



Medical Technology
Association of Australia



*Disability Care and Support
Productivity Commission Issues Paper*

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MEDICAL TECHNOLOGY FOR A HEALTHIER AUSTRALIA

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1. Executive Summary

This submission is in response to the release in May 2010 by the Productivity Commission of an Issues Paper: *Disability Care and Support*. The Australian Government has asked the Commission to consider how a national disability scheme could be designed, administered, financed and implemented. The Medical Technology Association of Australia (MTAA) welcomes the opportunity to comment on the paper and make specific recommendations. As a general comment MTAA would like to see policy developed to enable Australians with disabilities to have better access to medical products and technologies that assist independent living, decrease inappropriate emergency room, hospital and residential care admissions, and enable them to remain in their own homes.

MTAA recommends:

- Provision of funding for an Essential Care List scheme to fund consumable medical items
- Provision of funding for technology for home and remote monitoring of disabilities and associated medical conditions (Telemonitoring).

This submission makes specific response to the following key questions:

- What kinds of services particularly need to be increased or created?
- Are there ways of intervening early to get improved outcomes over people's lifetimes? How would this be done?
- What should be done in rural and remote areas where it is harder to get services?
- How could innovation be encouraged?

There are a large number of sub-acute medical products and remote monitoring devices that can assist individuals with disabilities to stay in their homes. Access to services that assist independent living needs to be increased through appropriate funding mechanisms. The ability to monitor medical conditions remotely increases access to care for people in rural and remote areas. While service provision for remote monitoring is funded overseas, current funding mechanisms in Australia are ad hoc. Early detection of symptom exacerbations leads to improved outcomes. Advanced medical technologies can be used to remotely monitor and maintain health, however healthcare professionals are not currently reimbursed to take advantage of them.

2. About the Medical Technology Association of Australia and the medical technology industry

The Medical Technology Association of Australia (MTAA) represents the manufacturers, exporters, importers and distributors of medical technology products in Australia. Medical technologies are products used in the diagnosis, prevention, treatment and management of disease and disability. Products range from commonplace, everyday items such as bandages and syringes, to high technology items such as cochlear implants and cardiac defibrillators and diagnostic imaging equipment.

The medical technology industry manufactures many products that contribute to the health of Australians with disabilities. These include cochlear devices, devices to manage cardiac disease, diabetes and chronic obstructive pulmonary disease (COPD), as well as a range of devices that can be used to monitor patients in their homes (e.g. personal alarms, heart rate and other vital signs monitors, pressure sensors, enuresis sensors, scales, glucose monitors, blood pressure monitors and sub-acute medical products). The medical technology industry had sales in Australia of more than \$7 billion in 2008/2009 and employs more than 17,500 people. It is strongly research-based, often working closely with healthcare professionals to design and develop products for improved patient benefit.

3. Comments on the Productivity Commission Issues Paper

The Issues Paper: *Disability Care and Support* addresses the challenges faced by approximately 4.5 million Australians with a disability of some type and approximately 550, 000 people who are primary carers of people with disabilities (2009 figures). The Commission addresses the difficulties associated with providing services to individuals with disabilities living in rural and remote communities. Rural Australians have poorer health and access to fewer health services. Mortality rates increase with remoteness and people in remote areas make greater use of hospital emergency departments than primary care facilities. They also have the highest rates of potentially preventable hospitalisations, due to inequitable access to health services, medical consumables and medical technology (AIHW, 2009). There are a number of innovative medical technologies that meet the challenges associated with providing healthcare to individuals with disabilities in remote communities. Advances in medical and information technology will fundamentally change the way that health services are delivered to all Australians. Individuals with disabilities wish to live as independently as possible in their own homes and communities and there are a number of assistive living, communication (e.g. video conference consultations) and health-monitoring technologies that can assist them to do so. Health professionals are not currently reimbursed if they wish to use these technologies to assist patients with independent living.

4. Establishment of an Essential Care List (ECL)

4.1. Background

This section addresses a key reform area – the development of an Essential Care List (ECL) to ensure that sub-acute care medical products needed by individuals for their care, and in some cases, survival, are readily available using a system that is equitable, transparent, and affordable. The scheme for an ECL will enable subsidised access to essential care medical technologies that provide necessities to chronically ill, disabled or incapacitated individuals in the community setting. The items intended for inclusion in the scheme are consumable, single use, non-implantable medical products, together with the hardware that the consumables are used with, essential to maintain an acceptable quality of life for those people who without government subsidy would not have adequate access to life supporting medical technology.

At present many of these essential care items are either unfunded or, if funded, vary in availability and subsidy depending on the place where the individual lives. Some assistance is available from the Federal Government; other support is from State

Governments. Some products are provided ex gratia by healthcare practitioners who understand the benefit that can be gained from use of a particular product.

MTAA acknowledges the need to provide a robust framework to ensure that the system does not become too complex or expensive. There are several key issues to consider in scoping the scheme. There are also some useful lessons that can be learned from the review by the Department of Health in the UK of Part IX of the Drug Tariff.¹ MTAA's conception of an Australian scheme is that it will operate similarly to a very simplified Pharmaceutical Benefit Scheme. While many of the products likely to be included in the scheme do not require a health technology assessment, there are some products which lend themselves to differential pricing based on additional patient benefit to attract an uplift on the base level or benchmark price.

MTAA has consulted widely on the possible structure and operation of the scheme. Bodies consulted were:

- Aged Care Association Australia
- Australian Council of Stoma Associations
- Australian Medical Association
- Australian Nursing Federation
- Australian Practice Nurses Association
- Australian Wound Management Association
- Consumer Health Forum
- Continence Foundation
- Continence Nurses
- Kidney Health Australia
- Pharmacy Guild of Australia
- Royal District Nursing Service (Vic)
- Royal Australian College of Surgeons

With the exception of individuals who currently benefit from subsidized access to ostomy products through the Stoma Appliance Scheme, and the suppliers who support the patients, the proposed scheme has received universal support. The current Stoma Appliance Scheme (SAS) has operated since 1974 and is mandated under section 9A of the *National Health Act*. The SAS is integrated into a wide range of community-based support for persons with an ostomy.

The SAS policy is currently under review by the Department of Health.

4.2. Issues for consideration

There are several key issues for consideration in shaping the scheme:

- Entry point into scheme
- Product range
- Current Australian Government funded schemes
- Pricing
- Delivery mechanisms

¹ UK Drug Tariff Part IX established under Section 41 of the NHS Act 1977.

4.3. Entry point into the scheme

Assessment by a healthcare professional is an essential element to ensure that the correct product is identified for the patient need. There is also an ongoing need to correctly assess demand from the wider perspective of related health needs.

