

## NATIONAL AGED CARE ALLIANCE

### POSITION PAPER

# Assistive Technology for Older Australians

#### About the National Aged Care Alliance

The National Aged Care Alliance (the Alliance) comprises 50 peak national organisations in aged care, representing consumer groups, providers, unions and health professionals, working together to determine a more positive future for aged care in Australia. As a leading voice for improvements to aged care for the past decade, the Alliance strives to implement its vision for ageing in Australia, that:

*Every older Australian is able to live well, with dignity and independence, as part of their community and in a place of their choosing, with a choice of appropriate and affordable support and care services when they need them.<sup>1</sup>*

Further information about the Alliance is available at <http://www.naca.asn.au/>.

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<sup>1</sup> National Aged Care Alliance (2015) Enhancing the quality of life of older people through better support and care, NACA Blueprint Series June 2015, available from: [www.naca.asn.au/Publications/NACA\\_Blueprint\\_2015\\_Final.pdf](http://www.naca.asn.au/Publications/NACA_Blueprint_2015_Final.pdf)

## Table of Contents

About the National Aged Care Alliance.....	1
Introduction .....	3
Potential directions for AT in aged care identified in the research report .....	4
Background .....	6
What is assistive technology? .....	6
How does it help?.....	6
Policy context .....	8
Funding and policy fails to meet need in aged care.....	8
Lack of alignment and consistency across programs or between sectors and jurisdictions .....	9
Risk of a two-tier System.....	10
What can be done? .....	11
Call for a national scheme .....	11
Cross-sector work and other opportunities .....	11
Conclusion .....	12
Recommended actions.....	13
Attachment 1: How AT for older Australians is funded .....	16
Attachment 2: Research Report.....	17

## Introduction

Assistive Technology is an intervention that has potential to address Australia's changing demographics and deliver positive health and wellbeing outcomes to older Australians. This Position Paper on Assistive Technology (AT) by the National Aged Care Alliance (the Alliance) is built on previous work undertaken by the Alliance including:

- A research report (commissioned by the Alliance). The Assistive Technology for Older Australians report (February 2018)<sup>2</sup>, found firm evidence that AT delivers independence, autonomy, safety and participation for consumers. Yet, as highlighted in the report, AT provision in Australia is currently inequitable, inefficient and, most importantly, fails to maximise government expenditure by taking advantage of the savings potential of assistive technology.
- A discussion paper by the Alliance on 'Improving the Interface between the Aged Care and Disability Sectors Discussion Paper (August 2016)'<sup>3</sup> exploring the current challenges faced by older Australians with a disability.
- The Alliance's Position Statement for the 2016 Federal Election (April 2016)<sup>4</sup> which called for a COAG agreement to develop a funded national aids, equipment and assistive technology program, along with a recommendation that the Productivity Commission identify the beneficial use of Assistive Technology.
- The Alliance's Blueprint 2 (June 2015)<sup>5</sup> which identified 'Securing access to affordable assistive technologies, aids and equipment' as one of 14 key areas of action needed in aged care.

In addition to building on our previous statements, this position paper explains our rationale for recommending action on assistive technologies before the finalisation of the NDIS rollout. A map of AT programs and departmental funding responsibilities for AT for older Australians across the Federal, state and non-government sources is presented in Attachment 1.

<sup>2</sup> The Assistive Technology (AT) for older Australians research project was conducted between September and December 2017. The project was undertaken by COTA Australia on behalf of the National Aged Care Alliance and overseen by a steering group of both Alliance members and AT industry specialists. Various bodies, organisations and individuals working in the AT field were also consulted as part of the project. The project led to the Assistive Technology for Older Australians: Rapid Evidence Review and Economic Pathway Analysis report produced for the Alliance.

<sup>3</sup> National Aged Care Alliance (2016) Improving the interface between the Aged Care and Disability sectors: A discussion paper, available from:  
<http://www.naca.asn.au/Publications/Improving%20the%20Interface%20Between%20the%20Aged%20Care%20and%20Disability%20Sectors.pdf>

<sup>4</sup> National Aged Care Alliance (2016) Position Statement for the 2016 Federal Election Enhancing the quality of life of older people through better support and care, NACA Blueprint Series April 2016, available from:  
[http://www.naca.asn.au/Publications/NACA\\_Blueprint\\_Election\\_Campaign\\_2016.pdf](http://www.naca.asn.au/Publications/NACA_Blueprint_Election_Campaign_2016.pdf)

<sup>5</sup> National Aged Care Alliance (2015) Enhancing the quality of life of older people through better support and care, NACA Blueprint Series June 2015, available from:  
[http://www.naca.asn.au/Publications/NACA\\_Blueprint\\_2015\\_Final.pdf](http://www.naca.asn.au/Publications/NACA_Blueprint_2015_Final.pdf)

## Potential directions for AT in aged care identified in the research report

The Assistive Technology for Older Australians research report attached to this report (Attachment 2) conducted a 'Rapid Evidence Review' of AT literature as it relates to older people, along with an 'Economic Pathway Analysis' assessing the economic benefits of AT products and AT services delivered in an 'AT bundle'. The Economic Pathway Analysis was applied to seven profiles representative of the range of functional impairments experienced by the older population. The economic pathway then assessed the cost of the required AT bundle, against the economic benefits of 'cost offsets (substitution)', downstream cost offsets (e.g. reduced hospitalisation) and the overall social benefits.

The research paper identified a range of possible policy directions for aged care which are outlined below:

### 1. Funding of AT information and awareness services

Consumers, and the practitioners and others who support them, want an independent source of trusted information. Enabling consumers to understand and locate relevant AT products and services is an essential first step to realising the potential benefit of AT. Australia has an effective system of information advisory service through the Independent Living Centre (ILC) network for many types of assistive technologies. This type of service meets the needs of most consumers and allied health professionals across all tiers of AT complexity, and functions as a 'safety net' of information across and between funding sources. Some types of AT however require alternative and more personalised information, such as for low vision/blindness information support services and nutrition support products and services.

### 2. Use of AT to complement service delivery costs

AT can provide solutions for individuals on all levels of packages. Importantly, AT can provide solutions to enable consumers on lower level support packages to meet their individual needs economically, preventing or reducing the need for more intensive levels of support.

### 3. Maximising the effectiveness of AT service provision and providers

AT services are essential elements of AT provision – government should ensure AT services are funded in concert with AT products. Funding to assess, trial, prescribe, implement and review AT is a critical component of any model of universal AT access. Opportunities exist to realise consumer choice and control by scaling existing capacity-building strategies for consumers interested in self-evaluation and skill building. Importantly, a collaborative approach between all allied health professionals should be supported. Maximising effective roles for allied health professionals includes supporting their currency and knowledge base via ILC-type services, and enabling the development of coaching type roles through funding streams.

#### 4. Developing better business models for prescribing and utilising AT

Given the evidence base suggesting AT products and AT services must be provided in an AT 'bundle' the current demarcations between clinical assessment, products sales (and possibly servicing), and installation / training / support and review, do not deliver a complete solution to older Australians requiring AT.

#### 5. Leveraging good practice from AT provision in NDIS into the aged care reforms

Government should consider adopting AT approaches used in the NDIS where these draw on good practice and evidence – specifically, a broad definition of AT including mainstream products; funding of AT services and AT products together; support throughout the AT supply, maintenance and review cycle.

#### 6. Building better data systems to inform policy

Government should consider utilising existing data sets on older AT users to better determine policy development on AT for older people. These data sets include DSS data on 65 and over disability support pension recipients and their service needs, as well as AT outcomes data in NDIS. In addition to the existing data sets, improvement is warranted across the aged care sector in the collection, analysis and publication of data.

#### 7. Considering utilisation of an economic impact model in funding AT and negotiating State/Commonwealth agreements to support funding appropriately at a Commonwealth Government level

Providing an AT bundle at or prior to the point of clinical need is demonstrably effective in minimising costly adverse events. Urgent consideration must be given to the early intervention and reablement needs of older Australians whose AT requirements will almost always exceed the current proposed AT (Goods and Equipment) spend under the Commonwealth Home Support Programme. This includes considering access to AT funding while on wait lists.

With these potential directions from the research paper in mind, the Alliance has developed numerous proposed actions for the Federal Government to consider. A summary is provided below and greater detail for each of these actions is provided at page 13:

1. Establish a national AT program.
2. Greater investment for AT in aged care.
3. Clearer funding and program responsibilities for AT in aged care across jurisdictions.
4. Better access to data.
5. Increasing consumer awareness and literacy around AT products and services.
6. Ensuring second-hand AT purchases are appropriate and meet Australian standards.
7. Better alignment of the aged care and disability service systems for provision of AT.
8. Appropriate identification of the disability-related needs of older people via the National Screening and Assessment Form (NSAF).
9. Availability of specialised AT advice and building capacity around AT in the aged care workforce.
10. Replicating successful AT models.

## Background

### What is assistive technology?

Assistive technology is a term used to describe the products and services which enable individuals' functioning and participation. Also known as 'aids and equipment', 'medical appliances' or 'medical devices', the term AT products refers to devices, equipment, instruments and software used by or for persons with disability<sup>6</sup>. Health technologies are a subset of AT products, including emerging smart home and information-communication-based technologies such as telecare, telehealth and monitoring systems. While many jurisdiction-based funders in Australia still use the term 'aids and equipment', the National Disability Insurance Scheme (NDIS) uses the term 'assistive technology' and the ANZ / ISO classification system. 'Assistive technology' is the term used throughout this paper and the AT research report.

### How does it help?

Globally, AT products and health technologies are noted to be '*indispensable to helping older people remain healthy, active and independent as long as possible*'<sup>7</sup>. A report prepared for Australia's Department of Health found AT to have '*enormous potential to improve the quality of life, mobility and independence of many Australians, enabling them to continue living at home and to remain connected to their communities for longer*'<sup>8</sup>.

AT promotes independence in addition to being cost-effective by offsetting health-related expenditure, for example, by minimising falls and secondary complications, thus decreasing the need for health interventions such as GP visits, emergency presentations, or hospital admissions.

AT is important particularly in early intervention stages of disability/disease. It should also be emphasised that AT often requires a multidisciplinary approach, for example allied health professionals play an important part in working on mobility, gait, strength etc in conjunction with provision of AT devices.

The social benefits, while harder to cost, are also extensive. Satisfaction, decreased difficulty and anxiety, increased confidence, participation, autonomy and decreased carer burden or injury are substantial contributors to overall health and wellbeing, and demonstrably save costs across the health sector. The Rapid Evidence Review demonstrates overall improved health and wellbeing for AT users including benefits in psychosocial factors such as increased confidence, participation, confidence, satisfaction and autonomy; maintenance of valued roles; better quality of life; as well as reduced difficulty and anxiety. These psychosocial benefits have been demonstrated to provide a direct correlation to mobility, independence and mental health and

<sup>6</sup> ISO (2016) Assistive products for persons with disability — Classification and terminology, Canberra, retrieved from: <https://www.iso.org/standard/60547.html>

<sup>7</sup> WHO (2015) World report on ageing and health, Geneva, retrieved from: [http://apps.who.int/iris/bitstream/10665/186463/1/9789240694811\\_eng.pdf?ua=1](http://apps.who.int/iris/bitstream/10665/186463/1/9789240694811_eng.pdf?ua=1)

<sup>8</sup> Connell, J., Grealy, C., Olver, K., & Power, J. (2008) Comprehensive scoping study on the use of assistive technology by frail older people living in the community, pp8

that people with increased social event attendance and higher self-satisfaction scores had lower hospital admissions, GP visits and number of medications.

Carer benefits include increased productivity, reduced personal injury and stress. AT considerably lightens the care load for family and friend carers by increasing the independence of the person being care for and enhancing the capacity of informal carers to sustain the provision of care in the home<sup>9</sup>. The person being cared for relies less on carers for mobility, including reducing the need for lifting and, in some instances, transport. Monitoring devices relieve carers from having to maintain constant vigilance of the safety and well-being of the person being cared for, freeing up time for them to pursue their own needs and interests.

Better access to AT also delivers wellness and reablement outcomes through its capacity to complement or supplement formal and informal supports such as the need for home care services. AT can prevent or reduce the need for more intensive supports and the research paper found that spending on AT has beneficial downstream impacts such as slowing the rate of admission to residential aged care services.

Older Australians usually require multiple AT products and related supports such as reablement strategies<sup>10 11 12</sup>. AT products are most effective when delivered as a bundle with AT services. AT services include any service that directly assists an individual in the selection, acquisition, or use of an assistive solution. Sometimes known as ‘soft technologies’ these service steps include evaluation, demonstration, education and trial, adaptation and review. AT services also include information and awareness-raising, informing potential AT users of the range of options which may suit their individual situation, and any indications or contraindications of use. AT services are essential to ensure the technology fits the person and their environment, and are effective in achieving the intended outcome<sup>13</sup>. AT products and services should be considered part of a suite of supports for older people to remain independent and in the home.

The Economic Pathway Analysis method used in the Alliance’s AT research project<sup>14</sup> combined clinically-indicated AT products and AT services into an AT bundle and costed this against benefits identified in the evidence base. The Pathway Analysis demonstrated the cost impacts of AT bundles for a comprehensive set of AT User Profiles constructed against a diversity of functional impairment and severity types. The analysis calculated cost offsets (savings due to money saved in other parts of the health or aged care sectors) and downstream costs (future expenditure avoided through early provision).

<sup>9</sup> Future Care - Care and technology in the 21st century, Carers UK, The voice of Carers, available from: <https://www.carersuk.org/for-professionals/policy/policy-library/future-care-care-and-technology-in-the-21st-century>

<sup>10</sup> DeCrean, Westendorp, Willems, Buskens, & Gussekloo (2006) Assistive devices and community-based services among 85 year old community-dwelling elderly in the Netherlands: ownership, use, and need for intervention, *Disability and Rehabilitation: Assistive Technology*, 1(3), pp199-203

<sup>11</sup> Gramstad, A., Storli, S. L., & Hamran, T. (2013) ‘Do I need it? Do I really need it?’ Elderly people’s experiences of unmet assistive technology device needs, *Disability and Rehabilitation: Assistive Technology*, 8(4), pp287-293

<sup>12</sup> Layton, N., Wilson, E., & Andrews, A (2014) Pathways to Non Complex Assistive Technology for HACC Clients in WA. Retrieved from Perth: <http://ilc.com.au/wp-content/uploads/2009/08/Full-Report-Pathways-to-Non-Complex-Assistive-Technology-for-HACC-Clients1.pdf>

<sup>13</sup> Cook, A., & Polgar, J. (2015) *Assistive Technologies*, in (4th Edition ed.), St. Louis: Mosby

<sup>14</sup> Assistive Technology for Older Australians: Rapid Evidence Review and Economic Pathway Analysis (2017), pp24

When savings over time were calculated, the AT report demonstrated value for money (more dollars saved than spent) across all scenarios. However, very few of the User Profiles used in the modelling would be able to establish an AT bundle up front with the limited amount of funding earmarked for AT within aged care. Furthermore, the economic modelling demonstrated that substantial cost offsets and downstream costs will be lost if AT is not introduced at the point of need as an 'early intervention'. Appropriate funding and service delivery contexts are therefore critical to ensure AT is provided in an effective way.

## Policy context

Currently, eligibility, access and out of pocket costs for AT provision in Australia differ depending on your age, level of disability, where you live, and importantly which service system you access. This is despite the Productivity Commission envisaging that such services would not differ regardless of the system a person was within and identifying a role for aged care systems to provide equivalent services to those in disability or compensable schemes<sup>15</sup>. See Attachment 1 for a map of AT programs and departmental funding responsibilities for AT for older Australians across the Federal, state and non-government sources.

## Funding and policy fails to meet need in aged care

Funding sources for AT in aged care range from Commonwealth and State and Territory governments to non-government sources, with poor alignment and consistency between schemes. No statewide or national funding scheme provides full access to AT despite assessed need being identified<sup>16</sup>. Access to AT will often depend on the funding program you are able to access and a consumer's ability to advocate for an AT solution. For example, the Rapid Evidence Review identified in Residential Aged Care some basic care equipment may be provided, but little, if any, holistic quality of life enabling AT is usually considered.

Since the Commonwealth took over responsibility for the funding of the aged care system, AT continues to remain under-utilised and under-funded. In July 2015 the launch of the Commonwealth Home Support Programme (CHSP) limited its reference to AT to a small discretionary annual spend of \$500 in total support per financial year under the 'Goods, Equipment and Assistive Technology' service type. Under this service type, the sub-type of AT includes communication aids, support and mobility aids, self-care aids, medical care aids, Reading aids, Car Modification and Other goods and equipment. Unfortunately, it would seem that not all aged care planning regions, or indeed all states are funded for this service type under CHSP. Where funding is available, it may not be available for all sub-types of AT needed by older Australians.

Similarly, limited references are made to AT within the Commonwealth Home Care Packages Program information<sup>17</sup>. Indeed, the Department of Health has at times reminded providers that

<sup>15</sup> Productivity Commission (2011) Disability Care and Support Final Report, Canberra, retrieved from: <http://www.pc.gov.au/projects/inquiry/disability-support/report>

<sup>16</sup> Jenny Pearson & Associates. (2013) Research for the National Disability Agreement: Aids and Equipment Reform, Final Report

<sup>17</sup> See Schedule 3, Care and Services of the Aged Care Act Quality of Care Principles, available from: <https://www.legislation.gov.au/Details/F2014L00830>

Home Care Packages are not designed to be used as an AT program where larger AT items are being sought and providers have noted that funding for AT within Home Care Packages often fails to meet the extent of the needs of ageing Australians with disabilities. Unfortunately, there are many service providers that are not encouraging the take up of AT because they are simply not aware of it and do not have processes in place to assist consumers to access it within their package (for example, policy and procedures around the purchase of second hand equipment). Best practice examples should be promoted by the Department and within the sector to encourage the increased adoption of AT within the HCP program.

Despite this, there are examples where service providers encourage the innovative use of ATs in Home Care packages. For example:

- vision impaired clients have been supported to buy or hire DAISY machines from Vision Australia (computerised text and audio books etc) and purchase talking scales so they can monitor their weight and self-manage complex medical conditions and medications.
- a client with a speech impairment and limited access to the community was supported to purchase an iPhone and iPad to help with her communication and socialisation.

The Commonwealth assumed responsibility for aged care in most States in 2015 (Victoria and Western Australia commencing later). State and Territory aids and equipment and AT schemes have traditionally ruled consumers ineligible for support if they are receiving high levels of support such as aged care Home Care Packages Levels 3 and 4 or residential care. More recently, State and Territory programs appear to have broadened their exclusions further, in some cases deeming ageing Australians ineligible if they are 'eligible for' any other Government funded programs (including Level 1 and 2 Home Care Packages)<sup>18</sup>. In addition, people fail to be referred for specialised assessments to help determine the correct level of Home Care Package as the National Screening and Assessment Form does not appropriately identify disability-related needs.

## Lack of alignment and consistency across programs or between sectors and jurisdictions

Funding models that align to ensure consistent models of care and systems that enable allied health professionals to work collaboratively will support equal access to healthcare for every Australian. Currently, consumers may access State and Territory AT schemes rather than using the funds available through CHSP. However, there is no national consistency in how this applies and the extent to which it is happening is unknown. Exclusion to AT programs can even occur simply by being deemed 'eligible' for aged care services, often long before such services commence.

Similarly, AT schemes across States and Territories have different budgets, scope, eligibility requirements and levels of subsidy. Some schemes require no consumer co-payments but limit eligibility and scope, while others have broader eligibility and scope but require user co-payments.

<sup>18</sup> National Aged Care Alliance (2016), op cit

Anomalies are also common across aged care programs. For example, one Alliance member reported a client was advised by a residential aged care facility that they are not required to provide a recliner chair, yet they do have to provide things such as walkers and wheelchairs. The client was advised he would have been able to receive one if he had been returning home. In contrast, other members have reported recliner chairs are commonly available in residential aged care.

After 2020, Australians requiring AT will be in a new policy landscape with the potential integration of care at home services for aged care and there is concern that further restrictions on eligibility of these State and Territory schemes will occur. Furthermore, State and Territory funded AT programs run the risk of reduced viability due to the incorporation of state funding into the NDIS.

### Risk of a two-tier system

In 2009 the Disability Investment Group set out a case for provision of aids and equipment as a fiscally responsible investment, to be realised by the NDIS and the National Injury Insurance Scheme (NIIS)<sup>19</sup>. The NDIS has developed a comprehensive AT Strategy and estimates that the NDIS spending on AT will reach \$1.06 billion per annum when the scheme is fully rolled out in 2019-20<sup>20</sup>. In addition, as part of its Participant Pathway reforms, NDIS participants will be able to access suitable funding up to \$1,500 to purchase low cost AT consumables<sup>21</sup>.

By 2019 the NDIS will take full responsibility from the States and Territories for disability-related assistive technologies for people who enter the NDIS before the age of 65 years. States and Territories will retain responsibility for aids and equipment for people not eligible for the NDIS<sup>22</sup>, whether health or disability-related. Older Australians are usually advised to access aged care services (via My Aged Care) for their ageing and disability-related needs and this is thought unlikely to change.

The Alliance considers equity and consistency of access an important principle and has concerns that, in an environment of on-going but differing reform across the ageing and disability sectors, a two-tier system could evolve. People who start the NDIS before age 65 can choose to keep receiving services under this scheme as they age<sup>23</sup>. However, people who acquire a disability over the age of 65 years and are consequently ineligible for NDIS will fail to have access to the same levels of AT provision as their NDIS counter-parts.

<sup>19</sup> Disability Investment Group. (2009) The Way Forward: A New Disability Policy Framework for Australia, Canberra, retrieved from: <http://www.fahcsia.gov.au/sa/disability/progserv/people/Pages/DisabilityInvestmentGroup.aspx>

<sup>20</sup> National Disability Insurance Agency October 2015 Assistive Technology Strategy, available at: [http://www.ndis.gov.au/sites/default/files/AT-Paper\\_0.pdf](http://www.ndis.gov.au/sites/default/files/AT-Paper_0.pdf). Figure quoted excludes special assessment setup and worn-hearing devices in the hearing equipment category. Figures based on NDIA actuarial team data on participants and plans, as at 30 April 2015

<sup>21</sup> Assistive Technology and Home Modifications Redesign Project Report (draft) (2016) NDIS, Canberra

<sup>22</sup> See section 3 of Schedule C to Bilateral Agreements for Transitioning to the NDIS. These are available at <https://www.coag.gov.au/node/525> (Commonwealth and NSW); <https://www.coag.gov.au/node/526> (Commonwealth and Victoria); <http://www.coag.gov.au/node/532> (Commonwealth and Queensland); <https://www.coag.gov.au/node/530> (Commonwealth and South Australia); <https://www.coag.gov.au/node/531> (Commonwealth and Tasmania)

<sup>23</sup> People with disabilities; My Aged Care website, accessed 5/4/2019: <https://www.myagedcare.gov.au/eligibility-diverse-needs/older-people-disabilities>

## What can be done?

### Call for a national scheme

The Alliance took steps to address concerns about policy shortcomings in Australia in relation to AT provision in aged care through its 2016 Election Position. This position states the need for a COAG agreement to establish *‘a funded national aids, equipment and assistive technology program which includes a statement on the process and timeframes for developing the national program’*. The Alliance’s discussion paper, *Improving the Interface between the Aged Care and Disability sectors*<sup>24</sup> supported this position. Better coordinated AT provision also formed part of the Alliance’s submission to the 2018-19 Federal Budget. The Legislated Review of Aged Care also identified the need for *‘resolution of the ongoing coordination and policy issues between the Australian and state/territory governments that is preventing optimal provision of aids and equipment to people over 65 with disabilities’*<sup>25</sup>.

### Cross-sector work and other opportunities

The deployment of AT within the NDIS may provide the aged care sector with models of efficiency and effective delivery of personalised AT services once maturity of the NDIS scheme is reached. A national AT scheme with the NDIS may allow greater economies of scale for procurement and development of innovation. This is particularly so in the case of technological solutions that may be higher in capital cost but have a longer life, provide better consumer outcomes and/or reduce future costs in other care settings, such as acute hospital services or residential aged care. NDIS data on AT may also provide good evidence to inform practice and aged care decisions and, in some cases, offer opportunities to deliver specialised services not commonly found within the ‘aged care’ system.

There is a growing trend within Government funded/subsidised programs to explore how second-hand items can be reutilised, many of which come through consumer-to-consumer sale channels such [ebay.com.au](http://ebay.com.au) and [gumtree.com.au](http://gumtree.com.au). The provision of guidance materials in this area may increase the uptake of formal OT assessments for such products which can have significant benefits for consumers who require AT products but have limited funds in their Home Care Package budget. Work would be needed to ensure such products are covered by our consumer law and meet Australian Standards.

Better information about AT can improve confidence in the use of AT among consumers. Older Australians and their supporters are active seekers of information about AT. Australia’s National Equipment Database (NED)<sup>26</sup> has over 1.2 million hits per year with 30% of visitors seeking product advice for themselves (86% of whom were over 50). A snapshot of 570 enquirers demonstrated AT products were sought to address daily living problems across over twenty domains including mobility and transfers, driving, self-care, self-management and monitoring,

<sup>24</sup> National Aged Care Alliance (2016), op cit

<sup>25</sup> Tune, D. (2017). Legislated Review of Aged Care, Canberra, retrieved from: <https://agedcare.health.gov.au/legislated-review-of-aged-care-2017-report>

<sup>26</sup> For more information, see: [www.askned.com.au](http://www.askned.com.au)

house-work and cooking, communicating, seeing and hearing, monitoring, lifting and carrying items<sup>27</sup>.

The National Aged Care Alliance would also welcome an opportunity to present to the Aged and Community Care Officials (ACCO) or any other group involved to address the issue of gaps, poor alignment and fragmentation of AT across the aged care service system. For example, the lack of clarity regarding consumer eligibility across State and Territory programs needs to be resolved as a priority and consumers should also be informed when registration with My Aged Care affects eligibility for access to other AT programs. In addition, to minimise ongoing costs and ensure current lengthy wait times for services do not impinge reablement principles, AT should be delivered as an early intervention to achieve optimal outcomes.

The National Assistive Technology Alliance (NATA) provides another opportunity for government to consult with all AT stakeholders (both within aged care and other sectors) in one setting around AT policy and planning. Established in 2017, NATA is a community of practice across a wide range of assistive technology (AT) stakeholders including peak bodies that represent AT service providers, AT suppliers, AT practitioners AT consumers, AT research and education and related allied health professionals.

## Conclusion

Australia's Survey of Disability, Ageing and Carers (SDAC) reports that 1,619,400 older Australians experience some limitation of activity,<sup>28</sup> representing around 43% of the total population over 65 years. 73.5% of these people with some limitation of activity need assistance with one or more activity<sup>29</sup> (around 1,190,400 people). The AT research report points to firm evidence that AT delivers independence, autonomy, safety and participation for consumers.

Yet older Australians are missing out on access to AT and its associated support services and are increasingly becoming confused about where they should go for information and assistance. This is partly caused by the poor alignment across sectors and between jurisdictions. Similarly, a lack of targeted funding for AT in aged care and lack of awareness of the benefits of AT amongst consumers, means people currently miss out on AT products and services that could help them stay at home longer.

Government currently does not maximise potential opportunities to leverage efficiencies and economies of scale with the NDIS. Therefore, in an environment of on-going reform across the ageing and disability sectors, the government is unable to capitalise on a service initiative that could prevent or reduce dependence on more intensive aged care services.

<sup>27</sup> GrowthAdvisors (2017) ILC National Equipment Database: Consumer Survey - Executive Summary (unpublished)

<sup>28</sup> Australian Bureau of Statistics Survey of Disability, Ageing and Carers Summary of Findings (2015) Severe or profound core activity limitation (654,900); moderate core activity limitation (713,700); mild core activity limitation (250,800) Table 3.1, , available from: [www.abs.gov.au/AUSSTATS/abs@.nsf/DetailsPage/4430.0.55.0092012?OpenDocument](http://www.abs.gov.au/AUSSTATS/abs@.nsf/DetailsPage/4430.0.55.0092012?OpenDocument)

<sup>29</sup> Australian Bureau of Statistics Survey of Disability, Ageing and Carers Summary of Findings (2015) Self-care, mobility, communication, cognitive or emotional tasks, health care, reading or writing tasks, transport, household chores, property maintenance, meal preparation, available from: <http://www.abs.gov.au/ausstats/abs@.nsf/Lookup/4430.0Glossary12015>

It will also be vital for governments and services to keep pace with changing expectations as younger cohorts, whose use of technology is more sophisticated than current users of aged care services, move into the aged care system. Technology infrastructure, including adequate internet access, will be an important component.

