both I and Mr Hamlyn had ceased our employment with SADI, but we still considered there was a place for a managed health network in the private sector. To make such a network sustainable in a private setting, it needed to provide applications that health services might be willing to pay for, and video communication was chosen as the initial product. In this way, Mr Hamlyn and I entered the telehealth arena, using Mr Hamlyn's company, Design Networks Pty Ltd, as the vehicle for a commercial start-up to prove the

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value of the concept. Over the next five years, the company conducted several feasibility tests and pilot studies of telehealth services, with myself and Mr Hamlyn working in a medical-technical partnership, whilst searching for a model that would make e-health sustainable.

As part of this undertaking, I canvassed the academic literature and found that the problems we had encountered in e-health implementation were apparent worldwide. Specifically, the same difficulties we had experienced in transitioning pilot studies to ongoing services, in achieving large scale uptake, and in becoming sustainable, had been encountered by many others. Whilst much commentary and some research had been published, I considered that the problem was not well understood, and hence commenced this PhD.

## Declaration of Conflict of Interest

Formally, I declare that:

- I was the unpaid Medical Director of Design Networks Pty Ltd for five years, from June 2007 to June 2012.
- I never had any equity in Design Networks, which is 100% owned by Mr Jeremy Hamlyn.
- Over the course of this five year period Design Networks provided me with reimbursement of expenses for conference attendance, a laptop computer, and a videophone with associated connectivity.
- I received reimbursement of expenses for conference attendance on one occasion from Telstra, a large Australian telecommunications company.
- In 2008, I received \$2,000 from the Royal District Nursing Service of South Australia (RDNS SA), for conducting an evaluation of a pilot study of using home videophones for medication management(1). Design Networks supplied the technical infrastructure for the study and worked with RDNS SA on the clinical and technical implementation. This pilot project became an ongoing service, and I researched one aspect of this service as part of the PhD.

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## List of Tables

<b>Table 1-1</b> The History of Telehealth.....	9
<b>Table 2-1</b> MedLine Search Terms for Proposed Telehealth Effectiveness Review .....	21
<b>Table 2-2</b> Comparison of Reviews of Reviews in Telehealth .....	26
<b>Table 2-3</b> Exclusions of Review Articles .....	28
<b>Table 6-1</b> Comparison of Factors Affecting Telehealth Uptake.....	115
<b>Table 6-2</b> Factors Contributing to Successful Sustainability of Telehealth Services.....	118
<b>Table 6-3</b> Comparisons of Successful and Failed Telehealth Services .....	119
<b>Table 6-4</b> Interview Data Utilised in Each Publication .....	128
<b>Table 7-1</b> Identification of Australian Telehealth Services .....	132
<b>Table 7-2</b> Characteristics of Telehealth Services in the Interview Sample .....	133
<b>Table 7-3</b> Telehealth and In-Person MBS Consultations July 2011 to March 2013 .....	137

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## List of Figures

<b>Figure 1-1</b> Telehealth within its Broader Context .....	5
<b>Figure 1-2</b> Logical Structure of Enquiry .....	12
<b>Figure 1-3</b> Logical Structure of Research Questions .....	14
<b>Figure 2-1</b> Logical Structure of Research Questions .....	20
<b>Figure 3-1</b> Logical Structure of Research Questions .....	47
<b>Figure 5-1</b> Logical Structure of Research Questions .....	90
<b>Figure 6-1</b> Levels of Theory Relevant to Telehealth Implementation.....	122
<b>Figure 7-1</b> Uptake of Video Consultations in Australia July 2011 to March 2013 .....	136
<b>Figure 8-1</b> Logical Structure of Research Questions .....	140
<b>Figure 9-1</b> Logical Structure of Research Questions .....	154
<b>Figure 10-1</b> Logical Structure of Research Questions .....	201
<b>Figure 10-2</b> Model of Sustainability in Telehealth Services .....	203

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## List of Abbreviations

ADSL	Asymmetric Digital Services Line
CBT	Cognitive Behaviour Therapy
COPD	Chronic Obstructive Pulmonary Disease
DoH	Department of Health
DSL	Digital Services Line
ED	Emergency Department
EPOC	(Cochrane) Effective Practice and Organisation of Care
HbA1c	Glycosylated Haemoglobin
HTA	Health Technology Assessment
ICT	Information and Communications Technology
ICU	Intensive Care Unit
IP	Internet Protocol
IT	Information Technology
ISDN	Integrated Services Digital Network
MBS	Medicare Benefits Schedule
NBN	National Broadband Network
NTOIP	National Telehealth Outcome Indicators Project
OCD	Obsessive Compulsive Disorder
PTSD	Post-Traumatic Stress Disorder
QoL	Quality of Life
QALY	Quality Adjusted Life Year
RDNS SA	Royal District Nursing Service of South Australia
SADI	SA Divisions of General Practice Inc.
TB	Tuberculosis
TSS	Telehealth Services Study
UK	United Kingdom
US	United States