Listing of products on the ECL will allow appropriately authorised, qualified and credentialed healthcare professionals to prescribe or establish an entitlement to ECL items for all clinically eligible Australian individuals in the community setting. It is not proposed to limit access according to status (whether privately insured or not), income, age or any other discriminator but neither is it proposed to exclude co-payments. It may be that a means test is appropriate to determine the level of co-payment. The eligibility of individuals should be based on clinical criteria, developed in consultation with the broader community of healthcare stakeholders.

Products listed on the ECL may also be available through other pathways without assessment, but in these circumstances they would not be funded under the scheme. The individual's entitlement to a product with a subsidy would require at least an initial assessment by a healthcare professional followed with appropriate subsequent assessment. The subsequent assessment ensures that the healthcare professional can determine appropriateness of treatment and familiarise an individual with any new product.

The following criteria are proposed for products to be listed on the ECL:

- Products are essential to the individual's quality of life or survival, in all settings outside hospitals including the community setting and residential care
- Products should be capable of self administration or administration with the help of a carer or, if required, by a relevant healthcare professional (which would include home visiting nurses)
- Products must be safe and efficacious and, where regulated, included on the Australian Register of Therapeutic Goods (ARTG)
- Products are appropriate for prescribing in the community setting
- Products are clinically effective – required levels of clinical evidence will be higher where similar products have not been listed before or where a manufacturer or supplier seeks a higher price than for similar products already listed
- The cost of the product is relative to its clinical effectiveness.

Entry of products into the scheme will need to be determined by an appropriate assessment body, in particular if the product is a new category of product, or is at the margin of existing listed products. In assessing quality of life, there are many potential measures including the social outcomes such as whether the individual is able to remain in their own home, and have the capacity to engage socially.

Many of the products will have limited clinical data. The assessment body should issue guidelines to ensure that an application is appropriately supported.

4.4. Product range

In general the products contemplated by the scheme can be characterised as aids for daily living that are for the critical care of an individual or that improve quality of life. These will often be consumable items that are low technology. In some cases

however they may be durable products, and may involve much higher levels of technology sophistication. The product range will also include the hardware that is supported by the consumables.

The scheme requires flexibility and redundancy to ensure that the range is not limiting but also that it does not grow to a disproportionate size. The scheme requires a methodology by which other items can be added. There also needs to be a mechanism by which products can be removed from the ECL. There is some natural redundancy in that suppliers will withdraw products that are out of date or superseded. However there are some circumstances where individuals continue to use products long after they have been superseded because of familiarity and confidence in the older product. To this extent there may need to be capacity to maintain availability of small numbers of otherwise redundant products.

Budget 2010/11 DVA Portfolio Outcome 2 for the Department of Veterans Affairs refers to entitled individuals having access to services that “maintain and enhance the physical wellbeing and quality of life through health and other care services that promote early intervention, prevention and treatment, including advice and information about health service entitlements”. The objective of DVA programs is to support veterans to remain independent in their homes, improve their quality of life and health and delay entry into residential aged care. The Repatriation Pharmaceutical Benefits Scheme (RPBS)² and the Rehabilitation Appliance Program (RAP)³ are instructive for the range of products accessed by entitled individuals to meet the aims of support in the community to be as independent and self-reliant as possible in their own home. Product ranges covered by the schemes are comprehensive and fall into the major categories of: pharmaceuticals and wound dressings (RPBS); continence, diabetes, oxygen and continuous positive airways pressure (CPAP), mobility and functional support (MFS), and personal response systems (through the RAP). It is not proposed that non-medical products be available through the ECL; however DVA objectives, entitlement and prescribing guidelines are informative in the development of ECL parameters.

Products identified in an initial scope of the scheme include:

- Oxygen supplies/consumables
- Compression hosiery, bandages and garments for lymphodaema
- Continence products
- Modern wound care devices (including wound dressings)
- Breast prosthetics (non-implantable)
- Pumps and consumables for insulin delivery, and continuous flow pumps for drug delivery, together with consumables
- CPAP/sleep apnoea devices
- Laryngitic products
- Diabetes consumables (pens, strips, pump consumables)
- Home dialysis devices, consumables and set-up costs.

For those individuals who have their first exposure to a product as a consequence of hospitalisation, there needs to be a mechanism to ensure a broader availability of

² The RPBS provides a wide range of pharmaceuticals and dressings at a concessional rate for the treatment of eligible veterans, war widows/widowers, and their dependants.

³ The RAP assists veterans, war widows and widowers and dependants to be as independent and self-reliant as possible in their own home.

products in the hospital system, as well as ongoing access to products introduced to an individual in hospital where these are judged most appropriate.

4.5. Current Australian Government funded schemes

Of the products identified above, continence and diabetes consumables are funded through schemes established by the Australian Government, in addition to ostomy products. Approximately 910,000 persons benefited from services and consumables provided under the National Diabetes Services Scheme (NDSS) in 2008/2009⁴. The products are provided to people registered with NDSS through Diabetes Australia offices, by mail order and through accredited sub-agents such as pharmacies, hospital clinics and other outlets. Diabetes Australia also provides a range of educational and information services to assist in the best use of products and the effective self management of diabetes.

Products available through the NDSS include:

- Pen needles and syringes
- Special injection system needles
- Blood and urine glucose testing strips
- Insulin infusion pump consumables.

There are approximately 30,000 ostomates who receive support through the Commonwealth-funded Stoma Appliance Scheme (SAS)⁵. Ostomates receive products under the SAS through approved volunteer stoma associations. The stoma associations purchase stoma related products from suppliers and distribute to their members as required.

The Australian Government also provides a subsidy to eligible people through the Continence Aids Payment Scheme (CAPS)⁶. CAPS provides a direct payment (\$489.95) to individuals enabling them to shop around and identify the best value product for their needs. The level of subsidy is subject to indexation. Some states also provide top-up funding.

The Issues Paper notes that there can be *“inequity of treatment and the ‘hit and miss’ delivery of services”*. This means that people with similar levels of functionality get access to quite different levels of support, depending on their location or the origin of the disability (page 10). The provision of continence aids through State and Territory schemes provides a good example of this inequity. Both the type of product and the amount available may differ depending upon which state the person lives. The actual name of the scheme may differ from State to State. Some State-based schemes may provide disposable products such as pads, while others may not. Therefore, people with the same disability and need for incontinence products receive different amounts of subsidy in each state/territory. There are also wide variations in the cost of continence treatment for patients with neuropathic diseases (Moore et al., 2006).

⁴ Department of Health and Ageing Annual Report 2008-2009 page 69.

⁵ <http://www.health.gov.au/internet/main/publishing.nsf/Content/Stoma+Appliance+Scheme-1>; accessed 25.07.10.

⁶ <http://www.continence.org.au/pages/continence-aids-payment-scheme-caps.html> accessed 14 07 10.

The total cost of the aids and appliances schemes funded by the Commonwealth in 2008/2009 was \$195,032,000⁷. The scope of products included in this figure is not disclosed but is assumed to include the three funded areas discussed above.