In contrast, the AT research report has identified that AT interventions are cost-effective and can decrease the need for health interventions such as GP visits, emergency presentations, or hospital admissions. Other benefits include increased confidence, satisfaction, autonomy, maintenance of valued roles, quality of life, and overall improved health and wellbeing in consumers. Carer benefits include increased productivity, reduced personal injury and stress. AT also considerably lightens the care load for family and friend carers by increasing the independence of the person being cared for and enhancing the capacity of informal carers to sustain the provision of care in the home.

## Recommended actions

Delivering national consistency and equity of access to AT programs and supports, leveraging good practice of AT provision in NDIS in aged care, enabling consumers to better understand and locate relevant AT products and services, and improved data were put forward by the AT research report as potential future directions for AT in aged care and are included at the beginning of this paper.

With these in mind and using the evidence outlined in this position paper, the Alliance proposes the following actions be considered before the finalisation of the NDIS rollout:

### 1. Establish a national AT program

COAG, through the Australian Health Ministers Advisory Council, makes the establishment of a national AT program a priority to address the gap for older people between the aged care and disability programs and to leverage cross-sector opportunities between disability and aged care. It is noted that in 2009 all levels of government in Australia agreed to nationally consistent aids and equipment schemes through the National Disability Agreement<sup>30</sup>.

### 2. Greater investment in AT in aged care

The Commonwealth Government invests additional funding into AT for older people to support the development and delivery of innovative AT solutions in home care and residential care for the aged care sector. Increased investment for AT in these areas will support positive, cost-effective outcomes for aged care consumers and carers, as well as for aged care workers. Any increased funding made available for AT should be based on evidence of clinical utility and cost effectiveness.

As an interim measure, funding available to consumers for AT should be incorporated into the CHSP, Home Care Packages and residential care service types at a threshold of \$1,000 as a minimum. For more specialised AT equipment at a higher cost, a pathway to review and approve applications for over-threshold funding in a timely manner needs to be considered

<sup>30</sup> Jenny Pearson & Associates (2013), op cit.

as part of the model. This will ensure greater consistency with the new AT pathway proposed by NDIS as part of its Participant Pathway reforms.

Funding for AT must be assigned for not only the purchase/hire/loan of the equipment but also the specialised assessment and training (where required) to deliver a complete solution for older Australians requiring AT. Funding should also cover servicing, reassessment, any ongoing training and support to ensure strong adoption of the AT equipment.

### **3. Clearer funding and program responsibilities across jurisdictions**

Clearer funding and program responsibilities across State and Territory and Commonwealth jurisdictions should be created as a priority to improve consumer understanding regarding eligibility. The Alliance stands ready to work with the Aged and Community Care Officials to address interjurisdictional alignment differences around AT funding and program responsibility and assist in improving communication processes to consumers about where they should go for AT support.

### **4. Better access to data**

Government considers developing goal-oriented outcome measures to better demonstrate AT outcomes and improve utilisation of existing data sets for older AT users. These include DSS data on 65 and over disability support pension recipients and their service needs, as well as AT outcomes data in NDIS, to drive policy development of AT for older people.

### **5. Increasing consumer awareness and literacy**

Increase consumer awareness and literacy of the availability and breadth of AT through development and delivery of specific programs. Improving community awareness of and funding to enhance Australia's National Equipment Database (NED) would be one solution to improving knowledge of AT. The NED has over 400,000 hits per quarter.

### **6. Ensuring second-hand AT purchases are appropriate and meet Australian standards**

Consideration is given to the development of minimum principles where government funds are used to purchase second-hand AT goods, particularly those purchased online or via consumer-to-consumer mechanisms where Australian Consumer Law may not apply as they do for 'new' purchases. Regulation in this area should consider the clinical appropriateness of funded second-hand AT products, that appropriate sanitation has occurred and a requirement that the product is in 'good working order'.

### **7. Better alignment of the aged care and disability service systems for provision of AT**

Government ensures the Continuity of Support (CoS) program for older people with a disability clearly articulates what alternative support there is for people who acquire a disability over 65 and who is ineligible for CoS.

**8. Appropriate identification of disability-related needs via the National Screening and Assessment Form (NSAF)**

The Department of Health reviews the appropriateness of the NSAF to ensure the disability-related needs for AT in older people are identified and that the aged care system will support older Australians with a disability.

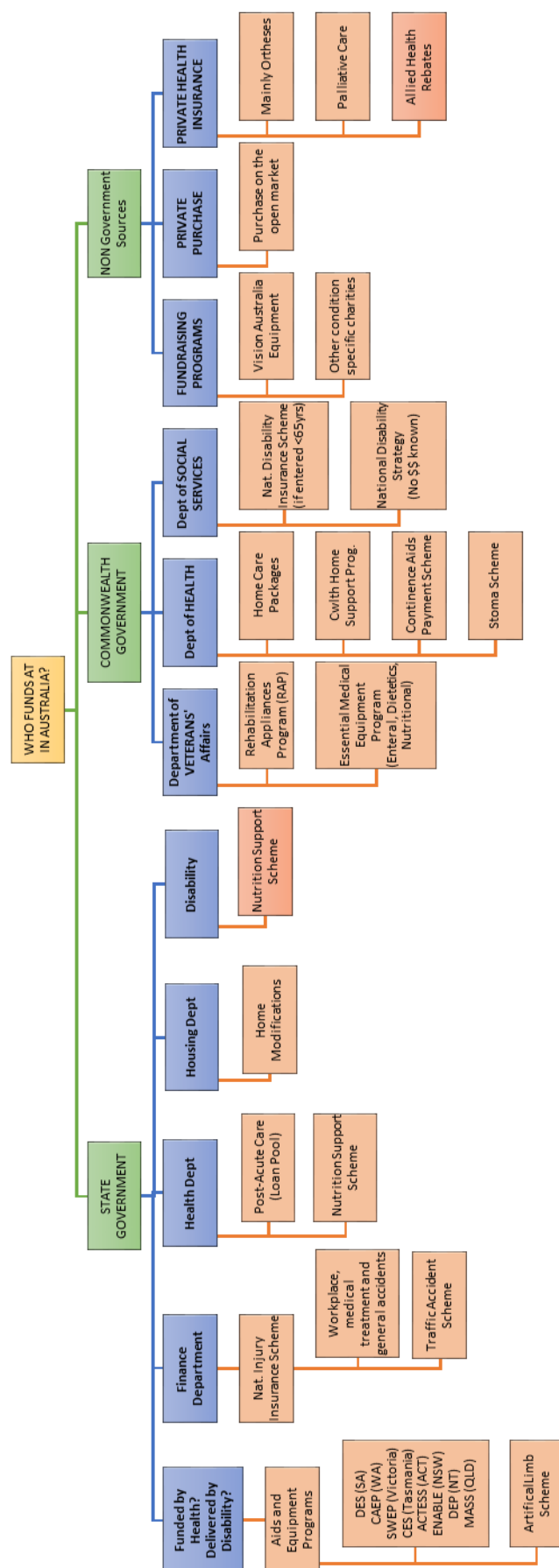
**9. Availability of specialised advice and building capacity in the aged care workforce**

Support is needed for aged care assessors and workers to develop and build capacity to better respond to the specialised advice needs of people with a disability.

**10. Replicating successful AT models**

Explore successful provider AT projects and models with a view to replicating these initiatives.

## Attachment 1: How AT for older Australians is funded



**Attachment 2**

# **ASSISTIVE TECHNOLOGY FOR OLDER AUSTRALIANS: RAPID EVIDENCE REVIEW AND ECONOMIC PATHWAY ANALYSIS**

**A RESEARCH REPORT FOR THE  
NATIONAL AGED CARE ALLIANCE**

*Project conducted by COTA Australia  
on behalf of the National Aged Care Alliance.*

**Report prepared by Dr Natasha Layton, Research and Policy Analyst, &  
Corey Irlam, Director, Advocacy & Government Relations, COTA Australia**

## Table of Contents

Steering Group .....	20
National Aged Care Alliance Contributing members .....	20
Other Contributors.....	20
Executive Summary .....	21
Results.....	21
Policy Directives .....	22
DELIVERABLE 1: RAPID EVIDENCE REVIEW: .....	244
1.1 Purpose .....	24
1.2 Background .....	244
1.3 Method .....	30
1.4 Results.....	333
1.5 Discussion.....	39
1.6 Conclusion.....	41
DELIVERABLE 2 ECONOMIC MODELLING via PATHWAY ANALYSIS .....	42
2.1 Background .....	422
2.2 Method .....	48
2.3 Results.....	58
2.4 Discussion.....	74
2.5 Assumptions and limitations.....	75
2.5 Extensions to this work .....	76
2.6 Conclusion .....	77
Appendix 1: AT Policy Design Principles in Australia and Internationally .....	78
Appendix 2: AT funding map for aged care .....	81
Appendix 3: Grid mapping of functional impairment groupings to assistive technology chapters, identified against likely funding sources.....	82
Appendix 4: Stakeholder feedback and revisions to AT profiles .....	84
Appendix 5: AT Bundle Pricing: lowest to highest .....	86
References .....	90

## Disclaimer

This report has been prepared for, but is not formally endorsed by the National Aged Care Alliance members. Members will consider the implications of this paper and accompanying policy paper in early 2018 through its usual consensus endorsement processes.

## Suggested Citation

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The project team would like to thank the leaders, academics and individuals interested in improving Assistive Technology for older Australians for their contributions to the development of this paper. In particular we wish to acknowledge the extensive support provided to the project team by members of COTA Australia, Steering Group, National Aged Care Alliance, the National Assistive Technology Alliance, Allied Health Professions Australia, Independent Living Centres and Victoria's Access to affordable AT for 65+ Campaign Coalition who have contributed to the contents of this paper, and reviewed its various iterations.

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## Steering Group

Rob Cummins	Macular Disease Foundation
Elizabeth Cummings	Australian Association of Gerontology
Hillary O’Connell	Independent Living Centre WA (ILC WA)
Heather Englehardt	Aged & Community Services Australia
Caile Ilhe	WA Health
Leanne O’Neill	Dementia Australia

## National Aged Care Alliance Contributing members

Annette Byron	Dietitians Association of Australia
Chris Grover and Matt Bevan	Uniting Care Australia
Fay Millington	The Royal Society for the Blind
Jessica Hayward	Speech Pathology Australia
Marcus Bleechmore	Vision Australia
Mark Choo	Macular Disease Foundation Australia
Michael Bleasdale	Home Modifications Australia
Rachel Norris and Jan Erven	Occupational Therapy Australia
Trish Johnson	Speech Pathology Australia

## Other Contributors

Members of the Victorian Assistive Technology for 65+ Alliance

Participants of the National Assistive Technology Alliance

Australian Orthotic Prosthetic Association

## Executive Summary

Evidence demonstrates that Assistive Technology (AT) provision in Australia is inequitable, inefficient and fails to maximise government expenditure by taking advantage of the cost potential of AT in substituting for other supports. Yet AT is an intervention with massive potential to address Australia's demographic changes, and deliver health and wellbeing outcomes to older Australians. The UK Audit Commission suggest '*If a drug was discovered with a similar cost-profile, it would be hailed as the wonder-drug of the age*' (2000:64). Australia's Department of Health and Ageing found AT to have '*enormous potential to improve the quality of life, mobility and independence of many Australians, enabling them to continue living at home and to remain connected to their communities for longer*' (2008:8). And globally, products and health technologies are noted to be '*indispensable to helping older people remain healthy, active and independent as long as possible*' World Health Organisation (2015).

In Australia, to address current policy shortcomings, the Alliance's 2016 Election Position states "*That a COAG agreement is established to develop a funded national aids, equipment and assistive technology program and which includes a statement on the process and timeframes for developing the national program*". This position has been referenced by the Legislated Review of Aged Care, which identifies the need for '*resolution of the ongoing coordination and policy issues between the Australian and state/territory governments that is preventing optimal provision of aids and equipment to people over 65 with disabilities*' (Tune, 2017, p. 11)

To inform and provide evidence for the Alliance position, the 'AT for Older Australians' research was commissioned. Mixed methods were used including a rapid evidence review of the black and grey literature, comprehensive consultation with sector experts, and economic modelling using a pathway analysis of AT costs and outcomes for a representative range of AT user profiles. Policy considerations utilising the evidence will be developed through the first quarter 2018.

The AT Project deliverables include 1) Rapid Evidence Review and 2) Economic Pathway Analysis

## Results

The Rapid Evidence Review found firm evidence that AT delivers independence, autonomy, safety and participation. AT is demonstrated to substitute or supplement formal and informal support work such as the need for home support hours. AT offsets health-related expenditure for example minimising falls and secondary complications, thus decreasing the need for health interventions such as GP visits, emergency presentations, or admissions. Research demonstrates that spending on AT has downstream impacts such as slowing the rate of admission to residential aged care services. Finally, social benefits, while difficult to cost, are extensive and include psychosocial factors such as confidence, satisfaction, autonomy, maintenance of valued roles, quality of life, and overall improved health and wellbeing for AT users and their circle of support. AT products are most effective when delivered in an AT 'bundle' with AT services. Appropriate funding and service delivery contexts are therefore critical to ensure AT is provided in an effective way.

The Economic Pathway Analysis method combined clinically indicated AT products and AT services into an AT bundle, and costed this against benefits identified in the evidence base. The Pathway

Analysis demonstrated the cost impacts of AT bundles for a diverse set of AT user profiles constructed against a diversity of functional impairment and severity types and is able to be extrapolated to the Australian populations they represent. In all cases, costs and benefit were identified from the base (first) year, growing exponentially over a projected 5 year time horizon. Very few of the profiles would be able to establish the required AT bundle up front with the current earmarked amount for AT within the aged care reforms. The economic modelling demonstrated that substantial cost offsets and downstream costs will be lost if AT cannot be introduced at point of need as an ‘early intervention’. A range of further sensitivity analyses and extensions of this method are possible to enable forecasting and policy formation to meet the needs of the full range of older Australians who require AT to live full lives.

## Policy Directives

The evidence base identified in the Rapid Evidence Review, and the Economic Pathway Analysis, support a clear range of policy directions:

### 1. Funding of AT information and awareness services

Consumers, and the practitioners and others who support them, want an independent source of trusted information. Enabling consumers to understand and locate relevant AT products and services is an essential first step to realising the potential benefit of AT. Australia has an effective system of information advisory service through the Independent Living Centre (ILC) network for many types of assistive technologies. This type of service meets the needs of most consumers and allied health professionals across all tiers of AT complexity, and functions as a ‘safety net’ of information across and between funding sources. Some types of AT however require alternative and more personalised information, such as for low vision/blindness information support services and nutrition support products and services.

### 2. Use of AT to complement service delivery costs

AT can provide solutions for individuals on all levels of packages. Importantly, AT can provide solutions to enable consumers on lower level support packages to meet their individual needs economically, preventing or reducing the need for more intensive levels of support.

### 3. Maximising the effectiveness of AT service provision and providers

AT services are essential elements of AT provision – government should ensure AT services are funded in concert with AT products. Funding to assess, trial, prescribe, implement and review AT is a critical component of any model of universal AT access. Opportunities exist to realise consumer choice and control by scaling existing capacity-building strategies for consumers interested in self-evaluation and skill building. Importantly, a collaborative approach between all allied health professionals should be supported. Maximising effective roles for allied health professionals includes supporting their currency and knowledge base via ILC-type services, and enabling the development of coaching type roles through funding streams.

#### **4. Developing better business models for prescribing and utilising AT**

Given the evidence base suggesting AT products and AT services must be provided in an AT 'bundle' the current demarcations between clinical assessment, products sales (and possibly servicing), and installation / training / support and review, do not deliver a complete solution to older Australians requiring AT.

#### **5. Leveraging good practice from AT provision in NDIS into the aged care reforms**

Government should consider adopting AT approaches used in the NDIS where these draw on good practice and evidence – specifically, a broad definition of AT including mainstream products; funding of AT services and AT products together; support throughout the AT supply, maintenance and review cycle.

#### **6. Building better data systems to inform policy**

Government should consider utilising existing data sets on older AT users to better determine policy development on AT for older people. These data sets include DSS data on 65 and over disability support pension recipients and their service needs, as well as AT outcomes data in NDIS. In addition to the existing data sets, improvement is warranted across the aged care sector in the collection, analysis and publication of data.

#### **7. Considering utilisation of an economic impact model in funding AT and negotiating State/Commonwealth agreements to support funding appropriately at a Commonwealth Government level**

Providing an AT bundle at or prior to the point of clinical need is demonstrably effective in minimising costly adverse events. Urgent consideration must be given to the early intervention and reablement needs of older Australians whose AT requirements will almost always exceed the current proposed AT (Goods and Equipment) spend under the Commonwealth Home Support Programme. This includes considering access to AT funding while on wait lists.

## DELIVERABLE 1: RAPID EVIDENCE REVIEW:

### 1.1 PURPOSE

Assistive technology (AT) is a key strategy to enable health and wellbeing by minimising the effects of functional impairment and facilitating activities and participation. The Alliance's 2016 Election Position provides two positions:

*12.1 That a COAG agreement is established to develop a funded national aids, equipment and assistive technology program and which includes a statement on the process and timeframes for developing the national program.*

*12.2. That the Productivity Commission be commissioned to investigate and increase the evidence base for better health, social and economic benefits that are achievable through increased use of aids, equipment and smart technologies (including those installed in the home) which reduce unnecessary dependency on alternative interventions.*

This research project considers how the Alliance position may be achieved. Methods comprise a rapid evidence review of the black (peer reviewed) and grey (reports and other non-academically sourced) literature, economic modelling of AT costs and outcomes for a representative range of AT user profiles, and data-gathering consultations with key stakeholders. The project:

- Provides an overview of the economic effectiveness of AT for elders.
- Identifies the AT needs of older Australians.
- Maps the types of AT required by older Australians.
- Evaluates current AT provision policies and models against need.
- Considers future AT policy for older Australians.

### 1.2 BACKGROUND

#### What is assistive technology?

Assistive technology refers to products and services which, combined with opportunities for use in desired occupations, across multiple environments, and without prejudice, enable individuals' functioning and participation (ARATA, 2016). Previously known as 'aids and equipment', 'medical appliances' or 'devices', assistive products (AT products) refers to any product (including devices, equipment, instruments and software), especially produced or generally available, used by or for persons with disability) (ISO, 2016). While many jurisdiction-based funders in Australia still use the term aids and equipment, the National Disability Insurance Scheme uses the current term assistive technology and also utilises the ISO classification system.

AT services include any service that directly assists an individual in the selection, acquisition, or use of an assistive solution. Sometimes known as 'soft technologies' these service steps are essential to ensure the technology fits the person and their environment, and is effective in achieving the intended outcome (Cook & Polgar, 2015). Internationally agreed service deliver steps include:

- Providing information: informing potential AT users of the range of options which may suit their individual situation, and any indications / contraindications of use.
- Evaluation / assessment: this can include self-evaluation for straightforward AT.
- Identifying and trialling assistive solution: an essential step to ensure AT fits within environments of use and with other AT products.
- Purchasing and customising the AT bundle.
- Maintenance and review to ensure ongoing and effective use, and to re-evaluate as needs or circumstances change (AAATE, October, 2012) (NDIA, 2015) (see Appendix 1).

## Assistive technology in context

There are essentially six ways to influence human functioning (Smith, 2002). Acute health services reduce the impairment through medical interventions such as surgery or pharmacology. Rehabilitation strategies aim to both reduce and to compensate for the impairment. Redesigning the activity is deployed in rehabilitation and in reablement. Two further approaches: redesign of the environment and the use of AT products are strategies used across the health continuum from acute to home based rehabilitation, reablement, and palliation. Figure 1.1 illustrates these approaches for someone cooking with arthritic joints.

The literature consistently reports that supports are most effective when provided as a bundle, for example the Cochrane Review of Reablement services concludes *‘the content of the intervention may encompass graduated practice in completing tasks, environmental adjustments and adaptive equipment, or enabling an older person to build up a social network’* (Cochrane et al., 2016, p. 7).


1.	<b>Reduce the impairment:</b> Surgery or medication for arthritic joints	
2.	<b>Compensate for the impairment:</b> Buy pre-chopped foods, meal home delivery	
3.	<b>Redesign the activity:</b> Use joint protection techniques and energy conservation strategies; cook foods requiring less handling	
4.	<b>Introduce AT products:</b> Cook with adapted utensils to provide mechanical advantage	
5.	<b>Redesign the environment:</b> Alter manual handling demands: minimise reach range and path of travel	
6.	<b>Use personal assistance:</b> support worker to cook	

Figure 1.1 Six ways to influence human functioning: cooking with arthritis example

Arguably all technology is ‘assistive’ as it enables humans to function in and manage their environments. International and Australian Standards offer a classification system to identify assistive technologies (whether mainstream products or especially made for people with disability or the

effects of ageing) (ISO, 2016). The ISO 9999 *Assistive Products for Persons with Disability - Classification and Terminology* has historically been adopted by Standards Australia<sup>31</sup> and is currently used by NDIS and national equipment databases<sup>32</sup> in Australia.

### Assistive technology, ageing, and disability

Assistive technologies are effective supports across the lifespan. While ‘disability’ and ‘aged care’ are often discussed and administered separately, demographic changes are altering the profile of AT users, as people with disability have greater longevity and are ageing, and older people may also age *into* disability. Figure 1.2 presents AT users as a subset of the combined total of ageing INTO, ageing WITH and frail AGED persons.

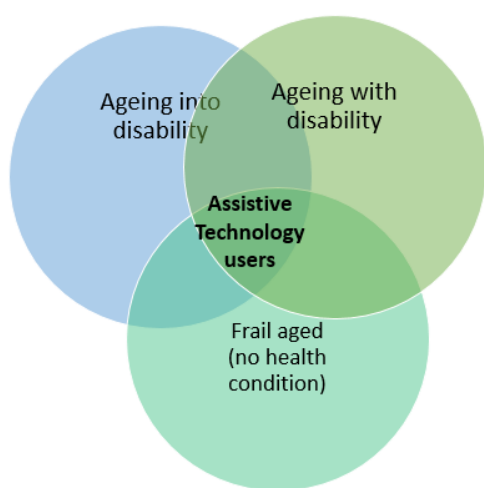


Figure 1.2 Diversity of AT users

Moving beyond perceptions of disability, illness or age, the World Health Organisation’s (WHO) new model of healthy ageing focusses on maximising functional ability as the ultimate goal of healthy ageing (WHO, 2015). The WHO states that even if an individual’s intrinsic capacity is diminished, the person may still be able to do the things that matter to them if they live in a supportive, enabling environment. Environment includes technologies, built environments, social contexts and service systems (World Health Organization, 2001).

Older adults use and value AT and demonstrate a range of improved outcomes. These include increased participation (objective and subjective), satisfaction, quality of life, well-being and inclusion. These are key primary outcome dimensions valued by AT users and resulting from tailored AT provision. Secondary outcomes include cost effectiveness (including minimising social costs and cost offsets), decreased support costs, lowered admission and readmission rates (Lofqvist, Nygren, Szeman, & Iwarsson, 2005; W. Mann, Llanes, Justiss, & Tomita, 2004)<sup>33</sup>.

Older adults utilise AT for a range of outcomes including independence, autonomy, safety and participation. Older Australians usually require multiple AT products and related supports such as reablement strategies and home modifications (DeCrean, Westendorp, Willems, Buskens, & Gussekloo, 2006; Gramstad, Storli, & Hamran, 2013; Layton, Wilson, & Andrews, 2014). Decades of

<sup>31</sup> AS/NZS & ISO 9999: 2018 *Assistive Products for Persons with Disability - Classification and Terminology*  
<https://infostore.saiglobal.com>

<sup>32</sup> See more available from [www.askned.com.au](http://www.askned.com.au)

<sup>33</sup> Lofqvist, C., Nygren, C., Szeman, Z., & Iwarsson, S. (2005). Assistive devices among very old people in five European countries. *Scandinavian Journal of Occupational Therapy*, 12(181-192).

Home and Community Care (HACC) funded services have provided allied health services (mainly provided by community health services or rural health services). These deliver assessment for AT and home modifications in order to increase and maintain functional independence, slow decline, decrease falls risks and delay admissions (Municipal Association of Victoria, 2014).

International conventions and reports (United Nations, 2006) (WHO, 2011, 2015, 2016) identify that people living with disability, of whatever age, have a right to the supports which enable a range of life outcomes<sup>34</sup>. The number of people aged 65 or older is projected to grow from an estimated 524 million in 2010 to nearly 1.5 billion in 2050: living longer will mean an increased incidence of impairments including cognitive decline, chronic age-related diseases, and limitations in physical activity, vision, and hearing (International Federation on Ageing, 2016). The number of people with disability in Australia is growing significantly at both ends of the life cycle, as the rate of informal carers decreases (Australian Senate, 2011). Around 3.7 million Australians (15% of the population) were aged 65 and over in 2016<sup>35</sup>.

Australia's Survey of Disability, Ageing and Carers (SDAC) reports that 1,619,400 Australians experience some limitation of activity over the age of 65<sup>36</sup>. Of these, 1,190,400 need assistance with one or more activity<sup>37</sup> (ABS, 2015). Australian AT policy for older Australians needs to take into account that for Australians over 65:

- 1,619,400 experience some limitation of activity;
- 1,190,400 need assistance with one or more activity;
- 461,000 use self-care aids;
- 487,000 use mobility aids;
- 657,600 use communication aids;
- 46,800 use meal preparation equipment;
- 479,900 manage health conditions using medical aids<sup>38</sup>.

<sup>34</sup> Persons with disabilities must be able to live independently, to be included in the community, to choose where and with whom to live and to have access to in-home, residential and community support services (Article 19). Personal mobility and independence are to be fostered by facilitating affordable personal mobility, training in mobility skills and access to mobility aids, devices, assistive technologies and live assistance (Article 20). To enable persons with disabilities to attain maximum independence and ability, countries are to provide comprehensive rehabilitation and rehabilitation services in the areas of health, employment and education (Article 26).

<sup>35</sup> For more information, see: <https://www.aihw.gov.au/reports/older-people/older-australia-at-a-glance/contents/health-and-functioning>

<sup>36</sup> Severe or profound core activity limitation (654,900); moderate core activity limitation (713,700); mild core activity limitation (250,800) SOURCE Australian Bureau of Statistics Survey of Disability, Ageing and Carers Summary of Findings (2015), available from: [www.abs.gov.au/AUSSTATS/abs@.nsf/DetailsPage/4430.0.55.0092012?OpenDocument](http://www.abs.gov.au/AUSSTATS/abs@.nsf/DetailsPage/4430.0.55.0092012?OpenDocument) Table 3.1

<sup>37</sup> Self-care, mobility, communication, cognitive or emotional tasks, health care, reading or writing tasks, transport, household chores, property maintenance, meal preparation, Australian Bureau of Statistics Survey of Disability, Ageing and Carers Summary of Findings (2015), available from: [www.abs.gov.au/AUSSTATS/abs@.nsf/DetailsPage/4430.0.55.0092012?OpenDocument](http://www.abs.gov.au/AUSSTATS/abs@.nsf/DetailsPage/4430.0.55.0092012?OpenDocument)

<sup>38</sup> ABS Personal Communication: Madeleine Markey (Disability, Ageing, Carers and Mental Health Section) restriction of Table 13 of the Survey of Disability, Ageing and Carers Summary of Findings publication to just those 65 years and over. Obtained 21.11.2017

These SDAC data cubes for disability and for older people were a primary source of demographic information used in this Research Report. The project has used the chronological age of 65 and over in line with the NDIS cut off and the main eligibility point for accessing aged care services. We note that indigenous people may access aged care at 50, but can continue to access NDIS until age 65. Additionally, we acknowledge perspectives from the disability literature which suggest ageing is experienced by those as young as 50 years due to vulnerability to risk factors resulting from physical impairment (Cooper & Bigby, 2014). While both these limitations indicate the uptake and need for AT could be higher than SDAC data predicts, it is unclear if this would be the responsibility of the Commonwealth and aged care areas.

## Costs and outcomes of assistive technology

The face validity of assistive technology is unmistakable. Particularly when viewed on an individual basis, AT is a powerful enabler of valued outcomes, and as a clear and obvious investment to prevent related and future (downstream) costs. The empirical evidence base for assistive technologies is growing, and the enormously wide application of assistive products across daily living areas has been identified. The impact of AT has been evidenced as effective and necessary to meet each one of the United Nations Sustainable Development Goals (Tebbutt et al., 2016). Based on such evidence, the World Report on Ageing and Health states '*Medical products, essential medicines and health technologies are indispensable to helping older people remain healthy, active and independent as long as possible*' (WHO, 2015, p. 110).

In Australia, the Department of Health and Ageing identify strong evidence for improved safety, independence, mobility, physical function, wellbeing and quality of life as well as reduced falls and hospitalisations:

*Assistive technology is one area with enormous potential to improve the quality of life, mobility and independence of many Australians, enabling them to continue living at home and to remain connected to their communities for longer. (Connell, Grealy, Olver, & Power, 2008, p. 6)*

## Current AT Policy

Current systems for AT provision in Australia differ based on age, disability, and location or jurisdiction, thus failing to meet equity criteria. The Disability Investment Group found the lack of essential equipment leads to increased disability, increased dependence and increased long-term costs, and yet noted that currently many Australians 'simply go without aids and equipment' (Disability Investment Group, 2009, p. 17). The Disability Investment Group set out a case for provision of aids and equipment as a fiscal responsibly investment, to be realised by the National Disability Insurance Scheme (NDIS) and the National Injury Insurance Scheme (NIIS). It is hoped that the deployment of AT within these schemes will provide the aged care sector with models of efficiency and effective delivery of personalised AT services. The NDIS is scheduled to be fully rolled out by 1 July 2019. As of 1 July 2016, the National Injury Insurance Scheme (NIIS) has been operational in each Australian State and Territory for motor vehicle accidents; but is yet to reach national coverage on workplace accidents, medical treatment or general accidents. AT policy within the NDIS to date provides an AT Strategy<sup>39</sup> which describes AT service provision steps, as well as a new way of classifying AT products across four

<sup>39</sup> For more information, see: <https://www.ndis.gov.au/providers/assistive-technology-strategy>

levels of complexity, linking this to the competencies needed to support their provision (see AT complexity hierarchy<sup>40</sup>).

In designing the new disability system, the Productivity Commission envisaged that services would not differ regardless of the system a person was within, and identified a role for aged care systems to provide equivalent services as those in disability or compensable schemes,

*People who acquired a disability after the age pension age would enter the aged care system, with the exception of the relatively few people experiencing catastrophic injury. The latter would be covered by the National Injury Insurance Scheme (NIIS) for their full lives, and so would generally lie outside both the aged care system and the NDIS, though potentially using some services common to both (Productivity Commission, 2011, p. 10).*

The realisation of the Productivity Commission vision for an aged care system is in progress with My Aged Care, however early indications suggest the role of AT is under realised. The Commonwealth Home Support Programme (CHSP) launched on 1 July 2015, includes service type 'Goods, Equipment and Assistive Technology', but limit its reference to a small discretionary annual spend,

*In general it is expected that clients who are unable to purchase the item/s independently will be able to access up to \$500 in total support per financial year under this service type. This cap applies in total per client, regardless of how many items are loaned or purchased. It is not a cap applied per item. For example, a client may lease a walking frame and shower chair in the same financial year for a total combined cost of \$450. These items include those which pose a low risk to the client or worker. Where a provider assesses it to be necessary, however, the provider has the discretion to increase the cap to \$1,000 per client per financial year (page 50)<sup>41</sup>*

Limited references are made to AT<sup>42</sup> within the Commonwealth Home Care Packages Program information. Indeed, the Department has at times reminded providers that Home Care Packages are not designed to be used as an AT program. In Residential Aged Care some basic care equipment may be provided. However, little if any holistic quality of life enabling AT is considered<sup>43</sup>. In practice, the small amount able to be spent on AT within Home Care Packages in no way meets the extent of the needs of many ageing Australians with disabilities, or the potent impact of early AT intervention on current and future cost savings for Australians ageing into disability. In addition, it would seem that the 'Goods, Equipment and Assistive Technology' service type funded under the CHSP appears to be only available in South Australia, and possibly in the ACT for Culturally and Linguistically Diverse (CALD) and Indigenous groups following the 2016 CHSP Growth Funding Round.<sup>44</sup> This CHSP service type is primarily used in this document as a comparator to demonstrate the hypothetical cost savings if the

<sup>40</sup> For more information, see: <https://www.ndis.gov.au/providers/assistive-technology-faqs.html>

<sup>41</sup> For more information, see: <https://agedcare.health.gov.au/news-and-resources/publications/fact-sheets/commonwealth-home-support-programme-programme-manual-2017>

<sup>42</sup> See Schedule 3, Care and Services of the Aged Care Act Quality of Care Principles available from <https://www.legislation.gov.au/Details/F2014L00830>

<sup>43</sup> See Schedule 1, Part 2, Care and Services of the Aged Care Act Quality of Care Principles available from <https://www.legislation.gov.au/Details/F2014L00830>

<sup>44</sup> For more information, see: [https://agedcare.health.gov.au/sites/g/files/net1426/f/documents/10\\_2016/appendix\\_a\\_chsp\\_growth\\_round\\_2016.pdf](https://agedcare.health.gov.au/sites/g/files/net1426/f/documents/10_2016/appendix_a_chsp_growth_round_2016.pdf): p 50

proposed AT bundles were established. However, we acknowledge that as this service type appears to be only funded in two states this is insufficient.

No state or national funding scheme provides full access to assistive technologies despite legitimate (assessed) need. Subsidy rates are not generally aligned to actual costs or to CPI, wait times usually apply, and processes are not fully person-centred (Jenny Pearson & Associates, 2013). Levels of funding are a key concern for individuals with disabilities, their carers, therapists, NGOs and peak bodies (Queensland Competition Authority, 2014). Appendix 2 lists current AT Funding Schemes for older Australians according to their funding source. Funding sources range from Commonwealth, State to Non-Government sources. Multiple departments are evident with four sources per state equalling 32 state jurisdictions as well as four commonwealth schemes, as well as a diversity of private health insurance options, and private purchase. It is as yet unclear who is responsible for non-aged care and non-NDIS-eligible AT users: potentially the National Disability Strategy (led by the Department of Social Services) bears responsibility here, or state health/disability services under the Health and Hospitals Agreement. It is noted however that a substantive gap exists in other scenarios for those requiring AT, for example blindness-related AT is excluded from South Australia's AT funding programs. After July 2019, Australians requiring AT will be in a new policy landscape, and now is the time to address these concerns. The 2017 Legislated Review of Aged Care identifies a clear role for AT within wellness and reablement, proposing (Recommendation 29) with choice and support for independent living to be enabled through:

*increasing access to short-term reablement supports and/or episodic care, rather than the provision of ongoing care, including an increased focus on the use of assistive technology enabling better integration with other available support systems such as the health care system and community-based support (Recommendation 29) (Tune, 2017).*

To enable equitable access to AT, Recommendation 34 states:

*That the Australian, state and territory governments work together to resolve current issues with the provision of aids and equipment for older people (Tune, 2017)*

The availability and update of technology within the aged care sector is currently highly fragmented (Barnett, Reynolds, Gordon, Maeder, & Hobbs, 2017). Current evidence suggests less than one quarter of older Australians received funding to purchase needed AT<sup>45</sup>. Approaches which integrate the parallel strategies of activity analysis, task redesign and adaptation alongside the introduction of AT, result in ongoing cost savings for health and community services (AIPC, 2008). Based on this premise, the Project critically appraises the way in which AT is framed within the current Aged Care Reforms. Starting with evidence of the impact of AT in terms of costs and benefits, we identify features of Australian AT policy which will deliver on the needs and rights of older Australians, and represent good practice in terms of AT policy structure and government expenditure.

### 1.3 METHOD

The Project was conducted by the lead researcher in liaison with COTA senior policy personnel. A Steering Group comprising representatives of the aged care and AT sectors critically appraised

<sup>45</sup> An Evaluation of Assistive Technology Outcomes for Home and Community Care (HACC) Clients of the Independent Living Centre (ILC) Assistive Technology Service Final Report January 2014 <http://ilc.com.au/about/research-and-projects/>

method, preliminary findings, and deliverables, between September - December 2017. The following methods were employed:

## Literature

A rapid evidence review drew on the literature across a range of data sources. These included peer reviewed publications as well as the grey literature (international and national government and NGO reports; ageing peak bodies; key conference proceedings). A Search Strategy run in early October searched La Trobe University library, EBSCO (Ageline, CINAHL, ECONLit) and Google for titles or abstracts in the English-speaking literature with the keywords and synonyms (Equipment OR Technology) AND (Age OR Disability) AND (Economic OR Cost)<sup>46</sup>. The contents pages of key health economics and ageing journals were also scanned, and key authors contacted for any current work. Study selection drew on the subset of literature which was national in its approach or application and in the English language. The yield was triangulated with publications and studies suggested by the concurrent survey of key stakeholders.

Quality of evidence was considered<sup>47</sup>. Quality criteria ought to be applied to research to determine the validity of its claims. For the purposes of this Project, the application of any quality criteria to quantitative, qualitative or review studies was itself a benchmark of some rigor.

From a pragmatic perspective, it is recognised that AT is an under researched area, that as a multifaceted intervention it does not lend itself to high level studies such as randomised control trials, and at a basic level the causal link is often so clear (for example, use of a wheelchair compared with no wheelchair) that empirical studies are not indicated. The absence of foundational research however does mean there is often no baseline for funding arguments, and that policymakers have little to guide policy.

Lack of evidence does not mean AT is an unimportant field, but is more likely to reflect a low research priority put upon independent living technologies and community living compared with medical research (Dijkers, 2009), and also reflects on the workloads and scope of practitioners, the level of academic research interest, and the maturity of the AT sector in forging connections between practice, research and policy. Arguably, the Project at hand is evidence of that maturity, as well as the pressing need to inform policy with a cogent research base.

<sup>46</sup> Age (Impairment; older persons; elders; disability); Assistive technology (aids and equipment; independent living products; medical devices / medical appliances excluding implants); Outcomes (economic impact; independence; community living/ avoid residential care or hospital admission; function including slowed rate of decline or maintained function; health-related quality of life; wellbeing / autonomy).

<sup>47</sup>

NHMRC levels of evidence (NHMRC, 2009)	Hierarchy of qualitative health research (Daly et al., 2007)
Systematic reviews (level 1)	Generalisable (level 1)
RCT (level 2)	Conceptual (level 2)
Comparative studies with controls (level 3)	Descriptive (level 3)
Case series (level 4)	Single case studies (level 4)

## Sector Expertise

Concurrently with the literature review, focussed data gathering was conducted with key stakeholders including members of the National Aged Care Alliance (a body of 50 peak organisations in Australia representing the breadth of the aged care sector, including providers, consumers, unions and health professionals). This primary stakeholder set was supplemented with 15 national non-profit bodies working in the AT in Australia (via the National AT Alliance) and the Victorian-based Assistive Technology for 65+ Alliance. Face to face consultation at each phase was held twice with this group, taking a qualitative deep dive approach to test out and ascertain Project directions and findings. These representative groups were surveyed at the commencement of the Project (12 September) and asked for nationally-applicable evidence regarding:

- Current demographic and population sources regarding older Australians and morbidities.
- Evidence of the functioning / daily living problems that older Australians have.
- Evidence regarding the AT that older Australians use, and its effectiveness
- Other key issues related to AT and older Australians which people wish to raise.

A further stage of data gathering occurred (12 October) to gather feedback on the AT Tables and AT User Profiles (see Appendix 4 for feedback and revisions). Sector experts also contributed their perspectives on the role of AT for their specific participants (for example low vision aid users) or cohorts (for example progressive neurological).

Some important consensus statements emerged from these stakeholder groups:

- 'Its not just one device': there are often hundreds of AT products which can support an individual to achieve their specific outcomes.
- The solutions people need may be low through to high tech.
- Frailty and health measurement is not sufficient to sum up life for those ageing with a disability. A wholistic understanding of the person is needed and this must be understood by decisionmakers.
- Well-tailored AT bundles address and facilitate lots of outcomes including independence, safety, activity, and connectedness
- Policy and decisionmakers need to understand that a mix of rehabilitative, habilitative (wellness and reablement) and compensatory approaches may be required to maximise outcomes for one individual, over the ageing process.

## Economic Modelling

Economic methods were sought to establish policy-relevant approaches to framing AT costs and cost offsets. The advice of economic methodologists was canvassed in late September and a costing method devised for the Project. These will be reported in full under Deliverable 2, but the method of choice is a pathway analysis from the perspective of third party payers (personal communication: Deakin Health Economics).

Figure 1.3 illustrates a pathway analysis for AT. A pathway analysis compares inputs or costs (AT bundle, comprising AT products and AT services) with the resulting outcomes. Outcomes can be measured as:

- i) direct cost savings (for example saved downstream costs, or expenditure which is offset, avoided or minimised through AT provision), or
- ii) indirect costs savings (improved functioning, psychosocial and participation outcomes are recognised determinants of health and wellbeing).

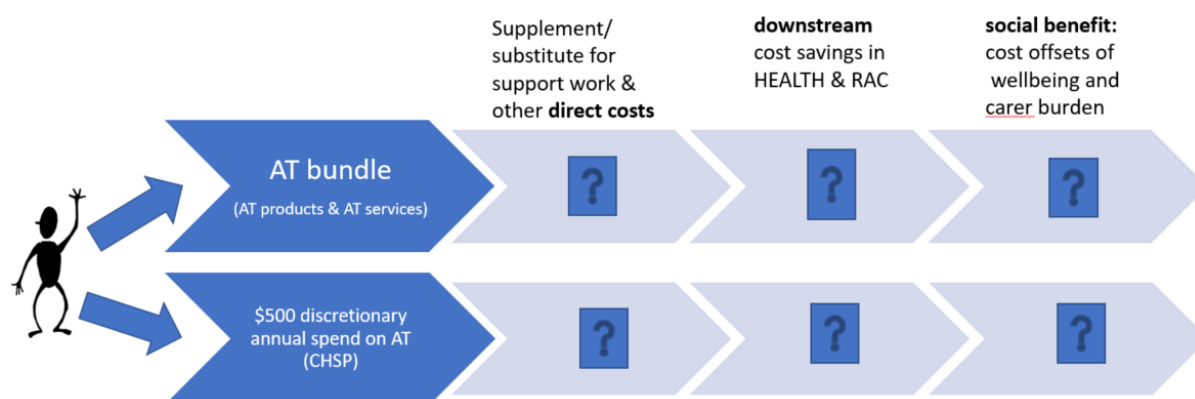


Figure 1.3 Pathway Analysis

## 1.4 RESULTS

Literature review and data (reports, references and links) from the sector informants demonstrate a diverse body of evidence, much of which remains current over a thirty year time span. While products on the market may be new, product categories are relatively stable (ISO, 2016). For some categories of AT, the literature in the last decade is now outdated, for example Information / Communication Technologies and Smart Home technologies. The diverse bodies of research (ageing, health, technology, rehabilitation technologies, information/communication technologies, disability) utilise different terminologies and outcome measures which makes it difficult to compare studies.

One of the highest levels of evidence available are Cochrane Reviews<sup>48</sup>: systematic reviews of primary research in human health care and health policy, internationally recognized as the highest standard in evidence-based health care resources. There have been two Cochrane Reviews related to AT. Both conclude there is little or no high-quality evidence for them to evaluate the effectiveness of, respectively, smart home technologies (Martin, Kelly, Kernohan, McCreight, & Nugent, 2008) and reablement for older adults, including technology (Cochrane et al., 2016). AT is identified as promising but not yet fully evidenced. Federici and Scherer propose rigorous pre- and post- single case studies as suitable to evidence AT interventions, given the heterogeneity of AT users and their individualised solutions (Federici & Scherer, 2017) and n of 1 studies are well-regarded in the evidence hierarchy. All evidence couples the AT product with a provision or 'prescription' process (Waldron & Layton, 2008). Although details about the skill or time input of allied health practitioners into this process are usually lacking from studies, reviews of AT abandonment and non-use rates make a direct correlation to the calibre provision (Federici & Scherer, 2017; Scherer, 2002; Wessels, Djicks, Soede, Gelderblom, &

<sup>48</sup> For more information, see: <http://www.cochrane.org/>

Witte, 2003). All studies of AT effectiveness include some combination of therapeutic ‘services’ such as assessment, set-up and adjustment, training, customising, conditioning, trial in real environments, and practical or psychosocial support.

Moving down the evidence hierarchy, other evidence of cost effectiveness is as follows.

### **Evidence of the effectiveness of AT (including minor home modifications) on independence and reducing speed of functional decline**

The highest level of evidence remains the work by Mann and colleagues which included a randomised control trial of the effectiveness of AT and environmental interventions in maintaining independence and reducing home care costs for 104 frail older adults over 18 months (W. C. Mann, Ottenbacher, Fraas, Tomita, & Granger, 1999). While both the intervention group and the control group declined in function, the control declined significantly more, demonstrating strong evidence that rate of decline can be slowed. Also, institutional and certain in-home personnel costs can be reduced through a systematic approach to provision, as this study demonstrated costs related to hospitalisation and nursing home stays were more than three times higher.

An Australian review of 51 articles concerning home modifications (Harris, Andrews, Logan, & Lee, 2016) conclude the following benefits:

- **Client benefits** - increased health, freedom, accessibility, confidence, independence, safety, privacy, self-rated ability, quality of life, and sense of normalcy. Reduced deterioration in health, fear of falls, depressive symptomatology, and reliance on formal and informal carers.
- **Caregiver benefits** - relief of burden, diminished worry, reduced personal pain / injury, and improved social inclusion and sense of security.
- **Social / economic benefits** - Cost effective compared to residential care; reduced health care costs as a result of fewer falls, faster hospital discharge, a reduction in cost of GP visits and hospital admissions, safer working environments for staff, and reduced demand on formal care and admissions to residential care.

A range of technologies were found to have a positive impact on enhancing senior's lives (Khosravi & Ghapanchi) in the area of health outcomes (body function; health condition); social influence (caregiving benefits; independent living and hospital readmission; and wellbeing (psychosocial effect, QOL). The AT ‘clusters’ which evidenced effectiveness were assistive technologies in clusters, namely, chronic disease management/ telemedicine; sensor technologies for falls prevention; ICT for dementia; use of robotics, general ICT and telemonitoring for wellbeing; sensor technologies for independent living; robotics and ICT for communication and emotional support, and medication management systems, although higher quality evidence is needed to quantify benefits.

Multi-intervention approaches such as restorative homecare or reablement demonstrate strong evidence on a range of outcome measures including functional independence, quality of life and decreased need for services (Lewin & Vandermeulen, 2010)<sup>49</sup>. A review by the Australian Institute of Primary Care (A.I.P.C., 2008) found strong evidence that multi-intervention approaches result in a reduced requirement for ongoing home and community care services in the short to medium term, as well as outcomes related to reduced admissions to hospital or residential care, caregiver burden, commitment and capacity to continue.

A substantive set of literature considers the cost effectiveness of home modifications, for example work of the UK Audit Commission in costing the need for personal support during waiting periods for modifications, and the loss of independence which accompanies this (Heywood, 2004; Frances Heywood & Lynn Turner, 2007)<sup>50</sup>. For the purposes of this Report, we have identified the scope of home modifications. We have costed and included minor modifications which entail AT (including handrails, handshowers, thermostatic mixers and switchcocks). We also include environmental changes which may not involve an AT product as such but are necessary to manage activities and participation within the home, using AT bundles which may include wheelchairs or hoists. Examples include non-structural doorway widening and level access, bench height and circulation space adjustments, and these are identified as adaptation / installation costs. We exclude more extensive home modifications which require removal of walls, extensions, and structural work across multiple rooms, noting these represent a smaller subset of home modifications and clinical judgement suggests are less likely to be deployed for older adults given time horizon considerations (Carnemolla & Bridge, 2011)<sup>51</sup>. This enables us to recognise the ‘technology chain’ and the need to consider and provide adjustments to the built environment alongside appropriate AT devices for use in these environments, but note that schemes to support major home modifications will have their own criteria and contexts to be considered.

### Evidence of the effectiveness of AT on specific cost offsets

A cornerstone study in 2003 conducted a large multivariate analysis with a cohort of ‘disabled elders’ to establish whether the use of equipment was associated with fewer hours of help. The authors sought to test the hypothesis that *‘common sense indicates that a hydraulic lift might reduce the time required to transfer a paralyzed patient from the bed to a chair; a raised toilet seat and grab bars might eliminate the need for help from another person when using the toilet; and use of a portable oxygen tank might enable independent mobility when otherwise exertional dyspnea might necessitate*

<sup>49</sup> Standardised outcome measures were used to measure functional dependency, morale, confidence in performing everyday activities without falling and functional mobility. Service outcomes were also examined at 3 months and 1 year. The HIP group showed improvements on all personal outcome measures compared with the control group. These improvements were, except for the morale scale, significantly associated with group assignment even when baseline differences between the groups were adjusted for. As regards service outcomes, the odds of the individuals who received HIP still requiring services was 0.07 (95% CI = 0.03-0.15,  $P < 0.001$ ) times those for the individuals in the control group at 3 months and 0.14 times at 12 months (95% CI = 0.07-0.29,  $P < 0.001$ ). The results of this study supported the hypothesis that older individuals referred for home care who participated in a programme to promote their independence had better individual and service outcomes than individuals who received usual home care.

<sup>50</sup> Delays lead to more costly options. One person received 4.5 additional home-care hours a week for 32 weeks, at a total cost of £1,440, when a door-widening adaptation costing £300 was delayed for 7 months for lack of funding. One London borough reported annual savings of £30,000 per client for two wheelchair users who were able to leave residential care due to the provision of adaptations in their homes. Another authority reported reductions in care costs of £1.98 million over five years as a result of an investment of £110,000 in 20 level-access showers.

<sup>51</sup> (personal communication: OTA home modifications special interest group, 2015)

*assistance from another person'* (Hoenig, Taylor, & Sloan, 2003, p. 330). Multivariate modelling showed a strong and consistent relation between equipment use and hours of help, with AT users reporting 3.8 ( $P = .008$ ) fewer hours of help per week than did those who used no technological assistance.

Economic modelling calculated savings<sup>52</sup> where respiratory AT was provided to elders with severe chronic obstructive pulmonary disease (Coughlin, Peyerl, Munson, Ravindranath, & Lee-Chiong, 2017), demonstrating reduced hospital costs and therefore reduced costs for third party payers.

An extensive body of work demonstrates the cost effectiveness of fall minimisation strategies, including AT. Outcomes include fewer falls, less hospitalisations, and delayed morbidity and mortality. The strongest evidence found a 1:1 return on investment for a comprehensive falls prevention program (Carande-Kulis, Stevens, Beattie, & Arias, 2010; Clemson et al., 2004). An impact assessment of AT systems<sup>53</sup> in nursing homes in the UK found falls reduced from 202 falls prior to AT introduction, to 112, with mean health care costs reduced by more than 50%. A full economic evaluation was not possible as the cost of AT installation was not calculated (Al-Oraibi, Fordham, & Lambert, 2012). The NSW Government commissioned an economic evaluation of community and residential aged care falls prevention strategies in 2011 concluding falls hazard assessment and deployment of AT, is effective, and providing figures for costs saved<sup>54</sup> (*An economic evaluation of community and residential aged care falls prevention strategies in NSW*, 2011).

A range of studies of home monitoring have promising results for example this study of healthcare use and savings concluded 'the participant group used substantially less custodial care, emergency department (ED) services, inpatient stays, and ED costs than the two control groups' (Finch, Griffin, & Pacala, 2017, p. 1301). In some instances, AT has been so cost effective that policies have adjusted and programmes rolled out widely across communities, (A Bowes, Dawson, & Greasley-Adams, 2013; Alison Bowes & McColgan, 2006; Magnusson & Hanson, 2005).

Mobility devices such as canes, crutches, and walkers, have a lengthy history of widespread usage and '*Little or no doubt exists that they benefit many users, notwithstanding uncertainty about the particular types of devices that enhance specific forms of mobility for users with particular impairments*' (Fuhrer, 2007, p. 150). Attempts to fiscally quantify benefit have been methodologically difficult. Hagberg et al concluded that provision of powered mobility to the elderly with disabilities appears cost effective and should be a standard intervention<sup>55</sup>, however noted difficulties with

<sup>52</sup> The hospital base case (250 patients) revealed cumulative savings of \$402,981 and \$449,101 over 30 and 90 days, respectively, for [optimal respiratory AT] versus comparators. For the payer base case (100,000 patients), 3-year cumulative savings with Advanced NIV were \$326 million versus no [optimal] respiratory AT and \$1.04 billion versus respiratory assist device [less optimal AT]

<sup>53</sup> Pull cord; Pendent alarm; Passive Infra-Red movement sensor; Flood detector; Falls detector; Urethra sensor; Pressure pad/mat (bed) Pressure pad/mat (chair); Speech unit; Control/response software on central computer

<sup>54</sup> Intervention: home hazard assessment (incremental cost per fall-related hospitalization avoided per 10,000 NSW older population over a 10 year period). Incremental cost/10,000 population (\$)3,780,000. Incremental falls avoided\*/10,000 population 1,315. Incremental cost per fall avoided (\$)2,875. Incremental hospitalisation avoided/10,000 population 56. Incremental cost per hospitalisation avoided (\$67,500) p.27

<sup>55</sup> Analyse the cost-effectiveness of prescribing powered mobility devices (PMDs) to elderly users. Methods: Forty-five persons participated in the pre- and post-intervention study with a follow-up at four months. All participants were prescribed a scooter model and were offered individual support to get started using the PMD. In the analysis, the use of the PMD was compared to the situation prior to its use. The cost-utility analysis takes a societal perspective and considers costs, savings and quality of life (QoL) using answers to the EQ-5D questionnaire. Results: Costs for the first year with the PMD were 1395 USD and then 592 USD per subsequent year. There was a significant decrease in transportation costs and

economic analysis methods which were not always appropriate (Hagberg, Hermansson, Fredriksson, & Pettersson, 2017).

The series of studies which are most methodically similar to this Project are The Equipping Inclusion Studies (N Layton & Walker, 2012) and subsequent 'Economic Potential of AT Solutions' report (N Layton & Walker, 2012). The method will be more fully explored in the Economic Modelling section of this Project, but the findings of these studies conclude:

*AT solutions are only fully effective when soft technologies (prescription, assessment, adaptation/fitting, training, maintenance, repairs, reviews etc) are provided along with the hard technology (AT device). Poor solutions not only reduce effectiveness but can also generate negative health outcomes and injuries. Investment in optimal AT solutions is demonstrated to offset other costs from a health and community services sector perspective, and to achieve multiple outcomes (N Layton & Walker, 2012, p. 2)*

### Evidence concerning AT services

AT services research has not delineated service steps in a way that makes it easy to identify their impact or effectiveness. This is complicated also by the very different service and policy settings in each country. Two key pieces of grey literature emerged through the sector reference group and are reported below.

#### Information Services

Australian seniors are actively searching for information and support on AT. Australia's National Equipment Database (NED)<sup>56</sup> has over 400,000 hits per quarter. Two thirds of NED visitors sought product advice on behalf of others, most of whom are over 50 years old (75%). Of the one third of visitors seeking products for themselves, 86% were over 50. A snapshot of 570 enquirers demonstrated AT products were sought to address daily living problems across over twenty domains (WHO ICF) including mobility and transfers, driving, self-care, self-management and monitoring, house-work and cooking, communicating, seeing and hearing, monitoring, lifting and carrying items<sup>57</sup>.

The pattern of engagement with NED and in other evaluations of technology sourcing and use (Layton et al., 2014) illustrates that older Australians engage with AT at multiple points and to address a diversity of daily living challenges in their lives. Older Australians and their supporters are active seekers of information, and impartial information is one important element of a pathway of many steps to find out about, locate, trial, fund, integrate and review AT into their lives.

#### Allied Health Practitioners

Of approximately 23 recognised allied health professions, a subset are involved in AT. The evidence reviewed for this paper suggest that currently occupational therapists have the broadest 'reach' across AT product categories but a range of professions address focal product areas including physiotherapy,

in relatives' time use, but the increase in QoL of 0.041 was not significant. Conclusion: Prescription of PMDs to elderly users might be cost-effective. However, there are shortcomings in measuring QALY gains from the use of a PMD, and it is unclear how time savings among relatives should be valued

<sup>56</sup> For more information, see: [www.askned.com.au](http://www.askned.com.au)

<sup>57</sup> GrowthAdvisors. (2017). ILC National Equipment Database: Consumer Survey - Executive Summary.

speech pathology, orthotics and prosthetics, podiatry, dietetics, orthoptics, audiology, and related professions such as pedorthics, rehabilitation engineering, and nursing.