A list of states' schemes is at Annex A.

There is inconsistent funding across Australia for modern wound care devices (MWCD). While most states do not fund MWCD some do, but to a limited extent (in South Australia and Western Australia dressings are provided to a limited degree by home nursing services). In NSW the NSCCAHS has subsidised MWCD on a trial basis in the Central Coast. Other products have varying levels of funding or subsidy. Where a product is not funded, access is limited to those with the capacity to pay, or at times, through the good graces of treating healthcare professionals.

In the 2009 Federal Budget the Government made a small but significant contribution to assist individuals suffering from Epidermolysis Bullosa with a national dressing scheme worth \$16.4 million over four years from January 2010. The Scheme is administered by BrightSky Australia, a division of the Paraplegic and Quadriplegic Association of New South Wales, on behalf of the Australian Government.

4.6. Pricing

The scheme is not intended to be fully-funded, but requires a degree of patient co-contribution. MTAA estimates the amount in a range of \$200-650m per annum, depending on the scope of included items. This sum is a combination of what is currently being spent in the various schemes across Commonwealth and State health budgets, plus additional areas that are currently unfunded. This amount does not take into account cost savings achieved through the merger of current stand-alone schemes. Costs and potential cost savings are outlined in Annex B and C. We have calculated the costs of the scheme using both conservative and non-conservative figures. Conservative figures assume equipment rental and funding for consumable items only. Less conservative figures assume purchase of equipment such as CPAP machines, oxygen concentrators etc as well as provision of consumable items. It is likely that the true costs falls somewhere in between the two figures (\$217m and \$667m). Cost savings from the scheme could be as high as \$250m. All cost savings are calculated with the assumption of an average DRG cost per separation and the assumption that approximately 9.3% of separations for chronic conditions are preventable⁸. Cost savings generated by the ECL assume that the provision of sub-acute medical items will reduce Emergency Room and hospital admissions. The appropriate diagnosis and treatment of conditions may reduce transition into high level residential care. For example, a condition such as incontinence increases the risk of nursing home admission by 66% (McCallum et al., 2005).

As at present with the identified products, there is a degree of individual co-contribution. The scope of the co-contribution will be dependent on the funding model adopted. For example, under current arrangements the co-payment by an ostomate is the fee to be a member of an ostomy patient association. These associations are run on a voluntary basis so the service provided by the associations has a cost equivalence.

⁷ Department of Health and Ageing Annual Report 2008-2009 page 71.

⁸ AIHW. Separation statistics for selected potentially preventable hospitalizations for chronic conditions for all states and hospitals, 2007-08.

One concern in imposing significant levels of patient co-payment for some products is an increase in non-compliance with the possibility that individuals will reuse consumable products rather than replace them.

There needs to be a mechanism by which products can be reviewed and reassessed as they date and no longer provide the additional benefit in comparison with competing products in the same group. Price review also needs to take account of longevity of product life cycles which means the development costs may be amortised over long periods of time.

The cost effectiveness assessment needs to be kept simple. However the analysis needs to be sufficiently robust to take account of societal factors, including both patient benefit and broader benefits to the Australian economy such as the capacity of an individual to engage in the workforce, remain in their home, or reduce dependence on a carer.

A reasonable approach is to have one level of funding for 'entry level' which is a generic price applied to all products within a product band within the scheme. Additional reimbursement may be appropriate for a premium product which provides improved product effectiveness on an evidence-based assessment. Any health technology assessment should be by a professional independent body with the capacity to conduct the clinical assessment of the claims made. A price review mechanism should be incorporated to allow for changing circumstances (e.g. cost of raw materials and oil) and consideration of CPI effects.

4.7. Delivery mechanisms

There are multiple delivery mechanisms for the products currently supplied under the various schemes funded by the federal and State Governments. These include consumer groups, pharmacists, healthcare professionals, contractors and manufacturers/suppliers.

There are particular reasons why a 'one size fits all' solution may not be appropriate. Consumer or patient groups provide more than simple product supply by offering a support network and social connection that would not be available through traditional supply routes such as pharmacies. The delivery of some products may be more critical in certain circumstances and varied performance criteria for delivery may be appropriate.

One option would be to consider multiple supply routes, with pharmacies as the default in the absence of other appropriate supply mechanisms. The reimbursement of the supply should be fixed to ensure that the scheme remains manageable – an example is the scheme operated under Part IX of the Drug Tariff in the UK (see paragraph 4.8.1 for a more detailed discussion). Supply costs should be an integral component of the scheme to ensure that the cost to the consumer remains constant and predictable regardless of location of the consumer and method of supply.

Other delivery options include by post, by relevant healthcare professionals (such as home visiting nurses), through community pharmacies, or through appliance contractors (as in the UK). Under the NDSS the same price point applies regardless of whether the products are supplied by a pharmacy or by Australia Post. One issue that may arise is the capacity of pharmacies to ensure an adequate stock of products with low demand.

4.8. A review of other schemes

4.8.1. Part IX Drug Tariff (United Kingdom)

The Department of Health in the UK has undertaken a series of consultations to review the structure and funding arrangements under Part IX of the Drug Tariff which covers reimbursement for wound dressings, incontinence appliances, stoma appliances and chemical reagents. Part IX had not been reviewed for 20 years. The July 2010 Drug Tariff has recently been published⁹. To the extent that the scheme addresses inclusion and reimbursement for several of the product groups proposed for inclusion on the ECL, there is some valuable experience from which Australia can draw. While the Drug Tariff is addressed to items in both primary and secondary care, the larger part of the expenditure is in primary care which is the focus of the ECL. In the primary care setting the items are prescribed by GPs and dispensed to the individual through contractors such as pharmacy contractors and appliance contractors.

Items are provided by manufacturers and wholesalers to the contractors. Services to patients in primary care, such as telephone assistance, home visits and product customization are provided mainly through appliance contractors and funded through the reimbursement of items. In addition to services, some manufacturers, and in particular those that are vertically integrated, sponsor nursing posts and patient groups.

At Annex D is a diagrammatical representation of the supply chain in the UK.

The Department's stated objectives in undertaking a review of the reimbursement arrangements were to:

- Maintain, and where applicable improve, the current quality of care to patients
- Secure value for money for the NHS
- Ensure equitable payment for equivalent services and transparent reimbursement pricing
- Work in partnership to deliver fair prices for the NHS and reasonable returns for suppliers and contractors
- Facilitate the introduction of innovative solutions
- Maintain local choice in the provision of services; and
- Keep administration arrangements to the necessary minimum.

These objectives (contextualised for Australia) all appear relevant and appropriate.

In subsequent consultations focused on stoma products and continence products further findings emerged. These include the fact that many users of incontinence appliances as well as stoma appliances rely on home delivery. Similarly individuals who use catheters also require a home visit. As a consequence, the pricing was revised to take account of the additional services supplied by way of home visits and customisation of stoma appliance flanges.

In addition to a revised payment structure for items and services, the UK Department of Health also proposes establishing a code of practice for suppliers in partnership with patient groups. This is intended to address issues such as patient service

⁹ http://www.ppa.org.uk/edt/July_2010/mindex.htm.

specification, sponsorship of nurses and patient groups and the direct marketing of items to patients.

This objective would also be supported by MTAA as consistent with the MTAA Code of Practice.

The July 2010 Drug Tariff specifies the arrangements for products listed in Part IXA (catheter, tracheotomy, dressings, bandages, laryngectomy items), Part IXB (incontinence appliances) and Part IXC (stoma appliances). The arrangements differentiate between payment for services and reimbursement for items. Dispensing Appliance Contractors (DACs) and pharmacy contractors are required to provide a specified set of services for items they supply in the normal course of their business:

- A dispensing service
- A home delivery service for catheters, laryngectomy and tracheotomy prescription items listed in Part IXA of the Drug Tariff and for all items listed in Parts IXB and IXC prescription items, if so requested by the user
- Complementary supplies of wipes and disposal bags with some prescription items; and
- Dispensing both elastic hosiery that requires measurement and/or fitting and trusses requiring measurement and/or fitting.

In addition, DACs and pharmacy contractors may choose to provide advanced services:

- The customisation of stoma appliances and/or
- Appliance use reviews (AURs) which are intended to improve the individual's knowledge and use of the appliance. The reviews will be conducted with the consent of the individual and are intended to complement the care provided by the healthcare professionals.

4.8.2. Repatriation Pharmaceutical Benefit Scheme

The Australian Repatriation system is based primarily on the principle of compensation to veterans and eligible dependants for injury or death related to war service.

Through the *Veterans' Entitlements Act 1986* the Department of Veterans' Affairs provides amongst other things, treatment for eligible veterans and their dependants. One of the defined benefits for eligible veterans is the Repatriation Pharmaceutical Benefits Scheme. A comprehensive range of medications and wound dressings is available through the Pharmaceutical Benefits Scheme.

Unless otherwise stated, Repatriation Pharmaceutical Benefits Scheme (RPBS) prescriptions must conform with the requirements of Pharmaceutical Benefits Scheme (PBS) prescriptions. Users of the RPBS pay a co-payment considerably lower than users of the PBS. Eligible veterans receiving Special Pharmaceutical Benefits under the RPBS are required to pay only the concessional patient contribution and any applicable brand premium.

4.8.3. Rehabilitation Appliance Program (RAP)

The Rehabilitation Appliance Program is an Australian Government program, administered by the Department of Veterans' Affairs, which provides aids and

appliances to eligible members of the veteran community to help them maintain their independence as they grow older. The program provides safe and appropriate equipment:

- According to assessed clinical need;
- In an effective and timely manner; and
- As part of the overall management of an individual's health care.

Equipment provided should be:

- Appropriate for its purpose
- Safe for the entitled person; and
- Designed for persons with an illness or disability, and not widely used by persons without an illness or disability.

4.9. Governance of the scheme

Consistent with all well-structured HTA bodies, the body which assesses products for inclusion on the ECL, and which sets the level of reimbursement, must be independent and qualified to make the assessments. It is appropriate to include representation of patient interests and industry interests as well as healthcare professionals and payers. It may be appropriate to use the HTA review mechanisms put in place as a result of the Review of the Health Technology Assessment, the recommendations of which were substantially accepted by the Government in February 2010. Assessments of clinical and comparative effectiveness should be undertaken by reference to appropriately qualified persons. These may be constituted in small clinical reference or assessment groups.

Decisions of the HTA body should be reviewable and appealable in circumstances where there has been a demonstrable error in a finding. The HTA body would also monitor the effectiveness of the scheme.

The body would be advisory in that the Minister for Health and Ageing will make the final decision on inclusion of a product and level of reimbursement.

5. Provision of Telemonitoring Services

5.1. Background

The Issues Paper: *Disability Care and Support* asks how innovation can be encouraged. Telemonitoring falls under the umbrella of tertiary prevention, which aims to slow the progress of disease or disability. Innovative technology and the clinical and cost savings associated with telemonitoring have been demonstrated in a number of contexts, however the pace of innovation has been much faster than regulation, reimbursement initiatives and the speed at which new technology is adopted by clinicians and patients. In Australia, adequate reimbursement policies are needed before these technologies can be delivered to individuals with disabilities.

Telemonitoring encourages active self-management as individuals are taught to monitor their health including, if appropriate, physiological indices such as blood glucose. Telemonitoring of vital signs uses equipment and medical devices installed in the individual's home to identify trends and send alerts when necessary, in order to detect symptom exacerbations, intervene early and reduce hospital admissions. It is

estimated that 35% of individuals living in care homes could be supported at home using telemonitoring (U.K. Department of Health, 2005).

There has been a shift in disability management from residential care to care in the home. Telemedicine is the delivery of medical services through information technology, multimedia, imaging and telecommunications. It is an overarching definition that includes the discipline of telemonitoring. Telemonitoring (or remote patient monitoring) covers the exchange of data between an individual who is at home and a healthcare professional based (usually) in a medical centre. The medical technology industry manufactures a range of telemonitoring devices including enuresis monitoring sensors, personal alarms and alert systems, home units for measuring temperature, heart rate, blood pressure, glucose levels, oxygen levels and objective symptoms. Health-related data can be transferred to a monitoring centre using phone lines or wireless technology¹⁰. Data collection may include subjective questionnaire measures. Suitable conditions for telemonitoring include stable chronic diseases and disabilities such as asthma, chronic wounds/ulcers, COPD, diabetes, cardiovascular disease, cardiac arrhythmias and dementia. Telemonitoring can also be used to provide rehabilitation and support services for disabled individuals who wish to remain in their homes.

5.2. Benefits of telemonitoring

The Benefits of telemonitoring can be summarised as:

- Reducing barriers of access to healthcare due to geography
- Providing access to specialists in areas where there is a shortage of staff
- Reducing the pressure on an over-extended healthcare workforce
- Shifting responsibility for healthcare onto the consumer
- Provision of a viable alternative to outpatient or doctor visits
- Reducing congestion in medical centres and emergency rooms
- Increasing quality of life
- Encouraging adherence to treatment regimes
- Reducing the burden on care givers
- Better integration of health and social services
- Increased access to individual care from a number of groups (carers, family, medical professionals)
- Early detection of abnormalities/symptom exacerbations
- Reducing the number of unnecessary hospital admissions.