A recent survey of the AT provision practices of allied health practitioners generated responses from 24 professionals drawn from occupational therapy, speech pathology and dietetics (personal communication AHPA, 2017<sup>58</sup>). Results indicated a substantial focus currently on the impact of NDIS, with a limited response set regarding older Australians and their AT needs. Other key barriers to delivery of AT were identified as follows:

#### *Service provision / policy barriers*

- Respondents were concerned about perceived inequities across jurisdictions and systems and a lack of consistency/coordination across the health/disability/aged care sectors. E.g. AT funding and implementation support for AT within National Disability Insurance Scheme vs Commonwealth Home Support Programme, is inequitable.
- Respondents strongly agreed that a single, national cross sectoral system for funding and supporting provision of AT would lead to improved efficiency and effectiveness, and that age or diagnosis ought not be a barrier to AT provision.
- Professional recommendations may be overridden by funders.

#### *Good Practice barriers*

- Practitioners struggled to provide appropriate team-based assessment, trial, prescription, provision and support for AT implementation and review, partly due to lack of funding for the whole assessment-intervention continuum of care.
- Lack of knowledge/understanding by funders of the range and value of AT available.
- Lack of knowledge/understanding by consumers of the range and value of AT available.
- Lack of knowledge/understanding of the importance and value of allied health professionals in supporting provision of AT.

Information services were identified as highly important as a resource to keep professionals current and appraised of current AT, and a valued option for clinical discussion. Allied health respondents described operating in contexts of reduced efficiencies in service provision: loss of block funded services and a move to fee-for-service individualised provision has led to, among other things, a reduction in funding/inadequate funding to enable provision of safe, high quality services. Respondents commented on a lack of understanding the cost and time to do a proper assessment and follow up, and the loss of systems to support trial, loan, maintenance and repair or replacement of AT. Practitioners stated it was not always easy to find out and understand what funding is available to support the provision of AT. Practitioners were not always able to provide sufficient training to the client and family to successfully implement AT.

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<sup>58</sup> Survey of 7 professions, responses from n-24 participants across OT, speech pathology, dietetics.

## 1.5 DISCUSSION

AT is effective – it can enable people to manage their daily lives and achieve their goals despite the impacts of disability or ageing. It is positively linked with quality of life, autonomy, independence, longevity and wellbeing. The evidence, still emerging in the literature but robust from user, practice and policy perspectives, supports AT as an effective strategy (Connell et al., 2008) despite gaps in research<sup>59</sup>.

The effectiveness of AT is such that it is enshrined in multiple clinical practice guidelines see for example (Australian Wound Management Association, 2011), and protocols<sup>60 61</sup>.

AT is not always deployed or researched in a fully consumer-focussed way. Many of the studies investigating the use of technology for improving ADL show a lack of rationale for choice of technology, little involvement of older people in technology selection, lack of clarity re the goals of older people and a lack of tailored approaches (Fleming, 2014; Piau et al, 2014). If the end users of AT are not empowered to co-produce and collaborate on the development of AT, a critical opportunity for appropriate co-design is lost. For example, the emerging concerns that surveillance and monitoring technologies may in fact be experienced as a form of restraint, and the need for an ethical framework in their application (Chung, Demiris, & Thompson, 2016).

AT services are necessary to deliver many AT products: regardless of technical complexity, the match of product to person, task, environment can require skill and knowledge: these skills can be learned by expert AT users and supporters also (N Layton, Andrews, & Wilson, 2015; Walker & Layton, August, 2017). Qualitative findings tell us that older Australians will have individualised ideas and responses to the experience of utilising technologies, and of substituting or supplementing personal support work with technology. In the interests of overall social connectedness and interdependence, technology must be deployed with sensitivity. The work of AT services (AT practitioners such as allied health staff and related personnel) in informing, educating, introducing and balancing technology into a persons' life and environment is critical to this conversation in order to maximise effective use and minimise AT abandonment: noting the potential to upskill AT users in self-evaluation and AT competency in the new era of choice and control. In terms of choice, autonomy, self-sufficiency and privacy may be *'worth some residual difficulty in carrying out tasks independently compared to using personal care services'* (Verbrugge & Sevak, 2004, p. 41).

The current situation in Australia is problematic as evidenced by the large and disparate funding map (see Appendix 2). The advent of the NDIS is further illuminating a range of unmet and undermet needs: The real impacts of reform can be found in submissions to the National Disability Strategy Senate

<sup>59</sup> Lack of Australian specific studies; Research where the older person is the centre of the research and not the technology; Studies investigating the viability of large scale implementation; Large-scale studies; Studies investigating social impacts (intended & unintended); How older people gain access, information and be assessed for assistive technology; Strategies to reduce costs and quantify outcomes; International comparative policy research

<sup>60</sup> For more information, see: <http://www.who.int/disabilities/publications/technology/wheelchairguidelines/en/>

<sup>61</sup> Centers for Medicare and Medicaid Services. Medicare Coverage Database [Internet]. Decision Memo for Mobility Assistive Equipment (CAG-00274N) [www.cms.hhs.gov/mcd/viewdecisionmemo.asp?id%143](http://www.cms.hhs.gov/mcd/viewdecisionmemo.asp?id%143)

Inquiry (Australian Senate, 2011). Over 90 submissions were received, with assistive technology provision noted as a key issue the subject of ten percent of the submissions<sup>62</sup>.

Impartial information services regarding AT products, considerations for their use, and pathways to obtain AT, is a critical first step. Both AT consumers and the allied health professionals who support them rely upon AT information services to canvass and interpret the AT marketplace. Table 1.1 lists good practice steps and asks who might take responsibility for funding these across the range of AT complexity levels. While hypothetical in nature, this query considers the potential effectiveness of funding various steps to achieve good AT outcomes.

AT Service Steps (good practice)	AT Complexity			
	Level 1 Basic	Level 2 Standard	Level 3 Specialised	Level 4 Complex
Information ** identify need/ goal evaluate options	Government should invest to support effective choices	Government should invest to support effective choices	Government should invest to support effective choices	Government should invest to support effective choices
Trial AT alternatives across environments & with other AT products in use**	Self Funded	Some may need Gov't Support	Some may need Gov't Support	May need Gov't Support
Funding**	Self Funded	Some may need Gov't Support	Some may need Gov't Support	May need Gov't Support
Implementation: ** delivery; fitting; training	Self Funded	Some may need Gov't Support	Some may need Gov't Support	May need Gov't Support
Followup:** troubleshooting; maintenance schedule	Self Funded	Some may need Gov't Support	May need Gov't Support	May need Gov't Support
Review of device** Review of person **	Gov't investment for prevention	Gov't investment for prevention	May need Gov't Support	May need Gov't Support
** potential role for AT practitioner/ provider / supporter				

*Table 1.1 Mapping steps of AT service provision against government provision*

<sup>62</sup> Macular Disease Foundation of Australia, National Disability Services, ANOUHD / Rights and Inclusion Australia; Self-help for Hard of Hearing People, Motor Neuron Disease Association, MS Australia, Alzheimer's Association, Speech Pathology Australia, ARATA, Deaf Australia, ACCAN, AMA, NDIS.

## 1.6 CONCLUSION

Funding of AT need to include both AT services and AT products. A foundation step is provision of impartial information and advice to educate potential users about AT in context, and to ensure other strategies (such as task adaptation) are understood and considered. Information services also support allied health professional practice. AT is most effectively deployed when AT services seamlessly offer the AT service provision good practice steps of information provision, evaluation/assessment, support through trials, adjustment and tailoring, coaching and skilling in self-monitoring and troubleshooting. It is likely a significant subset of tasks can be shared with non-allied-health practitioners and consumers themselves, however a risk based approach is required given the contraindications of many AT products.

Outcomes are multiple, and current research evidence understates the impact and outcomes of AT. Despite the speed of innovation, a stable set of product categories can be considered in scope for AT bundles.

AT is a 'multicomponent' interventions and its efficacy requires appropriate measurement. Rehabilitation research has underestimated the effectiveness of AT as it is often 'invisible' within a person's or community's context (Rust & Smith, 2005). AT products are most effective when combined with environmental modifications, service elements and personal support. Good indicative evidence speaks to:

- The potential substitution of AT for personal support, and/or supplementation of paid and unpaid personal support to achieve other goals and outcomes.
- Likely cost offsets where alternate expenditure is saved, or where personal capacity is increased, through appropriate AT bundle provision.
- Demonstrable downstream cost savings, with a significant lack of worked methodologies to fully cost these when we consider social and wellbeing benefits.

The Economic Pathway Analysis (Deliverable 2) more fully considers the evidence across these three parameters.

## DELIVERABLE 2: ECONOMIC MODELLING VIA PATHWAY ANALYSIS

The task of this Research Report is to ascertain the impact of AT in terms of costs and benefits, in order to identify features of Australian AT policy which will deliver on the needs and rights of older Australians, and represent good practice in terms of AT policy structure and government expenditure. This research draws on the literature base and grey sources such as reports and submissions to identify relevant economic concepts, to canvass relevant economic methods for use with AT and older Australians, to identify relevant and valid datasets, and to establish a method.

### 2.1 Background

Resources are scarce and must be utilised in the most effective way possible. Market forces and customer behaviour govern consumer spending, e.g. manage price points through competition, enable choice through advertising etc. However, many health-related interventions including assistive technology have the features of ‘merit goods’, where need rather than choice governs purchase, and the value of the product reaches beyond benefit to the individual purchaser. The AT marketplace also has characteristics of a ‘thin markets’: relatively few transactions means little competition and often a slow R&D cycle. Evidence of these problems include the AT Innovation Hub Scoping and Feasibility Study by NDIS<sup>63</sup> and the Queensland Competition Authority Price Disparities for Disability Aids and Equipment<sup>64</sup>.

Society has a range of principles to ensure that scarce resources are well-deployed, and to enact the social contract on behalf of citizens. In the health arena, merit goods such as hospitals are centrally funded as they are beyond any individual’s means, yet improve outcomes for all citizens. Some government support of the AT supply sector includes funding for bespoke items which markets do not provide, such as technical inventions through Technical Aid to the Disabled<sup>65</sup> and supporting R&D cycles<sup>66</sup>. Governments in Australia have, since the 1970’s, provided subsidy schemes to enable consumers to access AT for, usually, safety, independence at home, and community participation. These schemes differ in scope, subsidy, eligibility and efficiency.

### The Aged Care policy context

The aged care roadmap enshrines principles regarding choice and support and the aim of a market based and sustainable aged care system which is consumer driven<sup>67</sup>:

*By 2050, over 5 million older Australians will access aged care services. The current complex system contains care types which act independently of each other, as a result of fixed care settings and funding streams. This restrains the ability for a consumer to easily transfer between and choose services they need, and restricts smooth transition throughout the aged care system as their care needs change. Australia needs a single aged care and support system where consumers have choice and control and can access services as they need them, whether this be on a short*

<sup>63</sup> For more information, see: <https://www.ndis.gov.au/innovation-hub.html>

<sup>64</sup> For more information, see: <http://www.qca.org.au/getattachment/a98aac78-d791-4718-acbd-756195580892/Final-Report-Medical-and-Disability-Aids-and-Equip.aspx>

<sup>65</sup> For more information, see: TAD at <http://www.tadaustralia.org.au/>

<sup>66</sup> For more information, see: <http://www.flinders.edu.au/mdpp/>

<sup>67</sup> For more information, see: <https://agedcare.health.gov.au/aged-care-reform/aged-care-roadmap>

*term, episodic or ongoing basis. Regulating supply through the distribution, location and quantity of services impacts on consumer choice. There is the need to ensure equitable access and flexibility of location and supply of services. A market based aged care system, with no silos based on care settings and funding streams, can more efficiently deliver appropriate care and support to everyone with an assessed need (Tune, 2016, p. 18)*

Government has a role as ‘safety net’ where individuals cannot afford the range of goods they require, or there is insufficient market response.

### **Summary of studies which take an economic approach to AT and outcomes**

Foundation data on the costs and outcomes of AT and related interventions such as home modifications comes from the UK. The Audit Commission in three successive reports (Audit Commission, 2000, 2002; Frances Heywood & Lynn Turner, 2007) has identified the effectiveness and value of investment in equipment and adaptation to avoid health costs in four key areas:

1. Saving by reducing or removing completely an existing outlay (save cost of Residential Aged Care; reduce cost of home-care).
2. Saving through prevention of an outlay that would otherwise have been incurred.
3. Savings through prevention of waste.
4. Savings through achieving better outcomes for the same expenditure. (F. Heywood & L Turner, 2007, p. 9).

The Audit Commission acknowledged that more research was required to disaggregate the ‘multi-factorial interventions’ known to be effective but not fully understood. Some AT interventions have such compelling evidence of clinically significant outcomes they have been formulated into practice guidelines by the National Service Framework for Long-term Conditions (Department of Health, 2005), for example telehealth was found to reduce Chronic Obstructive Pulmonary Disease (COPD) admissions by 30%<sup>68</sup>.

A range of methods have been employed to investigate AT outcomes and build the AT business case. Early work in Italy developed a Social Cost Analysis Instrument, capturing social cost impacts of various AT products. For example, for a wheelchair user in a double storey house an in-home lift, whilst presenting significant upfront cost, was demonstrably cheaper over a 10 year time horizon compared with cheaper options such as a stair climber that required assistance to operate (Andrich, 2002; Andrich & Caracciolo, 2007; Andrich, Ferrario, & Moi, 1998). Andrich and colleagues took a wide view of social costs including, for example, the opportunity cost of an informal caregiver being unable to contribute to the economy and to superannuation. Taking forward the idea of social cost analysis for communities several authors have considered allocating the costs of inclusion to communities rather than individual (Fouarge, 2003) (De Jonge & Schraner, 2010). In 2012, noting there was still very little

<sup>68</sup> In England in 2001/02, COPD accounted for 81,283 admissions for 725,790 bed days. If 30 per cent of cases can be managed at home, then assuming a typical cost of a day in hospital of £250 per day this would release 217,000 bed days or over £50 million. Savings would also come from reducing the average length of stay for COPD (mean 9.1 days; median 6.0 days) (Table 2). Further savings would result from the reduced nursing visits that are otherwise needed when the patient is discharged from hospital (Department of Health, 2005, p. 24)

evidence around the effectiveness of individual interventions, Snell et al utilised a decision tree model which solely considers outcomes associated with a “package” of adaptive technology (Snell, Fernandez, & Forder, 2012). A Microsoft Excel-based decision tree framework mapped three scenario pathways and characteristics of individuals with unmet equipment needs. The probabilities, effects and costs<sup>69</sup> were incorporated, with sensitivity analyses and alternative scenarios used to test the outcomes achieved. The results suggest that ‘adaptive technologies provide a good return on investment’ (Snell et al., 2012, p. 9).

A similar pathway analysis was recently utilised in a national Discussion Paper on AT for people with disabilities and older people (Disability Federation of Ireland & Enable Ireland, 2016). Based on the investment in, or absence of, AT, two pathways were envisioned for three different AT users. Pathway dimensions included ‘totally dependent OR less dependent on personal assistant support’, and freedom of choice (more / restricted). Substantial savings to the state in hours of support; achieved salary or lowered support pension, were reported<sup>70</sup>.

One study in Australia has taken a similar cost consequence approach for a subset of AT users (Layton, Wilson, Colgan, Moodie, & Carter, 2010). This cost consequence analysis identified usual treatment (state AT funding/ self-funding) and a hypothetical optimal AT bundle (determined by user and panel of experts) for 8 representative AT users, selected from n -100 sample. A range of findings spoke to the effectiveness of AT (broadly defined according to the international standard) for a range of participation outcomes. People require on average 9 assistive technology products within a suite of 13 supports (such as personal support or home modifications). By contrast, all state funding schemes provide AT products in isolation to other supports, and often instead of each other, for example either a mobility device for indoor use, or outdoor use (Layton et al., 2010). More specifically, the economic analysis component of the study found varied but positive evidence of cost effectiveness for the majority of AT users with standard Quality Adjusted Life Years (QALY) methodology. With the application of an equity weight (in recognition of the relative disadvantage of a disabled cohort) the value of AT spend for almost all participants exceeded the cost outlay (Colgan, Moodie, & Carter, 2010).

Based upon this study, a subsequent Report was commissioned by the Australian Rehabilitation and Assistive Technology Association ARATA<sup>71</sup>, a peak body for AT in Australia, to further explore economic outcomes of AT to inform development of NDIS AT policy.

<sup>69</sup> Unit Costs of Health and Social Care (2016) <http://www.pssru.ac.uk/project-pages/unit-costs/unit-costs-2016/>

<sup>70</sup> A woman, who is a wheelchair user, lives in her own apartment. She uses environmental controls to the value of €18,500. She also has 99 hours of Personal Assistant (PA) supports per week. Without her environmental controls, she would sacrifice significant independence, and would require 168 hours of PA supports weekly (i.e. 24/7 support), at a cost in excess of €59,000 per annum. The total cost of her AT was less than one third of the annual cost of round-the-clock Personal Assistant support. DISABILITY FEDERATION OF IRELAND 2016 p 21

<sup>71</sup> For more information, see: [www.arata.org.au](http://www.arata.org.au)

The Report determined actual costs (purchase of AT devices; home and vehicle modifications; paid support; downstream costs of unpaid support) and related these to person-centred outcomes for representative archetypes of AT user (Layton & Walker, 2012)<sup>72</sup>. Conclusions were:

- Significant outcomes are possible in the areas of participation and satisfaction: these are difficult to measure and to cost.
- Timely soft technology [AT services] application is critical to the achievement of outcomes
- Funding must cover the cost of soft technology, maintenance, and running costs, as well as appropriate depreciation of the devices themselves to allow for timely replacement. The critical costs for both soft technology and maintenance are a relatively minor component of the AT budget but have been overlooked in previous formulae and service provision. Cost effective AT provision requires all these costs be incorporated into NDIS;
- Much AT operates across many life domains<sup>73</sup>. Assessment of success should thus be measured by participation in the higher level domains [that is, political, cultural, spiritual, educational and recreational outcomes ought be counted separately rather than assumed within 'social participation' or 'community access'. (Layton & Walker, 2012, p. 11)

Other Australian studies have taken different economic approaches. A cost of illness approach to the economic costs of dementia in Australia (Brown, Hansnata, & La, 2017) used a bottom up approach to itemise actual or imputed costs incurred by representative sample of patients and estimates for entire population. AT and home modifications were identified as direct costs, while indirect costs include lost productivity e.g. of carer, and Intangible costs were burden of disease, as captured by Disability Adjusted Life Year (DALY) methods.

Quality Adjusted Life Years (QALY) and Disability Adjusted Life Year (DALY) methods are common in health economics, yet evidence suggests a 'double jeopardy' situation exists with use of methods which value the absence of disease or dependence. A range of critiques suggest the personalised experience of living with impairment is not well captured by such methods (Persson et al., 2002) (N Layton & Wilson, 2010b). That said, one QALY study which demonstrated positive effects of 'optimal' AT evaluated the provision of a C-Leg (a microprocessor controlled) prosthetic limb compared with NMC (non microprocessor-controlled) prosthetic limb. All costs, including 2 hours of annual management by an orthotist/prosthetist, and regular maintenance were costed over an 8 year time horizon. Benefits included the ability to walk on dynamic surfaces, and upstairs without handrails, which contributed to an overall conclusion of cost-effectiveness<sup>74</sup>. The C-Leg total cost 25,146 Euro,

<sup>72</sup> Although many items of AT impact across multiple categories above, each was allocated to the primary category that it affected. All lump sum costs (capital, soft technology initial cost, etc.) are depreciated against the service life of the AT (3% discount rate). Capital costs include: purchase cost, installation cost (both discounted over the service life), plus an annual maintenance cost. Soft technology costs are split into three categories: assessment and prescription (which would include fitting/customisation), training, and ongoing review. Hourly rate was set at \$95/hr. Attendant care cost was based on the rates from an average cost from Federal Carer Award. In 2010 this was \$17.89. The time allocated for professional involvement (soft technology) and care support, and the recommended assistive technology solution was specified by a specialist group of allied health practitioners. The purpose was to provide an optimal solution to achieve the 'best or most favourable' solution for the individual (i.e. no better option in terms of technology is available).

<sup>73</sup> Activity and Participation Chapters from WHO ICF International Classification of Functioning, Disability & Health (2001)

<sup>74</sup> The mean incremental cost (in 2006 Euros) and QALYs for the C-Leg was €7657 and 2.38, respectively, yielding a cost per QALY gained of €3218.

compared with non-microprocessor controlled (NMC) prosthetic limb cost of 17,488 Euro. The C-Leg was beneficial in terms of quality adjusted life years (QALY) with a gain of 7657 Euro overall (Brotkorb, Henriksson, Johanneson, & Thidell, 2008).

The Australian Institute of Health and Welfare (A.I.H.W., 2006) reviewed the literature and utilised archetypal cases to address the question of whether therapy 'makes a difference'. They investigated the nature and extent of met, partially met and unmet need for therapies and equipment, and estimated the effects of provision in terms of functioning, participation, and reduced social costs. AIHW concluded, 'best practice ideals are compromised under the kind of resource constraints that appear to affect many organisations that provide therapy and equipment for people with CP and like disabilities in Australia today' (AIHW, 2006, p. 184).

Similarly, in an economic analysis of motor neurone disease in Australia (Deloitte Access Economics, 2015), four cases were explored: each of whom required 9-15 AT products. Comparisons were made between NDIS and Motor Neurone Disease Australia (MNDA spends on equipment and other supports, and the costs of residential care<sup>75</sup>. Key findings from this study note that:

- 42% of people with MND are over the aged of 65
- Informal care is estimated at 7.5 hours per day and represents \$13.60 per hour based on an opportunity cost approach
- Expenditure of aids, equipment and modifications to the home or vehicle totalled \$ 31,598 per person (overall spend)
- Mean average cost of home modifications was \$13,856, required by 89%
- Mean average cost of mobility aids was \$14,014, required by 92 %
- Mean average cost of medical equipment was \$6,987, required by 92% (Deloitte Access Economics, 2015)

A range of studies consider other costs of life with disability which may impact on the ability to self-fund AT (Anderson, Dumont, Jacobs, & Azzaria, 2007). In the abovementioned MND study, total other financial costs incurred \$39,921 per person with MND (Deloitte Access Economics, 2015). The recent systematic review of the global literature on the direct costs associated with living with a disability at the individual or household level (Mitra, Findley, & Sambamoorthi, 2009). Mitra et al found that that elderly people with disability have a wider range of extra costs compared to other age groups, with significant unmet need and costs relating to equipment. Costs are sizeable and vary according to severity of disability, life cycle and household competition. Future research on disability costs must consider needs as well as the availability and accessibility of needed goods and services, such as assistive devices (Mitra et al., 2009).

<sup>75</sup> The annual cost of staying at home was found to be more expensive (\$112,088) compared with the annual cost of staying in a residential aged care facility (\$78,631).—noting that these residential aged care costs are likely conservative. The cost of using an MND equipment loan service (\$19,625) is less expensive than the cost of equipment purchase under the NDIS (\$24,030). The annual cost of MND advisor support for a person with MND (\$2,865) is not fully recovered under the NDIS funding model for these services (\$2,257). Annual government costs of MND in the aged care system (\$8.3m.) are higher than government costs of MND in the NDIS (\$2.6 m.). See tables 11.1 & 11.2 Costs of staying in RAC; Costs of staying at home (Aids and equipment 21,002 per person)

A Cochrane Review of home-based care reablement services similarly mentions AT as an ingredient, concluding a small reduction in total aggregated home and healthcare costs over the 24-month follow-up<sup>76</sup> (Cochrane et al., 2016). A comprehensive scoping study of the use of AT by frail older people living in the community was commissioned by the Department of Health and Ageing (Connell et al., 2008). A range of outcome areas were identified including safety & prevention; sense of safety; prevent falls; prevent hospitalisation; ease of living/ mobility/ independence; increased active and health lifestyle; improved independence and reduced dependence on carers; social outcomes; preserve cognition; wellbeing & QOL; health at home. The scope of AT was broad and included daily living aids; safety aids; mobility aids; communication and sensory; cognitive and connectivity aids; environmental adaptations; remote monitoring devices; telecare; telehealth, integrated systems; and smart homes.

Connell et al conclude,

*there is strong evidence that assistive technology can enable: improved safety and reduced falls; reduced hospitalisation; improved independence, mobility and physical function; improved well-being and quality of life, including an enhanced sense of safety and increased opportunities to continue living at home. The evidence suggests that assistive technology is most effective when older people are provided with early intervention, careful assessment, the correct prescription and home-based follow-up training in how to use assistive technologies (Connell et al., 2008, p. 6).*

This is a key point - AT provision should not be a silo but provided as part of a full service offering reablement and home modifications. Co-ordinated service provision would be more cost effective than different service doing different pieces of the same puzzle.

### **Summarising the current measurement of AT costs and outcomes**

A diversity of outcomes are reported for AT. Primary outcomes are viewed from the person's perspective and relate to self-determined goals and achievements, usually in the areas of independence or enabled activity and participation, autonomy (directing one's life), independence in valued tasks, maintenance of occupational roles, improved quality of life.

Secondary or system level outcomes might include the cost or other system impacts of primary outcomes, for example preserved independence and decreased functional decline leading to reduced hospital admission rates; prevention of secondary complications; prevention of falls; alleviated carer burden, reduced residential care placement, and overall health and community life outcomes resulting from improved quality of life.

This Project requires methods which utilise publicly available data, are trustworthy, robust, and allow for sensible cost extrapolations. Economic methods were sought in order to establish policy-relevant approaches to framing AT costs and cost offsets. The advice of economic methodologists was canvassed in late September and a costing method devised for the Project. Based upon the above approaches, the following method is proposed.

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<sup>76</sup> Reablement: AUD 19,888; usual care: AUD 22,757; 1 trial with 750 participants

## 2.2 METHOD

A microeconomic approach focussed upon the individual enables us to explore AT need and useage for typical consumer profiles using WHO ICF archetypal cases method. We have taken a third party payer perspective to examine the costs and cost offset, including costs which occur in other parts of a system, for example a 'spend' in the health arena such as a bed day due to a fall or pressure sore, is considered even though it is an expense which falls outside the aged care spend. While person-focussed outcomes are centrally important, the lens additionally applied in this study is that of economic impact. Outcomes which have demonstrated economic impacts include independence; community living/ avoid residential care or hospital admission; function including slowed rate of decline or maintained function; health-related quality of life; wellbeing / autonomy. The known AT evidence regarding effectiveness of AT, as well as the ABS SDAC data, enables some extrapolations as to the impact of AT, and population projections.

The overall evaluation framework can be summarised as a set of inputs over outcomes:

$$\text{INPUT (COST)} = \text{Bundle of AT products and AT services} \times \text{AUSTRALIAN POPULATION WITH THIS NEED}$$

$$\text{OUTCOME (COST OFFSETS)}$$

Figure 2.1 Evaluation Framework: inputs and outcomes

Informed by the various methods deployed to date (see table above, particularly (Disability Federation of Ireland & Enable Ireland, 2016) a pathway analysis approach to economic evaluation is proposed (Figure 2.1 below).

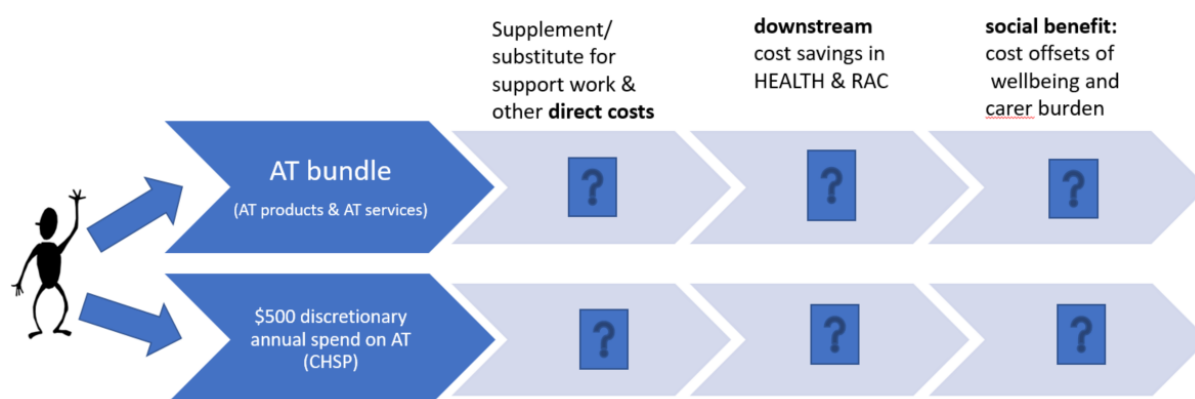


Figure 2.2 AT Pathway analysis

## Key assumptions underlying the economic analysis

**Study perspective:** A third party payer perspective is taken: this may be government, or the consumer if they have the capacity to self-fund the purchase of their AT.