5.3. Clinical benefits of telemonitoring

A large number of studies report a wide range of clinical benefits associated with telemonitoring, including reduced mortality, hospital admissions and readmissions, length of time in hospital, and critical care utilization. The clinical outcomes of fifteen studies are summarised in Annex E. The largest study, to date, was undertaken by the Veterans Health Administration in the US, which analysed data from a national home telehealth program, Care Coordination/Home Telehealth (CCHT). The aim of the CCHT program is to avoid the unnecessary admission of veterans with long term chronic health conditions and disabilities, into institutional care. The program aids

¹⁰ Definition adapted from the European Coordination Committee of the Radiological, Electromedical and Healthcare IT industry (COCIR).

people to live independently in their own home by implementing home telehealth, health informatics and disease management technologies. Clients are predominantly males (95%) aged 65 or older. Darkins et al. (2008) analysed data from a cohort of 17,025 individuals and report:

- A 25% reduction in numbers of bed days of care
- A 19% reduction in numbers of hospital admissions
- A mean satisfaction score rating of 86% after enrolment into the program.

Due to these impressive results, CCHT is now a routine program and provides services for hypertension, post traumatic stress disorder (PTSD), congestive heart failure (CHF), diabetes, COPD and depression. A care coordinator selects the appropriate home health technology, provides training, reviews data, communicates with the patient's physician and provides active case management. Depending on the individual's condition the care coordinator is able to select appropriate vital signs and other objective physiological data (e.g. heart rate, glucose levels) to monitor. An algorithm is used to determine the most appropriate device to use. Peripherals include: messaging devices (which present disease management protocols), videophones (that allow for remote consultations), digital cameras and biometric devices (to monitor vital signs). Individuals are risk-stratified each day according to pre-determined thresholds (e.g. increased heart rate). Medical staff are able to intervene if there are any problems, rather than individuals delaying treatment or presenting at the emergency room. A care coordinator is able to manage between 100-150 clients.

5.4. How Telemonitoring can advance the Australian Healthcare system

The Issues Paper *Disability Care and Support* reports that in 2009 approximately 4.5 million Australians had a disability of some type and that around 550,000 people were primary carers of people with disabilities and a further 2.4 million were other carers. Provision of telemonitoring services will help ease the burden of current demands on the Australian health system. Remote monitoring increases staff efficiency (Alwan et al., 2007) and decreases the number of nursing home visits and the amount of travel time (Litzinger et al., 2007). It also reduces the demand on emergency rooms and hospitals.

Australia is already a world leader in the provision of unique medical care to remote communities, with services such as The Royal Flying Doctors¹¹. Remote disability services are provided in some rural areas. For example the Royal Institute for Deaf and Blind Children (RIDBC) Teleschool provides lessons and support to families in remote areas via teleconferencing¹². A trial ear telehealth project in the Pilbara has demonstrated the value of remote service delivery for children with untreated ear infections and hearing loss in Western Australia. It is possible to provide remote services using video-otoscopy, which captures an image of the eardrum at a remote site and sends it using store-and-forward technology allowing the patient to be seen and triaged virtually¹³. Clinics can be conducted in schools, with the support of teaching staff.

Telemonitoring, in particular consultations via video conferencing, provide a way of providing services to people in rural and remote regions. In 2004-06 death rates in 'very remote' areas were 1.8 times as high as major cities (some of this increase can be explained by the high proportion of indigenous people living in remote areas).

¹¹ <http://www.flyingdoctor.org.au/>.

¹² <http://www.ridbc.org.au/index.asp>

¹³ Ear Science Institute Australia

People in remote regions make greater use of hospital emergency departments than primary care facilities. In 2004–06, there were about 4,600 excess deaths per year outside major cities, i.e. deaths above the number expected if these areas had the same death rates as major cities. The main causes of death contributing to this excess were coronary heart disease (20%), ‘other’ circulatory disease (17%), and COPD (9%). Again, stable chronic conditions and disabilities suitable for home monitoring.

The 2003 Australian Bureau of Statistics (ABS) Survey of Disability, Ageing and Carers (SDAC) found that the number of people with disability who were receiving assistance from informal carers such as family members is much higher than the number of people who receive formal services from government or non-government providers. Family and friends provide most help and/or care assistance to people with disability. The Commission notes that informal carers and people with disabilities bear much of the costs of disability and that carers have low levels of wellbeing (Cummins et al., 2007). There is a shortage of nurses (Isbister, 2009) and doctors (Joyce et al., 2006) in the Australian healthcare system. Informal care givers are predominantly family members, who are able to take blood pressure, provide home dialysis, monitor diabetes, provide physical therapy, provide continence help, provide clinical care such as changing bandages, help with dressing and mobility etc. The needs of informal care givers are rarely addressed. Assistance with monitoring health needs provides at least a partial solution to this problem. Hokenbirk et al. (2005) reviewed the evidence on the impact of telehomecare in Canada. The study found that the primary reasons for informal care provision was either an “elderly care recipient who is frail but wants to live in their home” (63%), or “a care recipient who is not elderly, but is physically or mentally ill or frail in some way” (53%). Telemonitoring was able to support care provision in the home environment, reduce family separation and reduce social isolation. The study concluded that telehomecare improved informal caregiver access to support services and information. Innovative technologies that assist care givers with medical monitoring have the potential to reduce the burden on care givers.

The Issues Paper asks, *How should the scheme address disability associated with natural ageing, and why?* (page 19)

The terms of reference outlined in the Issues Paper exclude disability that occurs as a consequence of the natural ageing process, as these sources of disability are covered under the aged care system. The Commission should consider the overlaps between disability and ageing and the ways that service provision will change with the changing demographics of the Australian population. Disability increases with age and a common goal in both disability and aged care is to allow the individual to maintain independence in their own homes. Any scheme needs to consider the overlap between schemes and the need for service provision to enable seamless transition between schemes (if they are kept separate).

6. Issues for consideration

There are several key issues for consideration in providing access to telemonitoring:

- Suitability of individual
- Product range
- Current Australian Government funding and pilot projects
- Pricing

- Delivery mechanisms

6.1. Suitability of individual

Individuals would need to be assessed by a health professional to ensure that they are assisted using the correct technology. It may be that a means test is appropriate to determine the level of co-payment if required. The eligibility of individuals should be based on clinical criteria, developed in consultation with the broader community of healthcare stakeholders.

6.2. Product range

In general the products can be characterised as devices that monitor symptoms, detect exacerbations, provide alerts and assist individuals to remain independent in the home. People with disabilities need a range of services. The provision of telemonitoring services requires flexibility and redundancy to ensure that the range is not limiting to new and improved technologies but also that it does not grow to a disproportionate size. A methodology would be required, by which other items can be added and removed.

Products identified in an initial scope of the proposal include:

- Glucose monitoring devices used by insulin dependent diabetics
- Systems that monitor oxygen intake remotely and track treatment response
- Electrocardiogram (ECG) and mobile telecardiology systems for monitoring arrhythmias and implantable cardiac devices
- Home haemodialysis monitoring systems
- Wireless devices combining satellite global positioning systems (e.g. for dementia patients who wander)
- Home monitoring devices for pulse oximetry, blood pressure, heart rate, heart rate variability, epilepsy, spirometry, and weight monitoring
- Portable anticoagulation monitors
- Smart incontinence management systems and enuresis sensors
- Remote monitoring and assistance with speech and language therapy for cochlear implantees
- Alarm systems to monitor falls and other medical alerts
- Videoconference consultations.

6.3. Current Australian Government funded schemes

At the level of the Federal Government, little policy work has been done to develop telemonitoring in Australia. A small number of devices that fit under the telemonitoring umbrella are funded in an ad-hoc way. For example, individuals who are eligible for Department of Veterans Affairs assistance may apply under the Rehabilitation Appliances Program (RAP) for a personal response system. The Victorian Government funds 'Personal Alert Victoria' (PAV), a personal monitoring service that responds to calls for assistance 24 hours a day. A small number of items are funded by Private Health Insurance and are listed on the Prostheses List (e.g. cardiac interloop recorders and defibrillators). In these cases the device is funded and the monitoring capabilities tend to be a free or unfunded adjunct. Health professionals are not currently reimbursed if they wish to use these technologies to assist patients with independent living.

At the State Government level there are funded initiatives to develop integrated models of care for chronic disease. An example is the Hospital Admission Risk Program (HARP) which is funded by the Department of Human Services in Victoria¹⁴. HARP has developed preventive care models for individuals with chronic conditions (diabetes, respiratory disease and heart disease), who frequently utilize acute hospital services. The program identifies and manages at-risk individuals, promotes self management, provides collaboration between existing services and reduces episodes of hospitalization. Care is tailored to the individual and enables them to stay in their homes for longer. HARP has been expanded into rural and regional health services across Victoria. Victoria also provides funding for video-conferencing and slit-lamp technology to image the eye. This means that individuals do not need to travel to Melbourne for specialist remote ophthalmology services.

Queensland Telehealth funds services so that individuals in remote locations can see a health professional from any hospital in Queensland, without the need to travel large distances. Individuals visit a health facility and a nurse may take preliminary data readings prior to a videoconference. The same standard of treatment as a face-to-face appointment, is provided at no additional cost.

There are a number of small pilot projects running in rural Queensland. The Centre for Online Health has developed a mobile, wireless telemedicine system that delivers consultations via a robot. They have also designed a system for tele-ENT, whereby real-time video images are transmitted via videoconference (Smith et al., 2006). Similarly, telemonitoring has been used to monitor post-laryngectomy patients in Queensland in a trial that took place over 1700kms using a 3G network and multimedia videoconferencing (Ward et al., 2009).

6.4. Pricing

Telemonitoring services are not intended to be fully-funded. The scope of the co-contribution will be dependent on the funding model adopted. It is likely that components such as monitors and some peripheral devices (e.g. scales, blood pressure monitors) can be rented and remain the property of the supplier. Other consumables may be disposable. Reimbursement of health professionals should be aligned with current payment for traditional face-to-face consults and follow the same sets of principles outlined in the Medicare Benefits Schedule.

There needs to be a mechanism by which products can be reviewed and reassessed as they date (this type of technology is likely to change rapidly). Pricing may work according to similar principles outlined under the ECL scheme. In the absence of evidence or comparative data for specific monitoring systems, expert consensus should be taken into account.

6.5. Cost Benefits of Telemonitoring

For telemonitoring to be cost effective it must be able to provide equal or better medical care, at a lower cost than standard care. Evidence from seven pilot programs points to four factors that drive the success of home monitoring (Fields et al., 2010):

- Dedicated non physician care managers

¹⁴ <http://www.health.vic.gov.au/harp-cdm/>.

- Expanded access to healthcare providers (e.g. ensuring an individual can have a medical question answered in the evening or weekend, rather than presenting to the emergency room)
- Performance management tools
- Payment incentives (i.e. member per month payments to physicians).

The outcomes from seven pilot programs are presented below. Home monitoring led to a reduction in hospitalizations, reduced emergency room visits and a decrease in costs.

Annual Outcomes for Seven Medical Home Demonstrations (Fields et al., 2010).

	Hospitalization reduction (%)	ER visit reduction	Total savings per patient (\$US)
Colorado	18	-	\$169-530 ^a
Geisinger	15	-	-
Group Health ^b	11	29	\$71
Intermountain	4.8-19.2 ^c	0-7.3 ^d	\$640
North Carolina	40 ^e	16	\$516 ^f
North Dakota	6	24	\$530
Vermont ^g	11	12	\$215

Sources: Colorado Department of Health Care Policy and Financing. Geisinger Health System, Notes 12-15 in text; Care Management Plus; Community Care of North Carolina; and Vermont Blueprint for Health. NOTES Not all metrics reported. Unless indicated otherwise, data are based on as-reported outcomes, reduction from baseline. ER is emergency room. ^a\$169 for all patients; \$530 for patients with chronic conditions. ^bChange relative to control group. See Note 12 in text, p. 2998, for more detail. ^c4.8 percent for all patients; 19.2 percent for patients with complex illnesses. ^dNo change for overall population; 7.3 percent for patients with complex illnesses. ^eOnly for asthma patients. ^fBased on Aid to Families with Dependent Children (AFDC) program savings from fiscal year 2007 (\$135 million) and Aged, Blind and Disabled (ABD) program savings from fiscal year 2008 (\$400 million). ^gExpected.

6.6. How might cost savings be achieved?

Dr Kim Sweeney (Centre for Strategic Economic Studies, Victoria University) reviewed the economic benefits of interventions that enable ageing-in place and estimated potential cost savings to government of up to \$526 million per year. The analysis did not consider disability, however the benefits gained by enabling disabled individuals to remain in their own homes are likely to be similar.

This proportion of individuals with disabilities increases with age. With the demographics of the Australian population changing and the number of older Australians expected to dramatically rise, there is a need for innovative home-based care and monitoring solutions. Economist Robert Litan has reviewed a range of studies assessing the benefits of telemonitoring in the US. He reports many quality of life benefits associated with remote monitoring including increased sense of security, avoidance of delayed treatment, reduced travel, and the means to remain in the home. Litan (2008) argues that the ability to be monitored at home has real implications for patients whose disability makes it time consuming and difficult to get to appointments.

A number of studies have shown that telemonitoring is cost effective. Outcomes from eleven studies are presented in Annex F. Veraga Rojas and Gragnon (2008) reviewed 23 studies assessing cost effectiveness to determine the direct and indirect costs of telemonitoring. Direct cost savings can be achieved as a result of:

- Reducing the number of clinical visits
- Reducing the distance travelled by healthcare professionals
- Early detection of symptom exacerbations and early intervention
- Reducing the number of emergency room visits
- Reducing the number of hospital re-admissions and bed days
- Decreasing the need for residential care.