**Reference year:** 2016/2017 period used for pricing of AT products and AT services. ABS SDAC 2015 provides general population figures, while other specific figures (such as vision loss) are taken from the latest available evidence source.

**Target group:** Older Australians, understanding that while a cut-off of 65 is used in many data sources, for some populations 50+ represents the likely onset of age-related impairment (indigenous; disability) therefore figures are likely to underestimate overall need.

**Study boundaries:** Other cost-effectiveness analysis of like interventions<sup>77</sup> note ‘spill-over effects ripple out from every intervention and the question is how far to follow them’. It is likely a range of difficult-to-capture impacts upon satisfaction, autonomy, degree of difficulty, occupational roles, will result from AT bundles. Substantial qualitative literature and data from consumer sources provides evidence of this. In the absence of a clear costing model however these potential benefits are not measured in this study. Social Return on Investment methodology may provide further options in future for capturing such impacts.

**Time horizon:** Similar studies in disability have utilised a 10-year time horizon. For an aged population, this study determined the time horizon is run from 1 year through to 5 years.

**Defining the intervention:** AT products and related AT services represent a broad set of many hundreds of actual AT bundles, each individually tailored to a person and their environment. Assumptions for this study are based on a program logic model. A wide range of disparate studies (see Rapid Evidence Review) provide evidence of the effectiveness of certain ‘ingredients’ of an AT intervention (AT service evaluation, provision of products, installation, set-up, trial, adaptation, training, maintenance and review). The combination of sound theoretical rationale and program logic was used to synthesise available evidence from studies of like products and bundles. This led us to forecast reasonable assumptions regarding the impact of AT bundles. AT services costs are an estimate of an assessment annually to review and update an AT bundle. Setting up initial AT usage, particularly for major AT products would occur at differing points in the primary care system and is indicative costings should be sought from relevant bodies.

**Defining the comparator:** The current CHSP policy: ‘clients who are unable to purchase the item/s independently will be able to access up to \$500 in total support per financial year’<sup>78</sup>. It is important to note that this comparator was not fully assessed in our study, that is, the detailed implications of spending choices and impact upon outcomes if only \$500 were available. Rather, an indicative statement points out the likely shortfalls for each case profile. This is discussed in limitations and recommendations to complete this step in order to run a full cost-benefit analysis.

<sup>77</sup> Voss, T., Carter, R., Barendregt, J., Mihalopoulos, C., Vermeeren, C., Magnus, A., . . . Wallace, A. (2010). *Assessing Cost-effectiveness in Prevention (ACE-Prevention): Final Report*. Retrieved from <http://www.sph.uq.edu.au/bodce-ace-prevention> (page 18)

<sup>78</sup> For more information, see: [https://agedcare.health.gov.au/sites/g/files/net1426/f/documents/10\\_2016/appendix\\_a\\_chsp\\_growth\\_round\\_2016.pdf](https://agedcare.health.gov.au/sites/g/files/net1426/f/documents/10_2016/appendix_a_chsp_growth_round_2016.pdf): p 50

**Identifying costs:** Firstly, the costs of AT bundles was established. AT product pricing was sourced from the National Equipment Database on November 13, 2017 by occupational therapists from ILC WA. Costs for AT services (allied health evaluation, and coaching / support from an allied health assistant, peer mentor or other supporter) recognise usually invisible AT service costs. These figures are conservative, based on Australian benchmark pricing <sup>79</sup>, and hours required draw on clinical judgement.

Secondly, to deliver valid data on outcome-related costs of AT for older Australians – specifically, cost offsets or substitutions, several parameters were established:

Parameter	Method
Types of AT User	Construct and validate AT user profiles (see Table 2.4 & Appendix 4)
Types of AT which each user profile may require	Identify and validate AT clusters (see Table 2.4)
Costs of each AT cluster	Costing using NED / average costs (Supplementary Excel Table)
Costs impacts	<p>Secondary data from outcome studies where possible (see Tables 2.2 &amp; 2.3)</p> <p>Impute fiscal benefits from outcomes where possible (see Supplementary Excel Table)</p>

Three tables of with explanatory notes were emailed to sector representatives (the Alliance, NATA, COTA Victoria) mid-October, with a two-week turnaround for comments:

1. Mapping functional impairment groupings to assistive technology chapters & identifying funders.
2. Suggested AT clusters (using NDIS AT complexity categories).
3. AT user profiles for costing.

Written feedback was received from twelve organisations, representing input from over 20 expert informants, and the Tables were revised (see Appendix 4 for a summary of feedback and revisions).

The finalised Tables comprise:

- Grid mapping of functional impairment groupings to assistive technology chapters, identified against likely funding sources. This table demonstrates we have comprehensively covered the range of impairments and functional limitations, against all the potential AT categories, mapped to the current complexities of Australian public funding (Appendix 3)

<sup>79</sup> <https://www.ndis.gov.au/providers/pricing-and-payment.html>

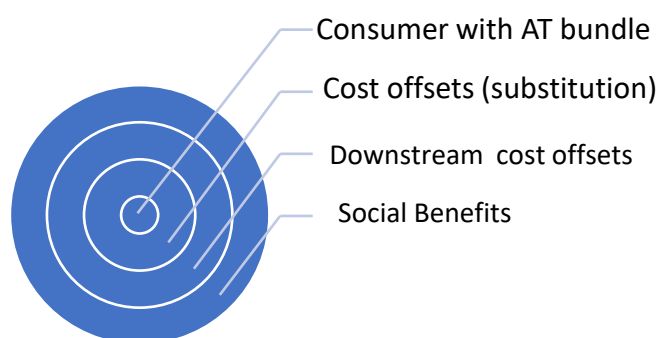
- Suggested AT bundle (using NDIS AT complexity categories) according to AT user types. This table aligns ABS SDAC language for severity and impact on daily life, with simple to complex AT which can impact on outcomes (Appendix 5)
- A series of seven AT user profiles with their AT requirements, for the purposes of costing (Table 2.4)

The range of AT Products identified as relevant for older Australians, as generated across the AT Profiles, was costed for lowest and highest price utilising the National Equipment Database on 13 November 2017 by occupational therapists from ILC WA. Time horizons and a Most Likely cost were calculated, enabling the AT user profiles to be costed. AT Services were also included with NDIS benchmark pricing.

AT PRODUCTS								
TASK	ABS SDAC category	Product	NDIS Complexity Level	Cost			Time Horizon (replacement time)	
				Lowest	Highest	Most Likely	1-2 years	5 years
ADL	Self-care	Eg. Safety tread	1	\$20.00	\$360.00			*
AT SERVICES								
AT SERVICES (allied health professional				\$180 p/h (NDIS rate)			annual	
AT SERVICES (allied health assistant / AT supporter)				\$80 p/h incl on costs			annual	
ADAPTATION / INSTALLATION COSTS				\$50 p/h technician			one-off	
MAINTENANCE / SERVICE COSTS				\$50 p/h technician			annual	

Table 2.1 Categories of Pricing Analysis completed November 2017

The next step then entailed linking evidence of effectiveness from the literature, to inform the cost 'offsets' side of the costing equation. These were envisioned at three points (see Figure 2.2) These included direct cost offsets (substitution of supplementation of paid or unpaid care costs); downstream cost offsets, and social benefit.



## Cost Offsets

Available evidence provides the following figures. Hoenig et al (2003) calculate AT use leads to a decrease in total support hours 3.8 hrs per week<sup>80</sup>. The Disability Federation of Ireland propose the total cost of AT less than 1/3 cost of additional support work<sup>81</sup>. Formal care costs for people with MND and like conditions range from 9- 68 hours per week (Deloitte Access Economics, 2015)<sup>82</sup>. Table 2.2 below lists the cost offset figures used for the Economic Pathway analysis:

<b>a)</b> Supplement/ substitute for support work	\$50 p/h formal care cost <ul style="list-style-type: none"> <li>• Save 2 hours per week mild severity</li> <li>• Save 3.8 hours of work per week with bundles for moderate severity</li> <li>• Save 7-17 hours per week with bundles for severe/ profound</li> </ul>
<b>b)</b> Supplement/ substitute for unpaid care	\$13.60 per hour of informal care <ul style="list-style-type: none"> <li>• Save 13 hours per week mild / mod</li> <li>• Save 7.5 hours per day severe/ profound (14.5 per week)</li> </ul>

*Table 2.2 Cost offset figures used for the Economic Pathway Analysis*

## Downstream Cost Impacts

Available evidence provides the following statistics and figures. Downstream healthcare savings relate to decreased secondary complications (e.g. pressure; respiratory; musculoskeletal)<sup>83</sup>. Al-Oraibi et al (2012) found the rate of falls and healthcare costs were halved with provision of monitoring-related AT<sup>84</sup>. Mann et al (1999) evidence slowed functional decline estimated at 8-18 months, along with one third fewer hospitalisations, and 18 month delays in residential aged care admission, with the AT

<sup>80</sup> The multivariate models show a strong and consistent relation between equipment use and hours of help—the use of equipment was associated with fewer hours of help, after control for other factors. Disabled people who used any technological assistance, either for some or for all of their basic ADL impairments, reported 3.8 ( $P = .008$ ) fewer hours of help per week than did those who used no technological assistance, net of other factors (HOENIG et al, 2003)

<sup>81</sup> A woman, who is a wheelchair user, lives in her own apartment. She uses environmental controls to the value of €18,500. She also has 99 hours of Personal Assistant (PA) supports per week. Without her environmental controls, she would sacrifice significant independence, and would require 168 hours of PA supports weekly (i.e. 24/7 support), at a cost in excess of €59,000 per annum. The total cost of her AT was less than one third of the annual cost of round-the-clock Personal Assistant support (DISABILITY FEDERATION IRELAND)

<sup>82</sup> An Individual Support Package recipient with severe limitations receives a maximum of 47 hours care per week. (MILD-MODERATE) each carer provides 673 hours per year or 13 hours per week (personal communication) (SEVERE/ PROFOUND) \$32,728 per person = estimated 7.5 hours of informal care per day represents \$13.60 per hour based on an opportunity cost approach Deloitte Access Economics. (2015). Economic analysis of motor neurone disease in Australia. Retrieved from Melbourne: <https://www2.deloitte.com/au/en/pages/economics/articles/economic-analysis-motor-neurone-disease-australia.html>

<sup>83</sup> In England in 2001/02, COPD accounted for 81,283 admissions for 725,790 bed days. If 30 per cent of cases can be managed at home, then assuming a typical cost of a day in hospital of £250 per day this would release 217,000 bed days or over £50 million. Savings would also come from reducing the average length of stay for COPD (mean 9.1 days; median 6.0 days) (Table 2). Further savings would result from the reduced nursing visits that are otherwise needed when the patient is discharged from hospital (Department of Health, 2005, p. 24) The hospital base case (250 patients) revealed cumulative savings of \$402,981 and \$449,101 over 30 and 90 days, respectively, for [optimal respiratory AT] versus comparators. For the payer base case (100,000 patients), 3-year cumulative savings with Advanced NIV were \$326 million versus no [optimal] respiratory AT and \$1.04 billion versus respiratory assist device [less optimal AT]

<sup>84</sup> An impact assessment of AT systems<sup>84</sup> in nursing homes in the UK found falls reduced from 202 falls prior to AT introduction, to 112, with mean health care costs reduced by more than 50%. A full economic evaluation was not possible as the cost of AT installation was not calculated (Al-Oraibi et al., 2012).

bundle provided. These ratios were used to extrapolate downstream cost impacts using current Australian pricing <sup>85</sup>

GP Visitation	\$37 MBS rebate Level B Consultation <sup>86</sup>
ED presentations	ED presentation: \$580
Acute Admissions	acute admission: episode \$5,000 subacute episode: \$13,000
Residential Aged Care Admission	18 months @ \$100 per day government spend

Table 2.3 Downstream Cost Estimates

## Social Costs

The Rapid Evidence Review demonstrates significant gains in terms of psychosocial outcomes. Satisfaction, decreased difficulty and anxiety, increased participation and decreased carer burden or injury are substantial contributors to overall health and wellbeing, and demonstrably save costs across the health sector (Cummins et al., 2007)<sup>87</sup>. Complexities arise in costing however, and for this initial study, we have not predicted these social benefits, but have indicated they do exist and ought to be taken into account.

## Population impact

A final step made population predictions for each of the representative AT profiles against population data. Table 2.4 links the representative profiles of AT users (and the populations they represent) with clusters of AT, and estimate the spend)<sup>88</sup>

SDAC CATEGORY	PROFILE	AT (NDIS COMPLEXITY CATEGORIES)	POPULATION
Mild core activity limitation / with long-term health condition)	<b>SIMONE</b> Frailty: Mild functional impairment, focus is prevention). May have subclinical chronic disease co-morbidities.	Level 1 & 2 AT Services: AHP AT Services: AHA/ supporter Handrails - shower Handrails - toilet Handrails - front steps Handrails - back steps Longhandled / lightweight cleaning equipment long handled reacher jar opener laundry trolley	<b>MILD = 250,800</b> <b>65+</b> <sup>89</sup>

<sup>85</sup> Independent Hospital Pricing Authority. (2014). Australian Public Hospitals Cost Report 2013-2014 Round 18. <https://www.iha.gov.au/publications/national-hospital-cost-data-collection-public-hospitals-cost-report-round-19-financial>

<sup>86</sup> For more information, see: <http://www9.health.gov.au/mbs/>

<sup>87</sup> Cummins, R., Hughes, J., Tomy, A., Gibson, A., Woerner, J., & Lai, L. (2007). The Wellbeing of Australians - Carer Health and Wellbeing.

<sup>89</sup> SDAC Table 3.1: 44300DO020\_2015 Disability, Ageing and Carers, Australia: Summary of Findings, 2015

		hiking poles / single point stick Emergency call (personal alarm) Adaptation/Installation Costs (one off) Maintenance/Service Costs	
Moderate core activity limitation	<b>KIM</b> (post-cancer; tracheostomy; multiple medical problems/ chronic disease; respiratory (COAD) incontinence, mental health / depression / anxiety)	Level 1-4 ADD AT Services: AHP ADD AT Services: AHA/ supporter gait aids scooter powered rise/recline chair bed supports communication device kitchen trolley laundry trolley kitchen propping school wig adapted gardening equipment pressure garments nutrition support (consumables, feeding tubes, feeding pumps, formula) Emergency response systems (personal alarm) ICT supports continence shower stool Handrails shower Adaptation/Installation Costs (one off) Maintenance/Service Costs	Total with one or more long term health condition <b>309,400<sup>90</sup></b>
	<b>ORLANDO</b> (stroke with hemiplegia and aphasia/ dysphagia)	Level 1-3 ADD AT Services ADD AT Services: AHA/ supporter one arm drive manual wheelchair & powerpack powerpack gait aid dressing equipment adapted footwear ankle foot orthosis shower stool	<b>Stroke = 43,900<sup>91</sup></b>

<sup>90</sup> SDAC **Table 27.1** Total with one or more long term health condition

<sup>91</sup> SDAC Table 27.1 Persons aged 65 years and over, main long-term health condition, by age and sex–2015, est

		flexible showerhose handrails safety mat temperature valve one handed cooking and eating equipment eating support (dysphagia management includes dysphagia cups, built up utensils and environmental aids (often low tech) that might prompt or support safe swallowing) ICT supports (iPad ; connectivity) bed supports dining chair medication management nutrition support (thickener) kitchen trolley chair raiser for lounge chair AAC e.g. communication devices (tablet and apps) Emergency response system (personal alarm) Adaptation/Installation Costs (one off) Maintenance/Service Costs	
Profound or severe core activity limitation	<b>MELEI</b> (Multiple Sclerosis OR Post-Polio Syndrome OR Spinal Cord Injury OR neurological progressive – Parkinsons, MND	ADD AT Services ADD AT Services: AHA/ supporter power wheelchair (power elevation; postural supports) pressure cushion (Jay) hoist plus sling (short track to loo) adjustable bed pressure mattress orthotics adapted footwear wheeled shower commode stepless entry handshower Handrails - shower Handrails - toilet long handled sponge and reacher	Diseases of the nervous system = 87,600 <sup>92</sup> NOTE this figure represents substantively more than the subset of progressive neurological conditions for which data was sought.

<sup>92</sup> Table 27.1 (44300DO030\_2015 Disability, Ageing and Carers, Australia: Summary of Findings, 2015

		access under bathroom and kitchen sink (allocated to INSTALLATION) wide doorways adapted kitchen workbench side opening oven dressing equipment medication management ICT supports (adapted data entry to large screen computer with mounting and software) simple smart home AT mainstream e.g. wireless doorbell complex continence e.g. single-use catheters Emergency response system (personal alarm) Adaptation/Installation Costs (one off) Maintenance/Service Costs	
	<b>TED</b> (amputee; diabetes)	Level 1-4 ADD AT Services ADD AT Services: AHA/ supporter prosthesis related consumables powerchair pressure cushion modified bathroom modified entrances adjustable bed prosthesis gait aid (pick up frame) ICT supports, ECU medication management customised footwear raised toilet frame Car adaptations Modified kitchen areas Emergency response system (personal alarm) Adaptation/Installation Costs (one off) Maintenance/Service Costs	AMPUTEE <sup>93</sup> 2/3 of the 35,306 LL amputations in 5 years from 2007 – 2012 occurred over 65's = 23,301 (half had diabetes) (23,301 amputations / 5 years/ 65+)

<sup>93</sup> <http://journals.plos.org/plosone/article?id=10.1371/journal.pone.0170705>

<b>Cognitive (moderate functional impairment)</b>	<b>MARIA</b> (dementia; arthritis, incontinence)  Moderate core activity limitation	Level 1-3 ADD AT Services ADD AT Services: AHA Safety stove shutoff Smoke detector temperature control valves prompts / alerts kitchen/laundry eg flood detection ICT monitoring support (support (inactivity sensor find me watch) adapted environment: lighting adapted environment: cueing/wayfinding shower stool flexible showerhose handrails safety mat continence products chair raiser medication management good grip products for kitchen prompts and reminder systems: time management Emergency response system (personal alarm) Adaptation/Installation Costs (one off) Maintenance/Service Costs	Dementia and Alzheimers <sup>94</sup> = 100.7 (000)
<b>Sensory (moderate functional impairment)</b>	<b>FATIMA</b> (vision and hearing loss; osteoarthritis; cardiovascular disease; past orthopaedics (total hip replacement)	Level 1 & 2 ADD AT Services ADD AT Services: AHA Glasses; low vision equipment; safety kitchen adaptations; gait aids, ICT supports (sensors; voice activated systems, wearables); adapted / lightweight cleaning equipment, AT to support transfers from low surfaces (Bed, chairs, toilet). Rails access. Contrast strips; sensor lighting; emergency	100,000 <sup>95</sup>

<sup>94</sup> Table 27.1 (44300DO030\_2015 Disability, Ageing and Carers, Australia: Summary of Findings, 2015

<sup>95</sup> **VISION** In Australia in 2016, low vision and blindness impacts a conservative estimate of 100,000 people aged over 50. The older population are disproportionately affected, with the primary causes of vision loss being age-related macular degeneration, diabetic eye disease and glaucoma. (Macular Disease Foundation Australia, 2017)

		monitoring (personal alarm) (NB has hearing aids but funding not part of this study Adaptation/Installation Costs (one off) Maintenance/Service Costs	
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*Table 2.4 Population projections for 7 AT User Profiles*

## 2.3 RESULTS

The results for each AT user profile sum the cost of the AT bundle, make some evidenced extrapolations about potential cost impacts (hopefully savings) of the outcomes of these bundles, and include an extension to the impact on the Australian population. Results are reported as follows.

Firstly, the AT user profile is introduced by name. The profile is described in terms of severity of presentation, as well as how many Australians might have the main condition or functional impairment. We then describe the AT bundle, and identify the assumptions we have used to explain life for this AT user in terms of the costs and benefits of the AT bundle. A cost-benefit analysis calculation table lists costs in the base year, and extrapolates over a further 4 years, noting some expenses last for 5 years, and others require annual or other replacement or review. The final figure demonstrates a return on investment likely with the AT bundle versus CHSP funding. A full evaluation of the impact of this smaller sum could be run, considering likely choices and tradeoffs, in future evaluations.

### EXPLANATORY NOTE REGARDING TABLE LAYOUT

The results are listed with the AT bundle items in the left column, and a 5-year time horizon of expenditure over the next 5 columns. The base year is first year or initial costs. The years are cumulative: so, if the bundle is used for 5 years, the figures in the final column represent the total cost (for 5 years).

Some AT needs replacement annually or a couple of times within the 5 years we are looking at. If the item needed replacing / paying for annually, such as maintenance or alarm services, then the initial cost is 'resent' each year, and at the end of 5 years we can see what it all costs.

E.g. a laundry trolley has an initial cost of \$120 and at the end of 5 years, the spending on laundry trolley is still \$120. Whereas, a monitored personal alarm with an initial cost of \$250 per annum, at the end of 5 years, has a total spend of \$1250.

## Profile 1 Frailty SIMONE (mild functional impairment)

**Severity:** Mild functional impairment, focus is prevention. May have subclinical chronic disease co-morbidities. There are 250,800 older Australians with mild functional impairment.

**AT Bundle:** Complexity levels 1 & 2.

AT bundle includes twelve AT products (Handrails: shower, toilet, front and back steps; bathmat; long-handled / lightweight cleaning equipment; long handled reacher; jar opener; laundry trolley; hiking poles or single point stick.

AT services includes one hour of allied health practitioner and two hours of AT supporter/ coach and service costs annually, and one-off installation costs plus annual maintenance/ service costs<sup>96</sup>.

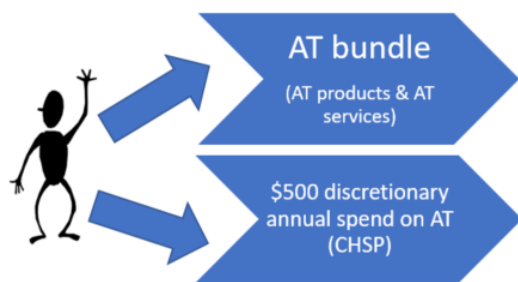
**Assumptions of Cost and Benefit:** With the AT bundle, we conservatively estimate Simone will save (substitute) 1 hours per week of paid support work (home care and instrumental ADL support). A further 1 hour may be supplemented by her increased independence: that is, she chooses to use an hour of paid support per week for community access or more substantial household chores. Seven hours of unpaid support work are released as Simone feels safe and autonomous at home, with unpaid supporters able to spend time with Simone on social and leisure pursuits rather than monitoring and daily living tasks. We avoid one GP visit per quarter due to less anxiety and fewer environmental barriers. Over a 5 year time horizon, we save one emergency department presentation and one acute admission through decreased falls risk and increased safety, particularly as the AT bundle is reviewed annually. Residential aged care admission is delayed by 6 months.

SIMONE		Time Horizon (i.e. how long will bundle be used for)				
		Base Year	+1	+2	+3	+4
	<i>AT Products</i>	\$589.00	\$1,038.00	\$1,487.00	\$1,936.00	\$2,385.00
	<i>AT Services: allied health / coach</i>	\$340.00	\$680.00	\$1,020.00	\$1,360.00	\$1,700.00
<b>TOTAL COSTS: AT BUNDLE</b>	<i>AT Services: adaptation/ Installation</i>	\$150.00	\$150.00	\$150.00	\$150.00	\$150.00
	<i>AT Services: maintenance / service</i>	\$50.00	\$100.00	\$150.00	\$200.00	\$250.00
	<b>TOTAL COSTS</b>	<b>\$1,129.00</b>	<b>\$1,968.00</b>	<b>\$2,807.00</b>	<b>\$3,646.00</b>	<b>\$4,485.00</b>
	<i>Supplement Paid Support Work</i>	\$2,600.00	\$5,200.00	\$7,800.00	\$10,400.00	\$13,000.00
	<i>Supplement Unpaid Support Work</i>	\$4,950.40	\$9,900.80	\$14,851.20	\$19,801.60	\$24,752.00
<b>TOTAL BENEFIT</b>	<i>GP Visitation</i>	\$148.00	\$296.00	\$444.00	\$592.00	\$740.00
	<i>ED presentations</i>	\$116.80	\$233.60	\$350.40	\$467.20	\$584.00
	<i>Acute Admissions</i>	\$993.20	\$1,986.40	\$2,979.60	\$3,972.80	\$4,966.00
	<i>Res Aged Care Admission</i>	\$3,600.00	\$7,200.00	\$10,800.00	\$14,400.00	\$18,000.00
	<i>Social Benefit</i>	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
	<b>TOTAL BENEFIT</b>	<b>\$12,408.40</b>	<b>\$24,816.80</b>	<b>\$37,225.20</b>	<b>\$49,633.60</b>	<b>\$62,042.00</b>
	<i>Net Benefit</i>	\$11,279.40	\$22,848.80	\$34,418.20	\$45,987.60	\$57,557.00

Table 2.5: Simone

<sup>96</sup> AT SERVICES allied health practitioner or other AT service initially to inform, recommend, support provision ('getting' the bundle); trial and adaptation at home and in environments of use, adjusting, training and maintenance, review and re-entry to tailor the bundle over time.

The cost benefit of an AT bundle versus CHSP funding for mild functional impairment:



*NOTE discounting is not applied to either costs or benefits in this scenario*

WITH AT Bundle: after one year, government saves \$10 for every \$1 spent. This rises to \$12.83 over 5 years, given GP visits and admissions likely to be avoided. **This is without costing in the likely substantial social benefits to independence and autonomy at home.**

With \$500 annual CHSP spend only, the initial expenditure of \$1129.00 to get the AT bundle up and running, cannot be funded. Recipients must therefore select a smaller portion of the AT bundle to purchase, and will not realise full potential benefit of AT. The potential benefits of cost offset (savings) of nearly \$60,000 may be forgone if an early intervention investment approach is not taken.

## Profile 2 Multiple medical conditions KIM (moderate functional impairment)

**Severity:** Moderate functional impairment. Complex medical problems: post-cancer; tracheostomy; respiratory issues; mental health (anxiety / depression). There are 309,400 older Australians living with one or more long-term health condition.

**AT Bundle:** Complexity levels 1 -4.

Fifteen AT products (walking aids; scooter; powered rise/recline chair; bed supports; communication device; kitchen trolley; laundry trolley; kitchen propping stool; wig; adapted gardening equipment; pressure garments; emergency monitoring (personal alarm); nutrition support (*consumables, feeding tubes, feeding pumps, formula*); ICT supports; continence).

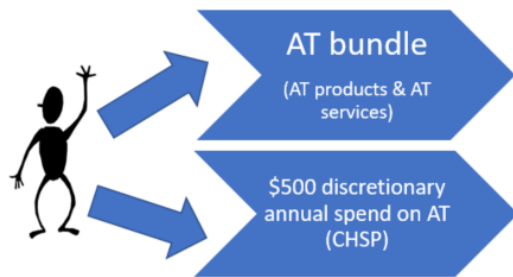
AT services includes one hour of allied health practitioner and two hours of AT supporter/ coach and service costs annually, plus one-off installation and annual maintenance/ service costs.

**Assumptions of Cost and Benefit:** With the AT bundle, Kim is able to manage and monitor her body functions (nutrition, continence and oedema with pressure support garments). She manages her fatigue and endurance with trolleys and propping stools for household tasks and a scooter for community mobility. She has bathroom adjustments for safety and energy conservation, and a personal alarm and ICT supports for safety and participation. We conservatively estimate that Kim will save (substitute) 3.8 hours per week of paid support work (home care and instrumental ADL support). Thirteen and a half hours of unpaid support work are released as Kim feels safe and autonomous at home, with unpaid supporters able to spend time with Kim on social and leisure pursuits rather than monitoring and daily living tasks. We avoid one GP visit per quarter due to less anxiety and fewer environmental barriers. Over a 5 year time horizon, we save one emergency department presentation and one acute admission through decreased falls risk and increased safety, particularly as the AT bundle is reviewed annually. Residential aged care admission is delayed by 6 months.

KIM		Time Horizon (i.e. how long will bundle be used for)				
		Base Year	+1	+2	+3	+4
	<i>AT Products</i>	\$11,607.00	\$15,904.00	\$20,201.00	\$24,498.00	\$28,795.00
	<i>AT Services: allied health / coach</i>	\$152.00	\$304.00	\$456.00	\$608.00	\$760.00
<b>TOTAL COSTS: AT BUNDLE</b>	<i>AT Services: adaptation/ Installation</i>	\$150.00	\$150.00	\$150.00	\$150.00	\$150.00
	<i>AT Services: maintenance / service</i>	\$50.00	\$100.00	\$150.00	\$200.00	\$250.00
	<b>TOTAL COSTS</b>	<b>\$11,959.00</b>	<b>\$16,458.00</b>	<b>\$20,957.00</b>	<b>\$25,456.00</b>	<b>\$29,955.00</b>
	<i>Supplement Paid Support Work</i>	\$9,880.00	\$19,760.00	\$29,640.00	\$39,520.00	\$49,400.00
	<i>Supplement Unpaid Support Work</i>	\$9,617.92	\$19,235.84	\$28,853.76	\$38,471.68	\$48,089.60
<b>TOTAL BENEFIT</b>	<i>GP Visitation</i>	\$148.00	\$296.00	\$444.00	\$592.00	\$740.00
	<i>ED presentations</i>	\$116.80	\$233.60	\$350.40	\$467.20	\$584.00
	<i>Acute Admissions</i>	\$993.20	\$1,986.40	\$2,979.60	\$3,972.80	\$4,966.00
	<i>Res Aged Care Admission</i>	\$3,600.00	\$7,200.00	\$10,800.00	\$14,400.00	\$18,000.00
	<i>Social Benefit</i>	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
	<b>TOTAL BENEFIT</b>	<b>\$24,355.92</b>	<b>\$48,711.84</b>	<b>\$73,067.76</b>	<b>\$97,423.68</b>	<b>\$121,779.60</b>
	<i>Net Benefit</i>	\$12,396.92	\$32,253.84	\$52,110.76	\$71,967.68	\$91,824.60

Table 2.6 - Kim

**The cost benefit of an AT bundle versus CHSP funding for moderate functional impairment (multiple co-morbidities):**



*NOTE discounting is not applied to either costs or benefits in this scenario*

WITH AT Bundle: after one year, government saves \$1.04 for every \$1 spent. This rises to \$3.07 over 5 years, given GP visits and admissions likely to be avoided. **This is without costing in the likely substantial social benefits to independence and autonomy at home.**

With \$500 annual CHSP spend only, the initial expenditure of \$11,959 to get the AT bundle up and running, cannot be funded. Recipients must therefore select a smaller portion of the AT bundle to purchase and will not realise full potential benefit of AT. The potential benefits of cost offset (savings) of up to \$91,000 may be forgone if an early intervention investment approach is not.

### Profile 3 Stroke ORLANDO (Moderate functional impairment)

**Severity:** Moderate functional impairment. Stroke with hemiplegia and aphasia/ dysphagia.

**AT Bundle:** Level 1-3.

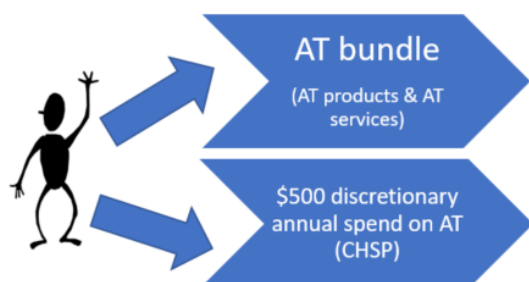
Twenty three AT products (one arm drive manual wheelchair with powerpack; gait aid; dressing equipment; adapted footwear; ankle foot orthosis; shower stool, flexible showerhose; handrails; safety mat; temperature valve; one handed cooking equipment, dysphagia eating support equipment: dysphagia cups, & environmental aids to prompt or support safe swallowing; ICT supports; bed supports; dining chair; adapted footwear; medication management; emergency monitoring (personal alarm); nutrition support: thickener; kitchen trolley; chair raiser for lounge chair; communication devices (high or low tech), plus AT services (annual support plus one-off installation costs). AT services includes two hour of allied health practitioner and four hours of AT supporter/ coach and service costs annually, plus one-off installation and annual maintenance / service costs.

**Assumptions of Cost and Benefit:** With the AT bundle, Orlando is able to manage and monitor his body functions (nutrition, and hemiplegic arm and leg) with thickened fluids, eating supports, orthoses, and a medication reminder/ dispenser. He manages personal and domestic tasks with one-handed equipment and a trolley. Orlando has a walking aid for indoor use as well as a manual one-arm drive wheelchair with powerpack for longer distances and community mobility. Orlando has bathroom adjustments for safety access. Transfers at home are supported by bed mobility equipment and raised seating. A personal alarm and ICT supports (tablet computer and Wi-Fi mean Orlando feels secure alone at home, and is able to engage with the online stroke support community as well as manage billpaying and other executive tasks online. We conservatively estimate that Orlando will save (substitute) 3.8 hours per week of paid support work (home care and instrumental ADL support), noting this is likely a very low estimate. Thirteen and a half hours of unpaid support work are released as Orlando feels safe and autonomous at home, with unpaid supporters able to spend time with Orlando on social and leisure pursuits rather than monitoring and daily living tasks. We avoid one GP visit per quarter due to less anxiety and fewer environmental barriers. Over a 5 year time horizon, we save one emergency department presentation and two acute admissions through decreased falls risk and increased safety, particularly as the AT bundle is reviewed annually. Residential aged care admission is delayed by 18 months.

ORLANDO		Time Horizon (i.e. how long will bundle be used for)				
		Base Year	+1	+2	+3	+4
	AT Products	\$12,204.45	\$18,138.90	\$24,073.35	\$30,007.80	\$35,942.25
	AT Services: allied health / coach	\$680.00	\$1,360.00	\$2,040.00	\$2,720.00	\$3,400.00
TOTAL COSTS: AT BUNDLE	AT Services: adaptation/ Installation	\$300.00	\$300.00	\$300.00	\$300.00	\$300.00
	AT Services: maintenance / service	\$50.00	\$100.00	\$150.00	\$200.00	\$250.00
	TOTAL COSTS	<b>\$13,234.45</b>	<b>\$19,898.90</b>	<b>\$26,563.35</b>	<b>\$33,227.80</b>	<b>\$39,892.25</b>
	Supplement Paid Support Work	\$9,880.00	\$19,760.00	\$29,640.00	\$39,520.00	\$49,400.00
	Supplement Unpaid Support Work	\$9,617.92	\$19,235.84	\$28,853.76	\$38,471.68	\$48,089.60
TOTAL BENEFIT	GP Visitation	\$148.00	\$296.00	\$444.00	\$592.00	\$740.00
	ED presentations	\$116.80	\$233.60	\$350.40	\$467.20	\$584.00
	Acute Admissions	\$1,986.40	\$3,972.80	\$5,959.20	\$7,945.60	\$9,932.00
	Res Aged Care Admission	\$10,800.00	\$21,600.00	\$32,400.00	\$43,200.00	\$54,000.00
	Social Benefit	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
	TOTAL BENEFIT	<b>\$32,549.12</b>	<b>\$65,098.24</b>	<b>\$97,647.36</b>	<b>\$130,196.48</b>	<b>\$162,745.60</b>
	Net Benefit	\$19,314.67	\$45,199.34	\$71,084.01	\$96,968.68	\$122,853.35

Table 2.7 - Orlando

**The cost benefit of an AT bundle versus CHSP funding for moderate functional impairment (stroke/swallowing):**



*NOTE discounting is not applied to either costs or benefits in this scenario*

WITH AT Bundle: after one year, government saves \$1.46 for every \$1 spent. This rises to \$3.08 over 5 years, given GP visits and admissions likely to be avoided. **This is without costing in the likely substantial social benefits to independence and autonomy at home.**

With \$500 annual CHSP spend only, the initial expenditure of \$13,234 to get the AT bundle up and running, cannot be funded. Recipients must therefore select a smaller portion of the AT bundle to purchase, and will not realise full potential benefit of AT. The potential benefits of cost offset (savings) of up to \$122,853 over 5 years if an early intervention investment approach is not taken.

## Profile 4 Progressive neurological MELEI (Severe/ profound functional impairment)

**Severity:** Severe/profound functional impairment due to progressive neurological impairment.

**AT Bundle:** Complexity levels 1-4.

Twenty four AT products (power wheelchair; pressure cushion; hoist; adjustable bed; pressure mattress; orthoses; adapted footwear; wheeled shower commode; stepless entry; handshower & handrails; long handled sponge and reacher; access under bathroom and kitchen sink; toilet rails; wide doorways; adapted kitchen workbench; side opening oven; dressing equipment; medication management; ICT supports, simple smart home AT that you can get from Bunnings/JB Hi Fi; emergency monitoring (personal alarm); complex continence, e.g. single-use catheters).

AT services includes two hours of allied health practitioner and four hours of AT supporter/ coach and service costs annually, plus adaptation/ installation costs and annual maintenance / service costs.

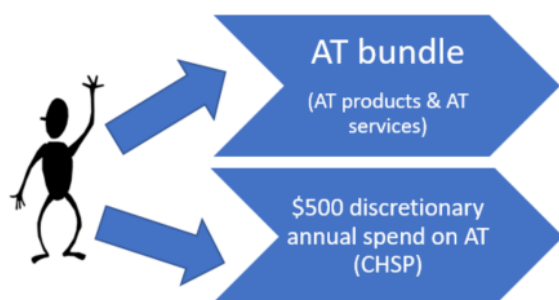
**Assumptions of Cost and Benefit:** Melei has significant and progressive neurological impairment: her AT bundle enables her to be at home with on-call support in lieu of overnight support, and to be autonomous at home for up to 10 hours per day<sup>97</sup>, leading to an estimated saving of 17 of the 47 formal support hours required per week. Twenty hours of unpaid support work are released as Melei and her circle of support know she can manage household environment and communications, as well as readily call for assistance when home. Therefore, unpaid supporters are able to spend time with Melei on social and leisure pursuits rather than monitoring and daily living tasks. Melei controls her doorbell, phone, heating and access via ICT-based environmental control accessed through her power wheelchair joystick and/or mounted tablet device and switches positioned within reach when in her adjustable bed. Pressure cushion and mattress, as well as padded wheeled shower commode preserve her posture and skin integrity. Home adaptations to key working surfaces and access points in the home enable Melei to maximise her functioning in personal and domestic tasks. We avoid one GP visit per quarter due to prevention of secondary complications (pressure care, knocks, adverse events). Over a 5 year time horizon, we save one emergency department presentation and 2.5 acute admissions through decreased falls risk and increased safety, particularly as the AT bundle is reviewed annually. Residential aged care admission is delayed by 18 months.

<sup>97</sup> Formal care costs for people with MND and like conditions range from 9- 68 hours per week (Deloitte Access Economics, 2015). An Individual Support Package recipient with severe limitations receives a maximum of 47 hours care per week. This figure was used for Melei.

MELEI		Time Horizon (i.e. how long will bundle be used for)				
		Base Year	+1	+2	+3	+4
<b>TOTAL COSTS: AT BUNDLE</b>	<i>AT Products</i>	\$45,165.00	\$47,102.00	\$49,039.00	\$50,976.00	\$52,913.00
	<i>AT Services: allied health / coach</i>	\$680.00	\$1,360.00	\$2,040.00	\$2,720.00	\$3,400.00
	<i>AT Services: adaptation/ Installation</i>	\$25,000.00	\$25,000.00	\$25,000.00	\$25,000.00	\$25,000.00
	<i>AT Services: maintenance / service</i>	\$50.00	\$100.00	\$150.00	\$200.00	\$250.00
	<b>TOTAL COSTS</b>	<b>\$70,895.00</b>	<b>\$73,562.00</b>	<b>\$76,229.00</b>	<b>\$78,896.00</b>	<b>\$81,563.00</b>
<b>TOTAL BENEFIT</b>	<i>Supplement Paid Support Work</i>	\$44,200.00	\$88,400.00	\$132,600.00	\$176,800.00	\$221,000.00
	<i>Supplement Unpaid Support Work</i>	\$14,144.00	\$28,288.00	\$42,432.00	\$56,576.00	\$70,720.00
	<i>GP Visitation</i>	\$148.00	\$296.00	\$444.00	\$592.00	\$740.00
	<i>ED presentations</i>	\$116.80	\$233.60	\$350.40	\$467.20	\$584.00
	<i>Acute Admissions</i>	\$2,483.00	\$4,966.00	\$7,449.00	\$9,932.00	\$12,415.00
	<i>Res Aged Care Admission</i>	\$10,800.00	\$21,600.00	\$32,400.00	\$43,200.00	\$54,000.00
	<i>Social Benefit</i>	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
	<b>TOTAL BENEFIT</b>	<b>\$71,891.80</b>	<b>\$143,783.60</b>	<b>\$215,675.40</b>	<b>\$287,567.20</b>	<b>\$359,459.00</b>
	<b>Net Benefit</b>	<b>\$996.80</b>	<b>\$70,221.60</b>	<b>\$139,446.40</b>	<b>\$208,671.20</b>	<b>\$277,896.00</b>

Table 2.8 - Melei

**The cost benefit of an AT bundle versus CHSP funding for severe/profound functional impairment (progressive neurological):**



*NOTE discounting is not applied to either costs or benefits in this scenario*

WITH AT Bundle: after one year, government saves \$0.01 for every \$1 spent. This rises to \$3.41 over 5 years, given GP visits and admissions likely to be avoided. **This is without costing in the likely substantial social benefits to independence and autonomy at home.**

With \$500 annual CHSP spend only, the initial expenditure of \$70,895 to get the AT bundle up and running, cannot be funded. Recipients must therefore select a smaller portion of the AT bundle to purchase, and will not realise full potential benefit of AT. The potential benefits of cost offset (savings) of up to \$277,896 over 5 years if an early intervention investment approach is not taken.

## Profile 5 Amputee TED (severe/ profound functional impairment)

**Severity:** Trans-tibial (below knee) amputation; diabetes.

**AT Bundle:** Complexity levels 1-4.

Seventeen AT products (powerchair; pressure cushion; modified bathroom; modified entrances; adjustable bed; prosthesis; kitchen trolley; ICT supports, ECU; medication management, pressure mattress, raised toilet frame; car adaptations; modified kitchen areas, emergency monitoring (personal alarm) *NOTE diabetes management technology not included.*

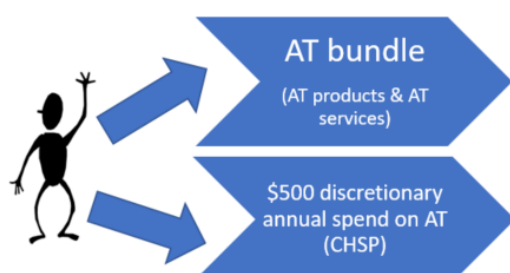
AT services includes one hour of allied health practitioner and five hours of AT supporter/ coach and service costs annually, plus adaptation/ installation costs and annual maintenance / service costs. It is important to note that the extensive AT service from prosthetists to establish prosthetic use would likely occur through Artificial Limb Schemes. The costing here reflects necessary associated technologies and maintenance support to enable the prosthetic user to live life in the community with support from the aged care system.

**Assumptions of Cost and Benefit:** With the AT bundle, we conservatively estimate Ted is able to manage and monitor his body functions (stump and related issues) with his prosthetic limb and related consumables such as prosthetic liners. Customised footwear (annual) enhances his gait and manages diabetes-related skin integrity in the non-affected limb. Ted can walk short distances but uses a power wheelchair with pressure cushion around the house and in the community, with vehicle adaptations for his car. Ted has bathroom and kitchen adaptations to enable him to participate in daily tasks from his wheelchair. An adjustable bed enables independent transfers. A personal alarm and environmental controls for managing his home enable him to control his security when he is not using his prosthetic or up and about in his wheelchair, enhancing autonomy and safety. We conservatively estimate that Ted will save (substitute) 22 hours per week of paid support work (home care and instrumental ADL support). Thirteen and a half hours of unpaid support work are released as Ted feels safe and autonomous at home, with unpaid supporters able to spend time with Ted on social and leisure pursuits rather than monitoring and daily living tasks. We avoid one GP visit per quarter due to less anxiety and fewer environmental barriers. Over a 5 year time horizon, we save one emergency department presentation and two acute admissions, particularly as the AT bundle is reviewed annually. Residential aged care admission is delayed by 18 months.

TED		Time Horizon (i.e. how long will bundle be used for)				
		Base Year	+1	+2	+3	+4
TOTAL COSTS: AT BUNDLE	AT Products	\$56,300.00	\$57,500.00	\$58,700.00	\$59,900.00	\$61,100.00
	AT Services: allied health / coach	\$580.00	\$1,160.00	\$1,740.00	\$2,320.00	\$2,900.00
	AT Services: adaptation/ Installation	\$15,000.00	\$15,000.00	\$15,000.00	\$15,000.00	\$15,000.00
	AT Services: maintenance / service	\$300.00	\$600.00	\$900.00	\$1,200.00	\$1,500.00
	TOTAL COSTS	\$72,180.00	\$74,260.00	\$76,340.00	\$78,420.00	\$80,500.00
TOTAL BENEFIT	Supplement Paid Support Work	\$57,200.00	\$114,400.00	\$171,600.00	\$228,800.00	\$286,000.00
	Supplement Unpaid Support Work	\$9,617.92	\$19,235.84	\$28,853.76	\$38,471.68	\$48,089.60
	GP Visitation	\$148.00	\$296.00	\$444.00	\$592.00	\$740.00
	ED presentations	\$116.80	\$233.60	\$350.40	\$467.20	\$584.00
	Acute Admissions	\$1,986.40	\$3,972.80	\$5,959.20	\$7,945.60	\$9,932.00
	Res Aged Care Admission	\$10,800.00	\$21,600.00	\$32,400.00	\$43,200.00	\$54,000.00
	Social Benefit	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
	TOTAL BENEFIT	\$79,869.12	\$159,738.24	\$239,607.36	\$319,476.48	\$399,345.60
	Net Benefit	\$7,689.12	\$85,478.24	\$163,267.36	\$241,056.48	\$318,845.60

Table 2.9 - Ted

### The cost benefit of an AT bundle versus CHSP funding for severe/profound functional impairment (amputation; diabetes):



NOTE discounting is not applied to either costs or benefits in this scenario

WITH AT Bundle: after one year, government saves \$0.11 for every \$1 spent. This rises to \$3.96 over 5 years, given GP visits and admissions likely to be avoided. **This is without costing in the likely substantial social benefits to independence and autonomy at home.**

With \$500 annual CHSP spend only, the initial expenditure of \$71,920 to get the AT bundle up and running, cannot be funded. Recipients must therefore select a smaller portion of the AT bundle to purchase, and will not realise full potential benefit of AT. The potential benefits of cost offset (savings) of up to \$320,425 over 5 years if an early intervention investment approach is not taken.

## Profile 6 Dementia MARIA (moderate functional impairment)

**Severity:** Dementia; arthritis, incontinence.

**AT Bundle:** Complexity levels 1-3.

Seventeen AT products (Safety stove shutoff; temperature control valves; alerts for kitchen/laundry: flood detectors; ICT monitoring support: inactivity sensor; find me watch; adapted environment: lighting; adapted environment: cueing/ wayfinding; shower stool; flexible showerhose; handrails; safety mat; continence products, chair raiser; medication management; good grip products for kitchen; prompts and reminder systems: time management; emergency monitoring (personal alarm).

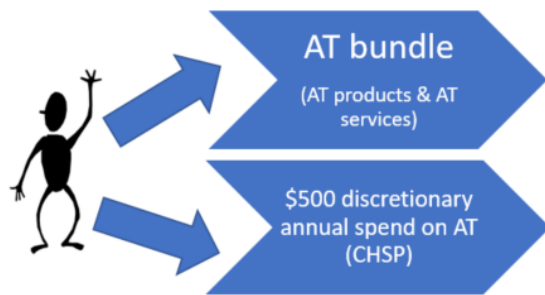
AT services includes one hour of allied health practitioner and two hours of AT supporter/ coach and service costs annually, plus one-off installation costs and annual maintenance / service costs.

**Assumptions of Cost and Benefit:** With the AT bundle, Maria can spend periods of her day without others in her home. Technologies to support her physical function include bathmat, handrails and stool for showering, chair raiser and adapted products for kitchen tasks. Environmental enhancements including lighting, wayfinding cues, prompts and reminder systems assist with daily orientation. 'Light touch' surveillance and monitoring technologies are linked with safety products (stove shutoff; temperature control valves, smoke detector, personal alarm system) as agreed by Maria to raise alerts should atypical data be noted. We conservatively estimate that Maria will save (substitute) 3.8 hours per week of paid support work (home care and instrumental ADL support). Thirteen and a half hours of unpaid support work are released as Maria feels safe and autonomous at home, with unpaid supporters able to spend time with Maria on social and leisure pursuits rather than monitoring and daily living tasks. We avoid one GP visit per quarter due to less anxiety and fewer environmental barriers. Over a 5 year time horizon, we save one emergency department presentation and one acute admission through decreased falls risk and increased safety, particularly as the AT bundle is reviewed annually. Residential aged care admission is delayed by 12 months.

MARIA		Time Horizon (i.e. how long will bundle be used for)				
		Base Year	+1	+2	+3	+4
<b>TOTAL COSTS: AT BUNDLE</b>	<i>AT Products</i>	\$4,635.00	\$5,490.00	\$6,345.00	\$7,200.00	\$8,055.00
	<i>AT Services: allied health / coach</i>	\$340.00	\$680.00	\$1,020.00	\$1,360.00	\$1,700.00
	<i>AT Services: adaptation/ Installation</i>	\$150.00	\$150.00	\$150.00	\$150.00	\$150.00
	<i>AT Services: maintenance / service</i>	\$50.00	\$100.00	\$150.00	\$200.00	\$250.00
	<b>TOTAL COSTS</b>	<b>\$5,175.00</b>	<b>\$6,420.00</b>	<b>\$7,665.00</b>	<b>\$8,910.00</b>	<b>\$10,155.00</b>
<b>TOTAL BENEFIT</b>	<i>Supplement Paid Support Work</i>	\$9,880.00	\$19,760.00	\$29,640.00	\$39,520.00	\$49,400.00
	<i>Supplement Unpaid Support Work</i>	\$9,617.92	\$19,235.84	\$28,853.76	\$38,471.68	\$48,089.60
	<i>GP Visitation</i>	\$148.00	\$296.00	\$444.00	\$592.00	\$740.00
	<i>ED presentations</i>	\$116.80	\$233.60	\$350.40	\$467.20	\$584.00
	<i>Acute Admissions</i>	\$993.20	\$1,986.40	\$2,979.60	\$3,972.80	\$4,966.00
	<i>Res Aged Care Admission</i>	\$7,200.00	\$14,400.00	\$21,600.00	\$28,800.00	\$36,000.00
	<i>Social Benefit</i>	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
	<b>TOTAL BENEFIT</b>	<b>\$27,955.92</b>	<b>\$55,911.84</b>	<b>\$83,867.76</b>	<b>\$111,823.68</b>	<b>\$139,779.60</b>
	<i>Net Benefit</i>	\$22,780.92	\$49,491.84	\$76,202.76	\$102,913.68	\$129,624.60

Table 2.10 – Maria

**The cost benefit of an AT bundle versus CHSP funding for moderate functional impairment (dementia):**



*NOTE discounting is not applied to either costs or benefits in this scenario*

WITH AT Bundle: after one year, government saves \$4.40 for every \$1 spent. This rises to \$12.76 over 5 years, given GP visits and admissions likely to be avoided. **This is without costing in the likely substantial social benefits to independence and autonomy at home.**

With \$500 annual CHSP spend only, the initial expenditure of \$5,175 to get the AT bundle up and running, cannot be funded. Recipients must therefore select a smaller portion of the AT bundle to purchase, and will not realise full potential benefit of AT. Government risks wasting expenses of up to \$129,624 over 5 years if an early intervention investment approach is not taken.

## Profile 7 Sensory loss Fatima (moderate functional impairment)

**Severity:** Vision and hearing loss; osteoarthritis; cardiovascular disease; past orthopaedics (total hip replacement).

**AT Bundle:** Complexity levels 1-4.

Approximately 18 AT products (low vision equipment<sup>98\*</sup>; safety kitchen adaptations; gait aids, ICT supports (sensors; voice activated systems, wearables); adapted / lightweight cleaning equipment, AT to support transfers from low surfaces (Bed, chairs, toilet); handrails at entrance; contrast strips; sensor lighting; emergency monitoring (personal alarm) (NB has hearing aids and glasses but funding not part of this study).

AT services includes one hour of allied health practitioner and five hours of AT supporter/ coach and service costs annually, requiring no installation costs but annual maintenance / service costs.

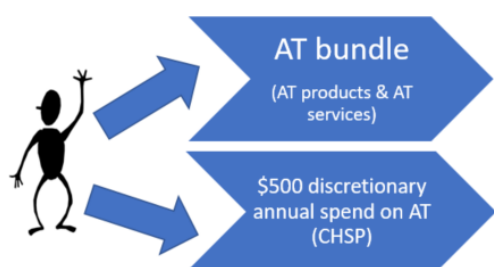
**Assumptions of Cost and Benefit:** With the AT bundle, Fatima has the supports she requires to be oriented to her home: she can cook and eat using liquid level indicators, Hi Mark tactile pens and audible cooking alerts, with contrast strips and lighting to maximise any residual sight. Using lightweight household cleaning equipment she participated in household management. She can move safely around due AT service orientation and mobility support, and has collaborated to decide which risky areas require safety tread and handrails. Mobility support for her arthritis-related functional difficulties include raised seats and a walking aid. Tailored ICT supports in the low vision equipment bundle mean Fatima can read and pay household bills, read books and documents, and find out the colour of items when making shopping choices: these technologies enable Fatima to continue her lifelong interests in fashion and current affairs, and to participate in her online book group, and to Skype family. We conservatively estimate Fatima will save (substitute) 3.8 hours per week of paid support work (home care and instrumental ADL support). Just over thirteen and a half hours of unpaid support work are released as Fatima feels safe and autonomous at home, with unpaid supporters able to spend time together on social and leisure pursuits rather than monitoring and daily living tasks. We avoid one GP visit per quarter due to less anxiety and fewer environmental barriers. Over a 5 year time horizon, we save one emergency department presentation and one acute admission through decreased falls risk and increased safety, particularly as the AT bundle is reviewed annually. Residential aged care admission is delayed by 18 months.

<sup>98</sup> \*LOW VISION EQUIPMENT (\$5,000 bundle): lighting, optical and electronic magnifiers, computer software, iPad, electronic magnifier, CCTV, talking books, OrCam, MDFA 2017.

FATIMA		Time Horizon (i.e. how long will bundle be used for)				
		Base Year	+1	+2	+3	+4
TOTAL COSTS: AT BUNDLE	AT Products	\$7,402.00	\$7,934.00	\$8,466.00	\$8,998.00	\$9,530.00
	AT Services: allied health / coach	\$580.00	\$1,160.00	\$1,740.00	\$2,320.00	\$2,900.00
	AT Services: adaptation/ Installation					
	AT Services: maintenance / service	\$50.00	\$100.00	\$150.00	\$200.00	\$250.00
	TOTAL COSTS	\$8,032.00	\$9,194.00	\$10,356.00	\$11,518.00	\$12,680.00
TOTAL BENEFIT	Supplement Paid Support Work	\$9,880.00	\$19,760.00	\$29,640.00	\$39,520.00	\$49,400.00
	Supplement Unpaid Support Work	\$9,617.92	\$19,235.84	\$28,853.76	\$38,471.68	\$48,089.60
	GP Visitation	\$148.00	\$296.00	\$444.00	\$592.00	\$740.00
	ED presentations	\$116.80	\$233.60	\$350.40	\$467.20	\$584.00
	Acute Admissions	\$993.20	\$1,986.40	\$2,979.60	\$3,972.80	\$4,966.00
	Res Aged Care Admission	\$10,800.00	\$21,600.00	\$32,400.00	\$43,200.00	\$54,000.00
	Social Benefit	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
	TOTAL BENEFIT	\$31,555.92	\$63,111.84	\$94,667.76	\$126,223.68	\$157,779.60
	Net Benefit	\$23,523.92	\$53,917.84	\$84,311.76	\$114,705.68	\$145,099.60

Table 2.11 - Fatima

The cost benefit of an AT bundle versus CHSP funding for moderate functional impairment (vision loss; joint conditions):



NOTE discounting is not applied to either costs or benefits in this scenario

WITH AT Bundle: after one year, government saves \$2.93 for every \$1 spent. This rises to \$11.44 over 5 years, given GP visits and admissions likely to be avoided. **This is without costing in the likely substantial social benefits to independence and autonomy at home.**

With \$500 annual CHSP spend only, the initial expenditure of \$8,032 to get the AT bundle up and running, cannot be funded. Recipients must therefore select a smaller portion of the AT bundle to purchase, and will not realise full potential benefit of AT. The potential benefits of cost offset (savings) of up to \$145,099 over 5 years if an early intervention investment approach is not taken.