Indirect cost savings can be achieved as a result of:

- Decreasing travel
- Increased individual and carer productivity
- Increased quality of life.

In many cases, assistive technologies such as alarms, global positioning devices and electronic medication reminders, mean staff can spend less time doing routine monitoring and more time on direct individual care. Targeting high utilization individuals is more likely to achieve cost savings. Programs such as CCHT in the US allow for interventions to be provided to clients before they deteriorate and need to be hospitalized. These programs do not necessarily replace the need for nursing home care, rather they enhance the ability for self management, offer a way to maintain independence and delay institutionalization. The CCHT study reported that the cost of monitoring a person per annum was \$1,600. This cost is far lower than either the direct cost of primary care services (\$13,121) or care provided in a nursing home (\$77,745).

7. Funding mechanisms

There are two cost considerations for the funding of telemonitoring. The first is the cost of the service (education, care provision, data transmission and data monitoring) and the second is the cost of devices (including monitors, hardware, software and medical devices). Telemonitoring services could be funded under the Medicare Benefits Schedule and/or community care packages, with a contribution from Private Health Insurance for devices for privately insured patients. Reimbursement strategies must be flexible enough to keep pace with the rapid technological advances associated with both wireless and medical technology. In the future telemonitoring will move beyond the telecommunications-only paradigms to fully integrated systems of in-home and in-hospital monitoring, data integration, electronic health records and physician/patient exchanges.

7.1. Funding under the Medicare Benefits Schedule (MBS)¹⁵

Telemonitoring services (with the exception of telepsychiatry) are not currently funded under the Medicare Benefits Schedule (MBS). A doctor would need to find the most appropriate item number to cover a service. In most cases, there is no item number and a doctor must fit the service within an existing item number.

Currently data collected remotely can be monitored in a number of ways:

¹⁵ The Medicare Benefits Schedule (MBS) Book (Australian Government, Department of Health and Ageing, operating from 01 May 2010).

- an individual may be able to review it themselves (in which case no reimbursement is required)
- the individual may be able to share the report as part of a regular face-to-face consult, in which case MBS item numbers 110, 116, 119 may be used by a consultant physician
- the individual can share the report with their health care providers and the consultation with the multi-disciplinary team can take place as part of Case Conferencing, often by teleconferencing, in which case MBS item numbers 820-838 may apply. Case conferences apply to community or residential care conferences organized to discuss an individual in detail. Items apply to those who suffer from chronic conditions and have complex care needs, requiring care from a multidisciplinary team. Formal care providers from a number of allied health professions may be included.

The MBS primary care items are used for primary care services such as health assessments, general attendances, and chronic disease management. A number of these services target groups with particular needs or coordinate multidisciplinary care for individuals with chronic or complex care needs. These assessments need to occur in person so that an MBS item number can be billed. Relaxing this requirement would enable individuals with disabilities to be monitored from their homes, where appropriate.

All services within the MBS book have a unique item number, description and Schedule fee/Medicare benefit. Benefits can be claimed for 'clinically relevant' services. Current MBS codes do not translate to remote monitoring consultations. There are no items under the headings telemonitoring, telemedicine, teleradiology, home monitoring or remote monitoring. Telephone consultations do not attract benefits (with the exception of telepsychiatry). Telemonitoring items could be included under Category 1 (Professional Attendances) or 2 (Diagnostic Procedures and Investigations).

The rules applicable to Category 1 telepsychiatry services could be applied to telemonitoring. For example, the psychiatrist is responsible for keeping a record of episodes of care provided; there are limits to the number of consultations per year; and the consultant must use an outcome tool where clinically appropriate. The consult may include a mental state examination, a psychiatric diagnosis and the provision of a management plan. Telepsychiatry services have specific item numbers and are available for patients in regional, rural or remote areas. Remote areas are defined under the Rural Remote Metropolitan Areas classification system (RRMA 3-7), which describes the areas of medical practice within Australia and divides the rural, remote and metropolitan areas according to city status, population, rurality and remoteness.

Professional attendances (Category 1) includes benefits for CDM. These items are comprehensive and enable evidence-based management of needs and are available for individuals who have chronic medical conditions or complex care needs. Individuals with severe disabilities, who have a chronic medical condition, are eligible for a GP Management Plan (GPMP). If they have a chronic condition and complex care needs, they may also be eligible for Team Care Arrangements (TCAs). Under the current system an allied health professional must personally attend a patient for Chronic Disease Management (CDM) allied health (individual) services. They are used by General Practitioners (GPs) for:

- GP Management Plans (GPMP)

- Coordination by a GP of Team Care Arrangements (TCAs)
- Review by a GP of a GP Management Plan (GPMP)
- Coordination by a GP of a review of Team Care Arrangements
- Contribution to a multidisciplinary care plans (in the home or care facility).

Benefits are available for certain services provided by allied health professionals to people who are being managed by a GP using CDM items (721, 723, 729, 732). These cover in-patients and patients in the community or residential aged care facilities. Telemonitoring services would fit under remote management, monitoring and treatment of individuals with chronic diseases needing complex care. A chronic medical condition is defined as one that has been (or is likely to be) present for least 6 months, e.g., diabetes, cancer, asthma, stroke, cardiovascular illness, musculoskeletal conditions, and other long term disabilities. Telemonitoring Items would provide medical rebates for GPs or other allied health professionals who develop care plans, educate patients and monitor data. The item numbers would need to be flexible enough to include monitoring undertaken by nursing staff or other allied health professionals. Additionally, some telemonitoring items would fit under Category 2: Diagnostic Procedures and Investigations, for example implantable loop recorders.

In the US most telemedicine providers bill as usual and do not use modifiers or specialized CPT codes. Service providers considered telemedicine services in the same way they would face-to-face medical practices. In general, 'special coding' systems are considered counter productive.

Revisions to the MBS Quality Framework will introduce time-limited listing for new MBS items that do not undergo a Medical Services Advisory Committee (MSAC) assessment and the evaluation of these items. Under the MBS Quality Framework telemonitoring items may not need assessment through MSAC. In most cases, the medical devices used for home monitoring are the same as those used in traditional consultations, with the addition of wireless technology and data transfer/monitoring capabilities.

7.2. Funding under Home and Community Care Services

Telemonitoring could be included in current funded programs designed for individuals who are eligible for Home and Community Care (HACC) or Extended Aged Care at Home (EACH) services.

- The aim of HACC services is to reduce inappropriate admissions to residential care by assisting people to remain independent in their own homes. Funding is provided for those whose capacity for independent living is at risk, or who are at risk of early or inappropriate admission to long-term residential care. HACC services are provided both to older people and to younger people with disability and their carers (around 20% of HACC clients are under the age of 65). Most clients (90%) receive less than two of hours of service per week. HACC provides low intensity levels of support including home modifications, personal care, domestic help and assistance by allied health care professionals.
- EACH and EACH-Dementia (EACH-D) packages provide 15-20 hours of support per week. These packages provide high levels of care in the home and include nursing care. EACH care providers are funded equivalent to the level for high care patients in residential care. Packages can include nursing

and allied health care, social support, transport, home help, personal care and assistance with oxygen and/or enteral feeding.