### Summary of return on investment for 7 AT user profiles

Profile	\$'s save per \$1 spent and Time Horizon (i.e. how long will bundle be used for)				
	Base Year	+1	+2	+3	+4
<b>Simone</b>	\$9.99	\$11.61	\$12.26	\$12.61	\$12.83
<b>Kim</b>	\$1.04	\$1.96	\$2.49	\$2.83	\$3.07
<b>Orlando</b>	\$1.46	\$2.27	\$2.68	\$2.92	\$3.08
<b>Melei</b>	\$0.01	\$0.95	\$1.83	\$2.64	\$3.41
<b>Ted</b>	\$0.11	\$1.15	\$2.14	\$3.07	\$3.96
<b>Maria</b>	\$4.40	\$7.71	\$9.94	\$11.55	\$12.76
<b>Fatima</b>	\$2.93	\$5.86	\$8.14	\$9.96	\$11.44

Table 2.12

## 2.4 DISCUSSION

Pathway analysis was demonstrated to be a successful method to articulate the impact of AT bundles within an expenditure context, providing data able to inform Australian policy. One consideration in cost benefit analyses is whether a saving can actually be realised. It cannot always be assumed that decreased costs directly leads to lower budgets e.g. where an empty nursing home bed doesn't 'cease to exist' but has institutional limitations/ rigidities in that infrastructure remains. We suggest in a policy context where individual bundles of support are provided, that it IS likely that decreasing care costs will not run into institutional hurdles so will be an actual cost saving.

The intent of constructing the seven AT user profiles was to broadly canvass virtually all scenarios<sup>99</sup> for older people living at home in Australia. The costed profiles provide information on life for Australians across all functional impairment types – from subclinical frailty to impairments of the skin, bone and joint, neurological, neuromusculoskeletal, sensory, cognitive and internal systems. These profiles canvassed life for people with mild, moderate, or severe to profound functional limitations.

The AT bundles were costed in full (including AT services such as allied health or AT support for evaluation, coaching, skill development and monitoring / review), AT installation, and servicing/ maintenance cycles. This is the first time this has been done in the Australian context, as usually these costs are spread over many stakeholders and not provided in one co-ordinated service. The AT benefits were not able to be fully costed, for example data on the social return on investment was difficult to locate and therefore social benefits are an indicative area not yet completed. Costing the tangible savings was a deliberate choice which strengthened the data and provided convincing evidence of potential return on investment.

Return on investment is positive where:

- a) the costs are exceeded by the cost offsets alone, or
- b) costs match more or less the cost offsets + social benefit occurs, weighting the benefits towards a dominant result

In each AT profile, the return on investment was positive. These results demonstrate that a spend on AT bundle of products and services can deliver cost effective outcomes and is a good government investment. Importantly in the severe/profound AT profiles, the expenditure to set up the AT bundle in the first year was 'dominated', that is, potential would not be covered by the initial expenditure. In all instances, however the return on investment was realised within 2-5 years.

In no instance would the CHSP \$500 annual allocation available for AT cover the cost of set up in the base year. That is, there is no potential for early intervention or to benefit from early investment in AT, in the current aged care service context.

This data is indicative of substantive potential savings, particularly in relation to Australian population figures.

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<sup>99</sup> Excluded were, eye glasses, hearing aids, stoma care, respiratory support

## 2.5 ASSUMPTIONS AND LIMITATIONS

It is necessary in economic evaluations to list the assumptions which have been made. The above economic calculations based upon the following:

- The AT user profiles are based in a series of studies and on a defensible methodology. They are however archetypes and intended to canvass the broadest range of AT products which can be utilised. Assumptions around the extent of relevance to the Australian population can be refined.
- Inclusion of AT services (allied health evaluation, and coaching / support from an allied health assistant, peer mentor or other supporter) is an important recognition of usually invisible AT service costs. These figures are conservative, based on Australian benchmark pricing, and drawn from tacit clinical judgement as to the time taken for a home assessment.
- The time horizon runs from a base year out to 5 years: these are broad calculations which may be refined in future studies, for example if evidence is found that older Australians are best researched in a shorter or longer horizon.
- Scarcity of available evidence of costs of AT products, particularly when bundled with relevant AT services and other related devices. The tacit knowledge of allied health professionals as well as data from reports on focal disability groups or groups of products, has been drawn upon to fill these gaps. Further testing, refinement and piloting of these AT bundle assumptions is recommended.
- Many AT products have a wide diversity of low through to high pricing. Clinical judgement is required to match the product to the person and context, and many allied health professions hold concerns that 'benchmark pricing' will lead policymakers to assume lowest price will suffice to deliver outcomes.
- Pricing for an item will differ depending on whether it is sold for a contract price to a state AT funder through bulk supply arrangements, through a distributor with or without handling charges, or through for example a local rural pharmacy, where mark-ups can be as much as 63% (personal communication, DAA, April 2017)<sup>100</sup>.
- Allied health practitioners emphasise that it is not accurate to use prices listed by many state AT funders as these in no way reflects actual market prices (see for example a 2010 study identifying a 30-60% shortfall in subsidy rates compared with market costs for the Victorian program (N Layton et al., 2010).
- Nutrition support pricing is contested, with limited available evidence (Independent Hospital Pricing Authority, 2014) standing in contrast to current practice experience and costs.
- Orthotic pricing is contested, with off-the shelf orthoses unlikely to be comparable to customised or custom-fitted orthoses, and complexities in costing AT service costs within this.

<sup>100</sup> EXAMPLE Nestle Resource Thicken Up Clear - \$90 for 750 grams at local rural pharmacy in NSW. Internet prices on the same product \$15-00 for 127 g pack in suburban Melbourne i.e. about \$90 per 750g. or \$73.24 per 750g through a well known distributor (without handling charges.) Consistency varies from 15 – 20 scoops/day up to 45 – 60 scoops/day. Cost therefore varies from \$14.65/day to \$48.80/day (personal communication DAA 1 Dec 2017)

- In the example of prostheses, prices differ significantly based upon the type of prosthesis / orthosis (Brotkorb et al., 2008). AT services in the form of prosthetic assessment, fitting, trial, training, user-skilling, maintenance and review are integral to the function and outcomes of the AT and are currently sit within the disability sector, once a person is discharged from hospital.
- A 'most likely cost' method used allied health judgement to determine costs for the range of mild, moderate, severe / profound AT user profiles. Products likely to meet these profile needs, at the nominated levels of severity, were identified and costs identified which fall between the lowest and highest costs for that product category. This method again relies on allied health expertise (primary researcher with expert input from AHPA and ILCA), and focussed expert input for specific product categories (respiratory, continence, orthotics, nutrition support)
- National hospital data was used to estimate cost of admissions, however it is acknowledged this aggregated data covers long and short stay occasions of service. A finer set of data to represent hospital admissions likely to be experienced by the specific cohort (e.g. stroke) would provide a more accurate estimate, such as diagnostic-groupings<sup>101</sup>.
- GP costs could rise or fall by a 'weighted average, however the current level B consult reimbursement rate of \$37 is likely to cover standard GP visits.
- Several specialised areas of AT are not costed: hearing aids; glasses for vision; major or complex home modifications; and the full bundle of prosthetic supports (ie stump socks and replacement parts)
- It is feasible to re-run the formula using lowest cost – a common cost effectiveness strategy to increase the confidence interval.
- Diverse data on the outcomes of AT, particularly from an economic perspective. Studies were selected based on their methodological strength (where possible), and variables such as currency / country, age of study, and inclusions / exclusions were taken into account. The decision path to identifying costs was made explicit through footnotes. Nevertheless, the identification of a 'bottom line' for costing outcomes has involved extrapolation of available data. The formula may be able to be improved by replacing indicative costs with more robust costs when this becomes available.

Finally, we note once again that we have not run a full cost-benefit analysis, as the comparator was not fully explored.

## 2.6 EXTENSIONS TO THIS WORK

- Run a full cost-benefit analysis by fully assessing the comparator situation for each Case Profile
- Conduct a sensitivity analysis: It is feasible to re-run the formula using lowest cost – a common cost effectiveness strategy to increase the confidence interval.

<sup>101</sup> For more information, see: <https://www.ihipa.gov.au/publications/national-hospital-cost-data-collection-public-hospitals-cost-report-round-19-financial>

- Extend the modelling at a population level to forecast AT bundle impacts and potential savings.
- Clinical consensus stage to validate the specific AT bundles emerging.
- Further develop focal AT bundles. This Research Report illuminated several specific instances where a set of products are highly likely to be required despite individual differences in user and environment, for example hearing; amputation; cognition, and profound physical. A worked example is provided for vision in the footnote<sup>102</sup>.

## 2.7 CONCLUSION

Investment in AT is a cost effective early intervention. AT is most effective delivered in a bundle, as consumers utilise between 8-12 AT products on average. Risk of AT abandonment or non-use is mitigated through provision of AT services: these include impartial and flexible information services to scope and envision potential AT solutions; and service systems which enable AT to be viewed, trialled in real environments, adjusted and fitted, and for users to be trained and upskilled in their use and application. Maintenance and review are also significant factors in the effectiveness of AT.

A return on investment approach enables valued outcomes from all stakeholders to be factored in. The published literature and reports dealing with the costs and outcomes of AT do not fully canvass potential outcomes, particularly social outcomes. This report models the actual cost offsets and downstream costs feasible with a comprehensive AT bundle. It demonstrates the high likelihood of under-realised potential for cost savings (offsets and downstream costs) across a range of government expenditure areas, and suggests a fuller investigation of these is warranted as part of providing a consistent AT provision service for older Australians.

<sup>102</sup> Communication and Participation – equipment to facilitate social interaction and complete tasks independently. Augmented vision devices for reading/ writing. Large print or contrast products. Handheld magnification. Computer or smart device with adapted input/output eg refreshable Braille, voice to text, contrasting or split keyboard. Independent Travel – navigation solutions with voice and large print options. White cane training. Dog guide. Self Care and Daily Living Tasks - Auditory and visual prompts and alerts in kitchen/laundry. Talking Microwaves, Clocks, Timers. Talking kitchen equipment and training to safely do tasks without looking; the cutting up of food etc. Smart devices to identify colours. Data labellers to identify pantry products. Online banking/ shopping assistive technology software, optical and electronic magnifiers and CCTVs. Large button phones. Lighting, optical and electronic magnifiers, computer software, iPad, CCTV with voice, Or Cams. Book, newspaper and magazine alternatives (DAISY players). Portable notetakers (Macular Disease Foundation Australia, 2017)

## Appendix 1: AT Policy Design Principles in Australia and Internationally

Source	Findings
AUSTRALIA 2016	Position papers: Statement on AT Good Practice calls for:
ARATA Position Statements <sup>103</sup>	<ul style="list-style-type: none"> <li>• Clear definitions for AT</li> <li>• Provide the essential steps of AT Provision (information and assessment, identifying and trialling assistive solutions, purchasing and customising the solution and ensuring ongoing and effective use, maintenance and review)</li> <li>• Getting the right people involved in assistive technology provision</li> </ul>
AUSTRALIA (2014) Study of 100 Victorian AT users including cost consequence analysis and policy case study (Natasha Layton & Wilson, 2014)	<p>POLICY SOLUTIONS:</p> <p>Policy solution 1: universalising policy</p> <p>Policy solution 2: aligning policy goals with valued outcomes</p> <p>Policy solution 3: Flexible service delivery: the AT solution</p> <p>Policy solution 4: increasing the number and extending the roles of duty holders</p> <p>Policy solution 5: providing entitlement and equity</p>
(from Queensland Competition Authority. (2014). Price Disparities for Disability Aids and Equipment)	<p>DESIGN OF FUTURE PROGRAMS xi</p> <p>While one 'right' program design is unlikely, there are some key features that governments should consider:</p> <ul style="list-style-type: none"> <li>• <b>Clearly define rationale and objectives.</b> Programs should have clearly defined objectives that focus on outcomes and not means, and provide a basis for the community to judge program success.</li> <li>• <b>Leverage buying power.</b> Governments should ensure that they do not impose unnecessary barriers to non-government entities pursuing bulk purchasing. Where it can be determined that governments are best placed to undertake procurement, they should consolidate their buying power rather than operate large numbers of programs.</li> <li>• <b>Choice.</b> Choice is important, even recognising the limits faced by consumers from information asymmetries. Consumer-orientated programs tend to produce better outcomes for people with disability, and can increase competition and achieve lower prices.</li> <li>• <b>Accessibility.</b> Programs should be as simple and accessible as possible.</li> <li>• <b>Competition.</b> Programs should avoid unintentional adverse impacts on competition.</li> </ul>
AUSTRALIA 2015 Journal article reporting on Delphi study of AT users regarding AT funding and service provision (De Jonge et al., 2015)	<p>What consumers want from AT funding and service provision:</p> <ol style="list-style-type: none"> <li>1. The best combination of equipment, personal care and environmental design to meet needs in every area of life;</li> <li>2. Access to sufficient funding to pay for good quality and long lasting equipment;</li> <li>3. Having needs looked at holistically, so that each piece of equipment works well and does not interfere with other equipment or supports;</li> <li>4. Having equipment needs considered across the lifespan, as needs change;</li> <li>5. Access to support through the whole process of getting equipment, including equipment trial, training and maintenance;</li> </ol>

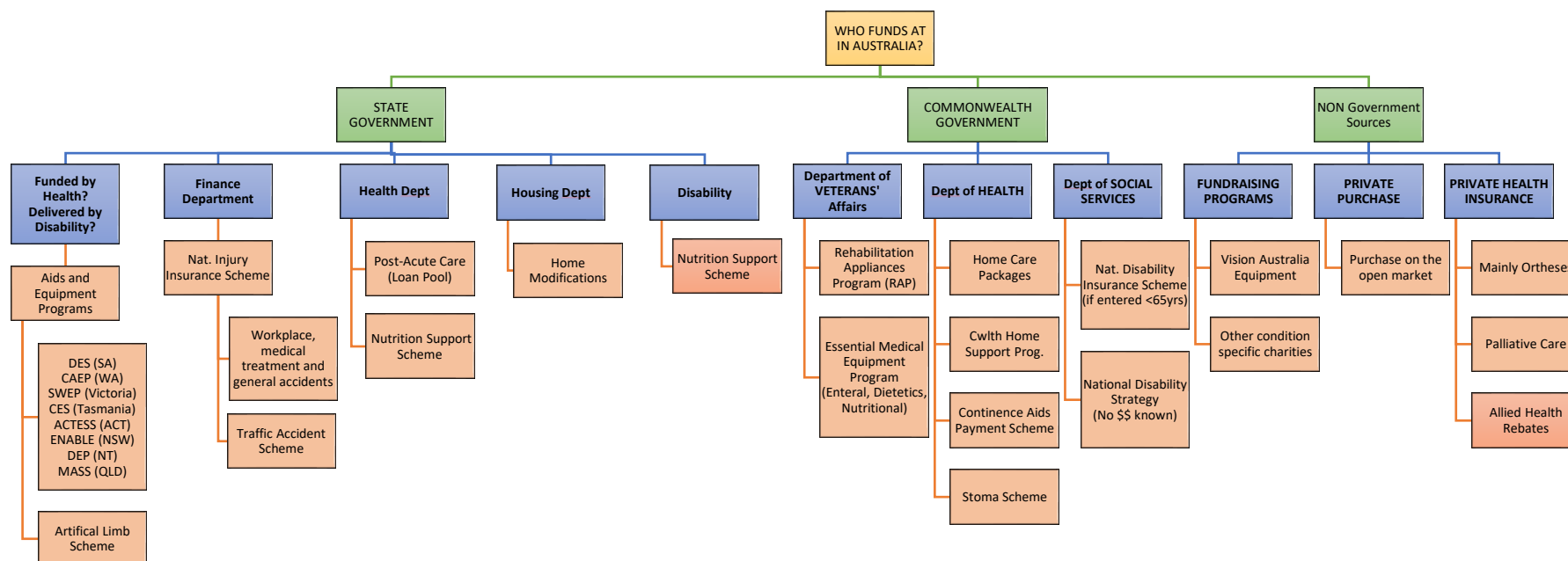
<sup>103</sup> <http://www.arata.org.au/access-&-funding/principles-standards-and-regulations/>

	6. Access to resources when needed; 7. Being actively involved in deciding on the best option; 8. Having personal preferences and identity considered when identifying equipment to suit lifestyle and participation; 9. Gaining knowledge of AT and the processes involved in accessing it; 10. Having access to skilled AT practitioners who can work across life domains.
IRELAND 2016  Discussion paper calling for government reform, based on the experiences of two major Disabled Person's Organisations, focussed on disability and on older people  (Disability Federation of Ireland & Enable Ireland, 2016)	Recommend whole of government approach to AT in Ireland based on principles of: 1) Accessibility: a) Access must be granted regardless of health condition or age; b) Access must be consistent regardless of geographical location. c) Access must be consistent regardless of education, work or living circumstances; d) Funding eligibility must be fair and equitable. e) Information and advice on options must be freely available; 2) Consumer-focused: a) AT users who can self-assess must be supported to do so, and have their assessment validated and processed; b) AT users must be supported to make active choices around solutions that suit their needs; c) Expert AT users must be trained and resourced to peer mentor other users and/or become a resource to industry; d) Consumers must also be offered the option to choose higher spec equipment and contribute to its purchase from their own resources, as well as input into the aesthetic elements of the equipment; e) The model must give autonomy to the user, or support services to instigate reviews at key life transition points, or as a result of changing health needs. 3) Progressiveness: a) Investment is required to keep up to date with technological advances and ensuring assessors, staff, and AT users keep pace with latest developments; b) Investment in innovation is also a requirement to ensure that mainstream developments are accessible. 4) Efficiency a) It must demonstrate value for money across the lifespan of the person using the technology, in a way that accounts for opportunity costs as well as financial costs; b) It must provide a timely response, particularly during key transition points; c) It must have the flexibility to support new AT users, learners and expert users across mainstream solutions and highly complex AT systems; d) It must deliver a service as close as possible to where people live or work; e) It must provide funding according to need, and take account of capacity to pay or contribute for low cost, readily available items;

	<p>f) Funding resources must also be pooled together to provide better value for money and better outcomes for people with disabilities;</p> <p>5) Effectiveness:</p> <p>a) The best use of existing resources, mainstream supports and services within current systems must be utilised, with specialist supports coming into play on a needs basis only;</p> <p>b) Central procurement of equipment can ensure value for money for commonly used items;</p> <p>c) The ecosystem and model of delivery should be monitored for effectiveness, efficacy and efficiency over time</p>
<p>NORWAY 2017</p> <p>Sund, T. (2017) The Norwegian Model of Assistive Technology Provision. (Sund, 2017)</p>	<p>Norwegian Assistive Technology model, established in 1995. Its primary objectives included</p> <ol style="list-style-type: none"> <li>1) establishing a unified, national system for assistive technology;</li> <li>2) addressing users' practical/functional daily problems regarding the AT they used;</li> <li>3) giving the users right in law to necessary and appropriate assistive products, free of charge,;</li> <li>4) providing users with the same level of services regardless of where they live;</li> <li>5) establishing a common ICT system for registration of purchases, distribution, repairs, regular servicing, and refurbishment of assistive product, and</li> <li>6) user involvement in the system and a focus on the individual strongly emphasized.</li> </ol>
<p>EUROPE 2013</p> <p>Association for the Advancement of Assistive Technology in Europe: (AAATE, October, 2012)<sup>104</sup></p>	<p>Service Delivery Systems for Assistive Technology in Europe: Position Paper. Good practice steps for AT provision include:</p> <ul style="list-style-type: none"> <li>• information and assessment,</li> <li>• identifying and trialling assistive solutions within environments of use</li> <li>• purchasing</li> <li>• customising the solution to ensure ongoing and effective use</li> <li>• maintenance and review</li> </ul>

<sup>104</sup> <http://www.atis4all.eu/news/detail.aspx?id=406&tipo=1>

## Appendix 2: AT funding map for aged care



## Appendix 3: Grid mapping of functional impairment groupings to assistive technology chapters, identified against likely funding sources

Mapping functional impairment groupings to assistive technology chapters & identifying current funder <i>Current Funding Responsibility: aged care; health; state disability; National Injury Insurance Scheme (NIIS); Hearing Services Program, or self funding/mix aged/health/private insurance</i> <b>NB DVA fund most AT if eligible</b>											
<b>PEOPLE: WHO ICF</b> (described in terms of body function and structures)  <b>PRODUCTS: ISO 9999</b>	<i>04 Assistive products for measuring, supporting, training or replacing body functions</i>	<i>05 Assistive products for education and for training in skills</i>	<i>06 Orthoses / prostheses</i>	<i>09 Assistive products for self-care activities and participation in self-care</i>	<i>12 Assistive products for activities and participation relating to personal mobility &amp; transportation</i>	<i>15 Assistive products for domestic activities and participation in domestic life</i>	<i>18 Furnishings, fixtures</i>	<i>22 Assistive products for communication and information management</i>	<i>24 Assistive products for controlling, carrying, moving and handling objects and devices</i>	<i>27 Assistive products for controlling, adapting or measuring elements of physical environments</i>	<i>28 Assistive products for work activities and participation in employment<sup>105</sup></i>
<b>Neuromusculo-skeletal</b>	MS/ Post Polio/ Spinal Cord Injury Arthritis Osteoporosis		MS / Post Polio/ Spinal Cord Injury	MS / Post Polio/ Spinal Cord Injury	MS / Post Polio/ Spinal Cord Injury	MS / Post Polio/ Spinal Cord Injury	Multiple Sclerosis/ Post Polio/ Spinal Cord Injury	MS / Post Polio/ Spinal Cord Injury	MS / Post Polio/ Spinal Cord Injury		
<b>Genito-urinary Metabolic</b>				Co-morbid chronic disease frailty	Co-morbid chronic disease frailty	Co-morbid chronic disease frailty	Co-morbid chronic disease frailty	Co-morbid chronic disease frailty	Co-morbid chronic disease frailty		
<b>Cardiorespiratory Immunological</b>	Co-morbid chronic disease frailty										

<sup>105</sup> JobAccess or National Workplace Modifications Scheme for working aged

<b>Sensory (including vision) Voice/speech</b>	Vision loss/ hearing loss	Vision loss		Vision loss/ hearing loss	Vision loss/ hearing loss	Vision loss/ hearing loss	Vision loss/ hearing loss	Vision loss/ hearing loss		Hearing loss	
<b>Nervous system/Mental functions</b>	Dementia Stroke	Dementia		Dementia Stroke	Stroke	Dementia Stroke	Dementia Stroke	Dementia	Stroke		
<b>Skin &amp;related structures</b>			Amputee	Amputee	Amputee	Amputee	Amputee				

## Appendix 4: Stakeholder feedback and revisions to AT profiles

Feedback from Stakeholders (n-7)	Revisions made
A key tension with this type of method concerns the categorisation 'lens'. International directions in ageing may consider wellness, and focus on participation, however currently policies do not align with this language or measure these outcomes. The available population data is diagnostic in nature (e.g. SDAC) making it difficult to 'find' the older person who does not fall into these categories, yet for whom AT enables significant participation outcomes. A particular issue is the delineation between 'older people with disabilities' and 'frailty'. Expert respondents noted that a large cohort of older Australians who need aged care services either have a range of underlying chronic health conditions (REF AIHW) but no specific diagnoses. According to current evidence, frailty is not considered a normal part of ageing, rather a clinical condition with certain features, including loss of muscle strength and slowed or impaired gait.	<i>REVISIONS: a MILD profile will be added to capture non-diagnostic based people, based on the chronic disease dataset (AIHW).</i>
Expert informants also identified a range of other 'potential' diagnostic groups with which they were familiar. It is however necessary to adhere to recognisable profile groupings (for example, neuromuscular) rather than generate exhaustive lists.	<i>REVISIONS: clearly indicate the groupings and what they may cover, aligned to ABS SDAC in order to obtain population data</i>
Defining activity and participation domains: initially these were divided across personal, domestic, community and instrumental activities of daily living.	<i>REVISION: A more contemporary approach just uses two dimensions of ADL and IADL, and cluster the relevant ABS SDAC categories against these.</i>

Feedback from Stakeholders (n-7)	Revisions made
<p>AT funding does not resemble the broad sweep of available technologies (especially smart home and monitoring technologies) which may therefore be underutilised. While the aged care reform agenda speaks to participation outcomes, the focus on activity-level outcomes (self-care, mobility) again fails to fully demonstrate the potential of AT. The proposed list of assistive products raised questions of scope for many expert informants, who suggested adding AT to maintain lifestyle and preferences, as well as a range of current developments in mainstream technologies applied to health (such as information and communication technologies); ambient environmental controls (smart home technologies), monitoring and surveillance technologies (including body worn devices for tracking in the community); therapeutic (therapy and exercise robots, robotic companion animals and cognitive training software) and leisure technologies (videogames, electronic social networking). Additionally, some feedback noted that a range of supportive AT and environments could be present in the community, beyond the home. Some saw this research as an opportunity to build in the relevance of AT to support areas such as self-management, falls prevention and reablement. We note these have, to date, been largely out of scope of equipment funding schemes. We note however the focus here is on AT which is within scope for government funding, addressing individuals (rather than belonging in communities or the built environs).</p>	<p><i>REVISION: addition AT proposed by expert informants to be added where relevant to contemporary or currently researched assistive products for individuals. Note that hearing aids and alternative listening products are out of scope as currently managed nationally by the Hearing Services Program, however daily living supports related to hearing (vibrating alarms etc) are in scope</i></p>

## Appendix 5: AT Bundle Pricing: lowest to highest

	BLACK: NED PRICING BLUE INTERNET PRICING RED SOUGHT FROM SPECIALISTS		Single unit OR annual cost	Cost
ABS category	SDAC	Product Costs	NDIS Complexity Level	Lowest Highest
Self-care		Safety tread	1	\$20.00 \$360.00
		Safety bathmat	1	\$25.00 \$50.00
		Tapturners	1	\$7.90 \$89.10
		Dressing equipment (sock donners, dressing hooks)	1	\$5.90 \$81.71
		Lightweight cleaning and cooking equipment	1	\$8.00 \$120.00
		Laundry trolley	1	\$19.99 \$180.00
		Nonslip products	1	\$5.00 \$250.00
		Long handled reacher	1	\$6.00 \$58.00
		Adapted clothing	1	\$10.00 \$200.00
		Colour contrast strips/ Hi Mark tactile pens	1	\$5.00 \$100.00
		Continence	1	\$10.00 \$80.00
		Shower stool/ bathseat	2	\$70.00 \$1,999.00
		Handshower	2	\$71.00 \$223.74
		Bed supports - grip ladder, monkey bar	2	\$35.00 \$205.00
		Chair raisers;	2	\$11.94 \$119.00
		Raised toilet frame	2	\$51.00 \$450.00
		Dysphagia cups or aids	2	\$18.00 \$126.00
		Upright lounge chair	2	\$280.00 \$2,300.00
		Flexible showerhose and switchcock	1	\$60.00 \$250.00
		Thermostatic mixer	2	\$70.00 \$2,000.00
		Bed raisers	2	\$11.94 \$119.00
		Bed supports - self help pole, turning supports	3	\$25.00 \$760.00
		Adjustable bed	3	\$1,209.00 \$9,239.00
		hoist and slings (mobile or overhead + tracking)	3	\$300.00 \$4,000.00
		Bidet	3	\$22.00 \$339.00
		Adapted footwear	3	\$10.00 \$250.00
		Orthoses	3	\$20.00 \$300.00
		Wall bumpers	3	\$35.00 \$360.00
		powered rise recline loungechair	3	\$599.00 \$3,600.00
		Over toilet mobile shower commode	4	\$55.00 \$2,500.00
		Wheeled shower commode/shower trolley	4	\$55.00 \$8,900.00
		Nutrition support - thickeners etc (180/month)	4	\$14.65 \$48.80
		Nutrition support - tube feed HEN	4	\$2,160.00 \$18,600.00

	pressure mattress - static to alternating	4	\$100.00	\$6,330.00
	Pressure cushion - static to alternating	4	\$20.00	\$2,000.00
	Wide doorways	4	\$1,000.00	\$2,000.00
	Level access adaptations	3	\$1,000.00	\$4,000.00
	Partial room adaptations	4	\$4,000.00	\$15,000.00
	Gantry hoists	4	\$4,500.00	
<b>Health-care</b>	Medication management	1	\$5.00	\$300.00
	self-monitoring devices (blood pressure, reminder systems)	2	\$30.00	
	oxygen	3	\$1,795.00	\$5,000.00
	Prosthesis-related consumables	3	\$50.00	\$500.00
	Orthoses	3	\$20.00	\$300.00
	Prostheses (NB stump socks etc not costed)	4	\$12,500.00	\$120,000.00
	Wig			
	Pressure garments		\$75.00	\$250.00
	Respirators / ventilators	4		
	Continence products (liners, pads, reusable products)	2	\$0.50	\$3.80
<b>Communication</b>	Online banking/ shopping = computer or smart device	1	\$50.00	\$2,900.00
	GPS	1	\$39.00	\$2,300.00
	Adapted ICT access for communication e.g. bundle of adapted keyboard, mouse, large screen, internet access	2	\$200.00	\$3,250.00
	Audible or vibrating doorbell / phone/ smoke / cooking alerts	2	\$10.00	\$600.00
	Environmental control units eg(Google Home)	2	\$45.00	\$3,600.00
	AAC AT- specific communication device set up for participant	2	\$40.00	\$23,900.00
	Voice amplifier	2	\$22.00	\$599.00
	Surveillance supports: Wearable devises, tracking systems	3	\$7.00	\$820.00
	Memory support products	3	\$5.00	\$300.00
	personal alarm call system	3	\$16.00	\$850.00
<b>Meal preparation</b>	Adapted kitchen equipment	1	\$7.00	\$230.00
	Side opening oven	1	\$400.00	\$2,000.00
	Microwave stealth shelf	1	\$160.00	
	Adapted cutlery and crockery	1	\$15.00	\$98.00
	Dysphagia cup	1	\$68.00	\$262.00
	Adapted kitchen chair	2	\$280.00	\$650.00
	Propping stool	2	\$100.00	\$400.00
	Kitchen adaptations: clearance beneath sink & cooker;	2	\$1,500.00	\$2,000.00
	Monitoring systems	2	\$20.00	\$650.00
	Prompts and reminder systems	2	\$10.00	\$350.00

	Kitchen trolley	2	\$20.00	\$200.00
	Jar opener	1	\$20.00	\$120.00
	one-handed products with contra-indications (splades, spike boards)	3	\$20.00	\$230.00
<b>Household chores</b>	Tapturners	1	\$7.90	\$89.10
	Food preparation equipment	1	\$7.00	\$230.00
	Robot vacuums	1	\$20.00	\$2,000.00
	long handled/ lightweight cleaning equipment	1	\$1.70	\$150.00
	shopping trolley	2	\$12.00	\$380.00
	Laundry trolley	2	\$19.99	\$180.00
	Stove shutoff devices	2	\$254.00	\$305.00
	Auditory and visual prompts and alerts in kitchen/laundry	2	\$5.00	\$600.00
	TVs / FM transmitter / receivers	2	\$10.00	\$6,000.00
	Temperature control taps	2	\$1,000.00	\$1,500.00
	Adapted ICT access to services e.g. online banking/ shopping	3	\$10.00	\$3,000.00
	Computer or smart device with adapted input/output e.g. refreshable Braille, voice to text, split keyboard	3	\$100.00	\$24,000.00
<b>Reading or writing tasks</b>	Online banking/ shopping = computer or smart device	2	\$50.00	\$2,900.00
	Augmented vision devices: VISION BUNDLE lighting, optical and electronic magnifiers, computer software,iPad,CCTV, talking books, OrCam	3	\$500.00	\$5,000.00
	Large print or contrast	3	\$5.00	\$100.00
	Low or high tech AAC AT	3	\$1.00	\$24,000.00
	Adapted / lightweight gardening equipment	1	\$40.00	\$100.00
<b>Property maintenance</b>	wheelie bin trolley		\$40.00	\$1,600.00
	remote controls for external doors	2	\$5,000.00	\$8,000.00
	simple smart AT from mainstream stores	1	\$30.00	\$1,000.00
	single point sticks	1	\$20.00	\$200.00
<b>Mobility</b>	hiking poles	1	\$10.00	\$350.00
	Wheeled walker with seat	2	\$80.00	\$900.00
	Manual wheelchair standard	3	\$100.00	\$1,600.00
	GPS location finder/ smart wayfinding supports /white cane	3	\$15.00	\$2,300.00
	Mobility scooter	3	\$1,000.00	\$11,900.00
	Postural supports	3	\$10.00	\$1,500.00
	Powerpack	3	\$1,000.00	\$2,000.00
	One arm drive manual wheelchair	3	\$1,500.00	\$3,000.00
	Powered wheelchair	3	\$2,000.00	\$30,000.00
	Pressure cushion	3	\$20.00	\$2,400.00

	Ramps	3	\$48.00	\$4,300.00
	Hand Rails	2	\$25.00	\$300.00
	powered walking frame	4	\$580.00	\$2,500.00
	slideboard	3	\$60.00	\$300.00
<b>Transport</b>	Walking aids (incl Wheelie frame with seat)	2	\$20.00	\$2,600.00
	transfer handle for car	2	\$17.95	\$89.97
	Vehicle adaptations	3	\$200.00	\$20,000.00
	Vehicle hoist or trailer	3	\$200.00	\$750.00
	spinner knob for steering wheel	3	\$8.00	\$150.00
	Vehicle adaptations - major	4	\$14,000.00	\$30,000.00
AHP evaluation: \$ 180 per hour			\$180.00	
Support training session: \$80 one hour (AHA + on costs)			\$80.00	

## REFERENCES

- A.I.H.W. (2006). Therapy and equipment needs of people with cerebral palsy and like disabilities in Australia. Retrieved from Canberra: <http://cpaustralia.com.au/learning-center/therapy-and-equipment-needs-of-people-with-cerebral-palsy-and-like-disabilities-in-australia/>
- A.I.P.C. (2008). The Active Service Model: A conceptual and empirical review of recent Australian and International literature (1996-2007).
- AAATE. (October, 2012). Service Delivery Systems for Assistive Technology in Europe: Position Paper. Retrieved from <http://www.atiss4all.eu/news/detail.aspx?id=406&tipo=1>
- ABS. (2015, <http://www.abs.gov.au/ausstats/abs@.nsf/Latestproducts/4430.0Main%20Features202015>). 4430.0 Disability, Ageing and Carers, Australia: Summary of Findings Retrieved from [www.abs.gov.au/ausstats/abs@.nsf/0/c258c88a7aa5a87eca2568a9001393e8?OpenDocument](http://www.abs.gov.au/ausstats/abs@.nsf/0/c258c88a7aa5a87eca2568a9001393e8?OpenDocument)
- Al-Oraibi, S., Fordham, R., & Lambert, R. (2012). Impact and economic assessment of assistive technology in care homes in Norfolk, UK. *Journal of Assistive Technologies*, 6(3), 192 - 201.
- Anderson, D., Dumont, S., Jacobs, P., & Azzaria, L. (2007). The Personal Costs of Caring for a Child with a Disability: A Review of the Literature. *Public Health Reports*, 122(1), 3-16.
- Andrich, R. (2002). The SCAI instrument: measuring costs of individual assistive technology programmes. *Technology and Disability*, 14, 95-99.
- Andrich, R., & Caracciolo, A. (2007). Analysing the cost of individual assistive technology programmes. *Disability and Rehabilitation: Assistive Technology*, online, 1-28. doi:<http://dx.doi.org/10.1080/17483100701325035>
- Andrich, R., Ferrario, M., & Moi, M. (1998). A model of cost-outcome analysis for assistive technology. *Disability and Rehabilitation*, 20(1), 1-24.
- ARATA. (2016). AATC 2016 Statements: Statement of Good Practice in Assistive Technology Provision in Australia and Issues Statement regarding Assistive Technology Provision in Australia. Paper presented at the Australian Assistive Technology Conference, Gold Coast.
- Audit Commission. (2000). Fully Equipped: The Provision of Equipment to Older or Disabled People by the NHS and Social Services in England and Wales. Retrieved from UK: <http://www.audit-commission.gov.uk/reports/NATIONAL-REPORT.asp?CategoryID=&ProdID=BD34429B-F1B2-4E50-8A82-7A60A7A45302>
- Audit Commission. (2002). Fully Equipped: Assisting Independence. Audit Commission Retrieved from <http://www.audit-commission.gov.uk/reports/>
- Australian Senate. (2011). Inquiry into Outcomes under the National Disability Strategy 2010-2020. Retrieved from [http://www.fahcsia.gov.au/sa/disability/progserv/govtint/nds\\_2010\\_2020/Documents/National\\_Disability\\_Strategy\\_2010\\_2020.pdf](http://www.fahcsia.gov.au/sa/disability/progserv/govtint/nds_2010_2020/Documents/National_Disability_Strategy_2010_2020.pdf).
- Australian Wound Management Association. (2011). Pan Pacific Clinical Practice Guideline for the Prevention and Management of Pressure Injury.
- Barnett, K., Reynolds, K., Gordon, S., Maeder, A., & Hobbs, D. (2017). A Technology Roadmap for the Australian Aged Care Sector.
- Bowes, A., Dawson, A., & Greasley-Adams, C. (2013). Literature review: the cost effectiveness of assistive technology in supporting people with dementia.

- Bowes, A., & McColgan, G. (2006). Smart technology and community care for older people: innovation in West Lothian, Scotland. Retrieved from Stirling: [http://www.patientconnect.com.au/ws-content/uploads/August\\_2006\\_Patient\\_Connect\\_-\\_Telehealthcare\\_-\\_Pilot\\_Study\\_-\\_University\\_of\\_Stirling\\_Telehealthcare\\_Study.pdf](http://www.patientconnect.com.au/ws-content/uploads/August_2006_Patient_Connect_-_Telehealthcare_-_Pilot_Study_-_University_of_Stirling_Telehealthcare_Study.pdf)
- Brotkorb, T.-H., Hernriksson, M., Johanneson, K., & Thidell, F. (2008). Cost-effectiveness of C-Leg compared with Non-Micro-Processor-Controlled Knees: A modeling approach. *Archives of Physical Medicine and Rehabilitation*, 89(24-30).
- Brown, L., Hansnata, E., & La, H. A. (2017). Economic Cost of Dementia in Australia 2016-2056. Retrieved from <https://www.fightdementia.org.au/files/NATIONAL/documents/The-economic-cost-of-dementia-in-Australia-2016-to-2056.pdf>
- Carande-Kulis, V., Stevens, J., Beattie, B., & Arias, I. (2010). The business case for interventions to prevent fall injuries in older adults. *Injury Prevention*, 16, A249-A249.
- Carnemolla, P., & Bridge, C. (2011). Home Modifications and their impact on waged care substitution. Retrieved from Sydney: [www.homemods.info](http://www.homemods.info)
- Chung, J., Demir, G., & Thompson, H. J. (2016). Ethical considerations regarding the use of smart home technologies for older adults: An integrative review. *Annual Review of Nursing Research*, 34(155-X1). doi:doi:<http://dx.doi.org/10.1891/0739-6686.34.155>
- Clemson, L., Cumming, R., Kendig, H., Swann, M., Heard, R., & Taylor, K. (2004). The Effectiveness of a Community-Based Program for Reducing the Incidence of Falls in the Elderly: A Randomized Trial. *Journal of the American Geriatrics Society*, 52(9), 1487–1494.
- Cochrane, A., Furlong, M., McGilloway, S., Molloy, D. W., Stevenson, M., & Donnelly, M. (2016). Time-limited home-care reablement services for maintaining and improving the functional independence of older adults. *Cochrane Database Syst Rev*, 10, Cd010825. doi:10.1002/14651858.CD010825.pub2
- Colgan, S., Moodie, M., & Carter, R. (2010). *The Economic Study*: Melbourne. Available from: <http://dro.deakin.edu.au/view/DU:30030938>
- Connell, J., Grealy, C., Olver, K., & Power, J. (2008). Comprehensive scoping study on the use of assistive technology by frail older people living in the community.
- Cook, A., & Polgar, J. (2015). *Assistive Technologies*. In (4th Edition). St. Louis: Mosby.
- Cooper, M., & Bigby, C. (2014). Cycles of Adaptive Strategies Over the Life Course. *Journal of Gerontological Social Work*, 57(5), 421-437.
- Coughlin, S., Peyerl, F. W., Munson, S. H., Ravindranath, A. J., & Lee-Chiong, T. L. (2017). Cost Savings from Reduced Hospitalizations with Use of Home Noninvasive Ventilation for COPD. *Value in Health*, 20(3), 379-387. doi:10.1016/j.jval.2016.09.2401
- Cummins, R., Hughes, J., Tomin, A., Gibson, A., Woerner, J., & Lai, L. (2007). *The Wellbeing of Australians - Carer Health and Wellbeing*.
- Daly, J., Willis, K., Small, R., Green, J., Welch, N., Kealy, M., & Hughes, E. (2007). A hierarchy of evidence for assessing qualitative health research. *Journal of Clinical Epidemiology*, 60, 43-49.
- De Jonge, D., Layton, N., Vicary, F., & Steel, E. (2015). Motivations and incentives: exploring assistive technology service delivery from the perspectives of multiple stakeholders. Paper presented at the RESNA 2015: New Frontiers in Assistive Technology, Arlington, VA.
- De Jonge, D., & Schraner, I. (2010). Economics of Inclusiveness: Can We as a Society Afford Not to Provide Assistive Technology or Use Universal Design? In J. Maisel (Ed.), *The State of the Science in*

Universal Design: Emerging Research and Developments (pp. 132-143). Buffalo: Bentham Science Publishers.

DeCrean, A., Westendorp, R., Willems, C., Buskens, I., & Gussekloo, J. (2006). Assistive devices and community-based services among 85 year old community-dwelling elderly in the Netherlands: ownership, use, and need for intervention. *Disability and Rehabilitation: Assistive Technology*, 1(3), 199-203.

Deloitte Access Economics. (2015). Economic analysis of motor neurone disease in Australia. Retrieved from Melbourne: [http://www.mndaust.asn.au/Influencing-policy/Economic-analysis-of-MND-\(1\)/Economic-analysis-of-MND-in-Australia.aspx](http://www.mndaust.asn.au/Influencing-policy/Economic-analysis-of-MND-(1)/Economic-analysis-of-MND-in-Australia.aspx)

Department of Health. (2005). The National Service Framework for Longterm Conditions. Retrieved from Leeds, UK: [https://www.gov.uk/government/uploads/system/uploads/attachment\\_data/file/198114/National\\_Service\\_Framework\\_for\\_Long\\_Term\\_Conditions.pdf](https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/198114/National_Service_Framework_for_Long_Term_Conditions.pdf)

Dijkers, M. (2009). When the best is the enemy of the good: The nature of research evidence used in systematic reviews and guidelines. Retrieved from Austin, Texas: [http://www.ktdrr.org/ktlibrary/articles\\_pubs/ncddrwork/tfsr\\_best/tfsr\\_best.pdf](http://www.ktdrr.org/ktlibrary/articles_pubs/ncddrwork/tfsr_best/tfsr_best.pdf)

Disability Federation of Ireland, & Enable Ireland. (2016). Assistive Technology for People with Disabilities and Older People: A Discussion Paper. Retrieved from Ireland: <http://www.enableireland.ie/sites/default/files/publication/AT%20Paper%20final%20version.pdf>

Disability Investment Group. (2009). The Way Forward: A New Disability Policy Framework for Australia. Retrieved from Canberra: <http://www.fahcsia.gov.au/sa/disability/progserv/people/Pages/DisabilityInvestmentGroup.aspx>

An economic evaluation of community and residential aged care falls prevention strategies in NSW. (2011). Retrieved from Sydney: <http://www.health.nsw.gov.au/falls/Publications/economic-evaluation-falls-prevention.pdf>

Federici, S., & Scherer, M., J (Eds.). (2017). *Assistive Technology Assessment Handbook*. Boca Raton, FL: CRC Press.

Finch, M., Griffin, K., & Pacala, J. T. (2017). Reduced Healthcare Use and Apparent Savings with Passive Home Monitoring Technology: A Pilot Study. *Journal of the American Geriatrics Society*, 65(6), 1301-1305. doi:10.1111/jgs.14892

Fleming, R. (2014). Empirical studies on the effectiveness of assistive technology in the care of people with dementia: a systematic review.

Fouarge, D. (2003). Costs of non-social policy: towards an economic framework of quality social policies - and the costs of not having them. European Commission

Fuhrer, M. (2007). Assessing the efficacy, effectiveness, and cost-effectiveness of assistive technology interventions for enhancing mobility. *Disability and Rehabilitation: Assistive Technology*, 23(3), 149-158.

Gramstad, A., Storli, S. L., & Hamran, T. (2013). "Do I need it? Do I really need it?" Elderly peoples experiences of unmet assistive technology device needs. *Disability and Rehabilitation: Assistive Technology*, 8(4), 287-293.

Hagberg, L., Hermansson, L., Fredriksson, C., & Pettersson, I. (2017). Cost-effectiveness of powered mobility devices for elderly people with disability. *Disability and Rehabilitation: Assistive Technology*, 12(2), 115-120. doi:10.3109/17483107.2014.1002540

- Harris, C., Andrews, A., Logan, E., & Lee, E. (2016). A Scoping Review on Best Practice for Home Modifications Service Delivery. Retrieved from <http://ilc.com.au/wa-hacc-home-modifications-assistive-technology-project/>
- Heywood, F. (2004). The health outcomes of housing adaptations. *Disability and Society*, 19(2), 129-143.
- Heywood, F., & Turner, L. (2007). Better outcomes, lower costs. Retrieved from Leeds, UK: <http://www.officefordisability.gov.uk/research/research-reports.php>
- Heywood, F., & Turner, L. (2007). Better outcomes, lower costs: Implications for health and social care budgets of investment in housing adaptations, improvements and equipment: a review of the evidence. Retrieved from Bristol: [www.officefordisability.gov.uk](http://www.officefordisability.gov.uk)
- Hoenig, H., Taylor, D., & Sloan, F. (2003). Does Assistive Technology Substitute for Personal Assistance Among the Disabled Elderly? *American Journal of Public Health*, 93(2), 330-337.
- Independent Hospital Pricing Authority. (2014). Costing Studies to Support the Development of the National Efficient Price 2015-2016. Retrieved from Canberra: <https://www.ihpa.gov.au/publications/home-enteral-nutrition-home-total-parenteral-nutrition-and-home-ventilation-services>
- International Federation on Ageing. (2016). Expert Papers: Reablement and Older People. Paper presented at the Copenhagen Summit, Copenhagen. <https://www.ifa-fiv.org/publication/health/copenhagen-summit-report-reablement-older-people/>
- ISO. (2016). Assistive products for persons with disability — Classification and terminology. Retrieved from: <https://www.iso.org/standard/60547.html>
- Jenny Pearson & Associates. (2013). Research for the National Disability Agreement: Aids and Equipment Reform, Final Report.
- Khosravi, P., & Ghapanchi, A. H. Investigating the effectiveness of technologies applied to assist seniors: A systematic literature review. *Int J Med Inform*, 85(1), 17-26. doi:10.1016/j.ijmedinf.2015.05.014
- Layton, N., Andrews, A., & Wilson, E. (2015). Rocket Science or Commonsense? How elders access non-complex assistive technologies and the implications for occupational therapy. *Australian Occupational Therapy Journal*, 62 (Supplement 1), 114. doi:10.1111/1440-1630.12212\_1
- Layton, N., & Walker, L. (2012). The economic potential of Assistive Technology solutions – an introduction. Retrieved from Caloundra:
- Layton, N., & Wilson, E. (2010b). The Equipment Study. Retrieved from Melbourne: <http://dro.deakin.edu.au/view/DU:30030938>
- Layton, N., & Wilson, E. (2014). Practicing inclusion in policy design for people with disabilities. In A. Taket, B. Crisp, S. Goldingay, M. Graham, L. Hanna, & L. Wilson (Eds.), *Practising Social Inclusion* (pp. 54-64). Oxon, New York: Routledge.
- Layton, N., Wilson, E., & Andrews, A. (2014). Pathways to Non Complex Assistive Technology for HACC Clients in WA. Retrieved from Perth: <http://ilc.com.au/wp-content/uploads/2009/08/Full-Report-Pathways-to-Non-Complex-Assistive-Technology-for-HACC-Clients1.pdf>
- Layton, N., Wilson, E., Colgan, S., Moodie, M., & Carter, R. (2010). The Equipping Inclusion Studies: Assistive Technology Use and Outcomes in Victoria. Retrieved from Melbourne: <http://dro.deakin.edu.au/view/DU:30030938>
- Lewin, G., & Vandermeulen, S. (2010). A non-randomised controlled trial of the Home Independence Program (HIP) - an Australian restorative programme for older home care clients. *Health and Social*

Care in the Community Journal, 18(1), 91-99. doi:doi: 10.1111/j.1365-2524.2009.00878.x. Epub 2009 Aug 6.

Lofqvist, C., Nygren, C., Szeman, Z., & Iwarsson, S. (2005). Assistive devices among very old people in five European countries. *Scandinavian Journal of Occupational Therapy*, 12(181-192).

Macular Disease Foundation Australia. (2017). Low vision, quality of life and independence - A review of the evidence on aids and technologies.

Magnusson, L., & Hanson, E. (2005). Supporting frail older people and their family carers at home using information and communication technology: cost analysis. *Journal of Advanced Nursing*, 51(6), 645-657. doi:10.1111/j.1365-2648.2005.03541.x

Mann, W., Llanes, C., Justiss, M., & Tomita, M. (2004). Frail older adults self-report of their most important assistive devices. *Occupational Therapy Journal of Research: Occupation, Participation and Health*, 24(1), 4-12.

Mann, W. C., Ottenbacher, K. J., Fraas, L., Tomita, M., & Granger, C. V. (1999). Effectiveness of Assistive Technology and Environmental Interventions in Maintaining Independence and Reducing Home Care Costs for the Frail Elderly: A Randomised Controlled Trial. *Archives of Family Medicine*, May/June 8(3), 210-214.

Martin, S., Kelly, G., Kernohan, W., McCreight, B., & Nugent, C. (2008). Smart home technologies for health and social care support. *Cochrane Database of Systematic Reviews*, CD006412(4). doi:doi: 10.1002/14651858.CD006412.pub2

Mitra, S., Findley, P., & Sambamoorthi, U. (2009). Health Care Expenditures of Living With a Disability: Total Expenditures, Out-of-Pocket Expenses, and Burden, 1996 to 2004. *Archives of Physical Medicine and Rehabilitation*, 90(9), 1532-1540.

Municipal Association of Victoria. (2014). HACC Easy Living Equipment Guide: A guide for Home and Community Care services in Victoria. Retrieved from MAV:  
<http://www.mav.asn.au/search/results.aspx?k=assistive%20technology>

NDIA. (2015). Assistive Technology Strategy. Retrieved from <https://www.ndis.gov.au/about-us/information-publications-and-reports/assistive-technology-strategy/3-strategy.html>.

NHMRC. (2009). NHMRC levels of evidence and grades for recommendations for developers of guidelines. National Health and Medical Research Council.

Persson, J., Andrich, R., CanBeekum, T., Brodin, H., Lorentsen, O., Wessels, R., & DeWitte, L. (2002). Preference based assessment of the quality of life of disabled persons. *Technology and Disability*, 14, 119-124.

Piau et al. (2014). Aging society and gerontechnology: a solution for an independent living? *Journal of Nutrition Health and Ageing*, 18(1), 97-112.

Productivity Commission. (2011). Disability Care and Support Final Report. Canberra Retrieved from <http://www.pc.gov.au/projects/inquiry/disability-support/report>.

Queensland Competition Authority. (2014). Price Disparities for Disability Aids and Equipment. Retrieved from <http://www.qca.org.au/getattachment/a98aac78-d791-4718-acbd-756195580892/Final-Report-Medical-and-Disability-Aids-and-Equip.aspx>.

Rust, K., & Smith, R. (2005). Assistive technology in the measurement of rehabilitation and health outcomes: a review and analysis of instruments. *American Journal of Physical Medicine and Rehabilitation*, 84(10), 780-793.

Scherer, M. (2002). The change in emphasis from people to person: introduction to the special issue on Assistive Technology. *Disability and Rehabilitation*, 24(1/2/3), 1/4.

- Smith, R. O. (2002). IMPACT 2 MODEL. Retrieved from: <http://www.r2d2.uwm.edu/archive/impact2model.html>
- Snell, T., Fernandez, J., & Forder, J. (2012). Building a business case for investing in adaptive technologies in England. Retrieved from [www.pssru.ac.uk/pub/dp2831.pdf](http://www.pssru.ac.uk/pub/dp2831.pdf)
- Sund, T. (2017). Norwegian Model of Assistive Technology Provision. Paper presented at the Global Research, Innovation and Education on Assistive Technology (GREAT) Summit, Geneva.
- Tebbutt, E., Brodmann, R., Borg, J., MacLachlan, M., Khasnabis, C., & Horvath, R. (2016). Assistive products and the Sustainable Development Goals (SDGs). *Globalization and Health*, 12, 1-6.
- Tune, D. (2016). Aged Care Roadmap. Retrieved from Canberra: [https://agedcare.health.gov.au/sites/g/files/net1426/f/documents/04\\_2016/strategic\\_roadmap\\_for\\_aged\\_care\\_web.pdf](https://agedcare.health.gov.au/sites/g/files/net1426/f/documents/04_2016/strategic_roadmap_for_aged_care_web.pdf)
- Tune, D. (2017). Legislated Review of Aged Care. Retrieved from Canberra: <https://agedcare.health.gov.au/legislated-review-of-aged-care-2017-report>
- United Nations. (2006). Convention on the rights of persons with disabilities and optional protocol. Retrieved from Geneva: <http://www.un.org/disabilities/convention/conventionfull.shtml>
- Verbrugge, L. M., & Sevak, P. (2004). Disability symptoms and the price of self-sufficiency. *Journal of Aging and Health*, 16(5), 688-722.
- Waldron, D., & Layton, N. (2008). Hard and Soft Assistive Technology: defining roles for clinicians. *Australian Occupational Therapy Journal*, 55(1), 61-64.
- Walker, L., & Layton, N. (August, 2017). Assistive Technology Capability Framework. Paper presented at the GREAT Summit, Geneva, available at: [http://www.who.int/phi/implementation/assistive\\_technology/great\\_summit/en/](http://www.who.int/phi/implementation/assistive_technology/great_summit/en/)
- Wessels, R., Djicks, B., Soede, M., Gelderblom, G. J., & Witte, L. D. (2003). Non-use of provided assistive technology devices, a literature overview. *Technology and Disability*, 15.
- WHO. (2011). World Report on Disability. Retrieved from Malta: [http://www.who.int/disabilities/world\\_report/2011/en/](http://www.who.int/disabilities/world_report/2011/en/)
- WHO. (2015). World report on ageing and health. Retrieved from Geneva: [http://apps.who.int/iris/bitstream/10665/186463/1/9789240694811\\_eng.pdf?ua=1](http://apps.who.int/iris/bitstream/10665/186463/1/9789240694811_eng.pdf?ua=1)
- WHO. (2016). Global Strategy and Action Plan on Ageing and Health (2016-2020). Retrieved from: <http://www.who.int/ageing/global-strategy>
- World Health Organization. (2001). International classification of functioning, disability and health: ICF. Geneva: World Health Organization.

# NACA

The National Aged Care Alliance is the representative body of peak national organisations in aged care including consumer groups, providers, unions and professionals.