The issues paper references inappropriate models of support, such as cases where young people with disabilities are cared for in aged care homes (page 12). The Council of Australian Governments is committed to reducing the number of younger people with disability who are forced to live in residential aged care. There are currently 6,700 young Australians living in nursing homes as they have no where else to go¹⁶. Smart technology, alarms and medical monitoring may assist in increasing the number of younger Australians with disabilities who live independently.

8. A review of other schemes

8.1. USA: Centers for Medicare and Medicaid

One of the major barriers to the wide spread adoption of telemonitoring is lack of reimbursement. The United States has overcome this barrier and remote monitoring has been approved by the Centers for Medicare and Medicaid (CMS) for reimbursement. In 2000 Congress passed the Benefits Improvement Act (BIPA), which enabled flexible reimbursement procedures which incentivize health professionals and encourage the use of technology. Nineteen States now offer reimbursement for telemedicine (Naditz, 2008). Telemedicine services cannot be substituted for face-to-face home visits (although they may be used as a supplement to a required face-to-face visit).

9. Governance of the telemonitoring services

The body which assesses products for telemonitoring, and which sets the level of reimbursement, must be independent and qualified to make the assessments. It is appropriate to include representation of patient interests and industry interests as well as healthcare professionals and payers. It would be appropriate to use the mechanisms established as a result of the Federal Governments review of Health Technology Assessment. Assessments of clinical and comparative effectiveness should be undertaken by reference to appropriately qualified persons.

Decisions of the HTA body should be reviewable and appealable in circumstances where there has been a demonstrable error in a finding. The HTA body would also monitor the effectiveness of the program.

The body would be advisory in that the Minister for Health and Ageing will make the final decision on inclusion of a product and level of reimbursement.

10. Conclusion

There are a wide range of medical devices that can enhance the care of Australians with disabilities. Wireless communications and advanced medical technology can be used to respond to the challenges of disability and chronic disease. MTAA strongly supports the establishment of schemes that enable equitable access to medical

¹⁶ <http://www.ypinh.org.au/>

products and technologies. The appropriate provision of Essential Care items and telemonitoring services will decrease emergency room visits, decrease unnecessary hospitalizations, avoid inappropriate transition to residential care and achieve cost savings through maintaining people in their own homes. Monitoring will allow disabled individuals in rural and remote areas to receive better levels of care. Based on overseas models, both the ECL and telemonitoring services are likely to be highly cost effective. A recent study in Northern Ireland compared the costs of in-hospital care to comparative delivery of out-of-hospital over a year. Out-of-hospital care was 80% less expensive. Five patients could be treated at home for the same price as treating one patient in hospital (Northern Ireland Health Economic Group, 2008).

There are a number of examples where care is pushed into hospital settings that could be provided in the home. For example, patients with chronic wounds are most appropriately treated at home (by community nurses) or in the GP's office (Gross, 2006). Because modern wound care products are not funded, individuals end up being treated in (costly) hospital settings.

Telemonitoring is well aligned with Government broadband and electronic health record (EHR) policies. Government strategies such as the National Broadband Network (NBN) will bring broadband into more homes and to remote and rural communities that have not previously had coverage. Network speeds will run at 100 megabits per second and connect other premises with next generation wireless and satellite technologies, offering speeds of 12 megabits per second or more. Next generation wireless and satellite technologies will be able to deliver over 12 megabits per second to people living in more remote parts of rural Australia¹⁷. In the future telemonitoring services may be coordinated using Personally Controlled Electronic Health Record (PCEHR)¹⁸.

An Australian literature review found consistent reporting of high levels of 'inappropriate' bed days in international acute care settings (Poulos & Eagar, 2007). The MTAA predicts that the provision of ECL items and telemonitoring services will decrease the number of potentially preventable hospitalisations (PPHs). These are hospitalizations that could have been avoided had more timely and adequate non-hospital care been provided. In 2007-2008, selected potentially preventable hospitalisations represented 9.3% of all separations in Australian Hospitals. PPHs are often associated with chronic ailments, which could be prevented or managed through effective, timely care (usually non-hospital). These conditions include asthma, angina, diabetes, hypertension, congestive heart failure and chronic obstructive pulmonary disease. These are all conditions that could be monitored to avoid symptom exacerbations leading to hospitalization. For example, remote monitoring can be used to detect dangerous trends such as weight gain due to fluid retention or lung dysfunction in cardiac and COPD patients.

MTAA would strongly argue that the provision of care that enables individuals to be treated in the home environment is far more cost effective than *all* other alternatives. The average cost for a visit to an emergency department is \$373 (NSW Policy Directive, 2008/2009). In large public hospitals, only 28% (3.8 million) of people who presented to an emergency room were actually referred for treatment or admitted to hospital. This suggests that many people are visiting A&E with conditions that could be best managed in the community. Emergency Room patients are categorized according to need. Category 5 patients are considered non-urgent

¹⁷ <http://www.nbnco.com.au/>.

¹⁸ <http://www.nehta.gov.au/>.

and usually have minor illnesses or stable chronic conditions such as diabetes with relatively minor complicating symptoms. In 2008-09 these patients accounted for 12% of emergency department presentations. Of 7.2 million presentations during this time period, 864,000 (12%) people may have been better treated using appropriate medical consumables and home monitoring service (Statistics from Hospital Services in Australia, State of our Public Hospitals, June 2010). The average cost of an admission to a public hospital in 2008-09 was \$4,471. This covers medical staff, diagnostic services, supplies and support services such as cleaning and meals, medical and drug supplies, allied health services and administration costs. A place in a high level care facility has an average annual cost of \$48,550 (or \$17,750 in low care facilities) (DoHA, 2009). MTAA is currently consulting with industry to estimate the costs of telemonitoring and address the need for analysis of comparative data.

A range of technologies exist to assist and support patients who wish to remain in their own homes. ECL and monitoring devices would be most suitable for disabled individuals with regular support needs. The impediment to access for Australian patients is a lack of physician reimbursement. Other countries do reimburse and it is not a major departure from current funding systems to include funding for ECL items or telemonitoring services under current funding schemes designed to assist Australians with disabilities to stay in their own homes. Eligibility for either ECL items or telemonitoring services could be determined by current Aged Care Assessment Teams (ACATs) or alternate disability funding assessment tools, who currently determine eligibility for subsidised community care. MTAA strongly supports schemes which improve access of disabled Australians to medical products and telemonitoring services and devices that enable them to maintain an independent life in their community for as long as they are capable of doing so.

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Annex A Summary Information on State and Territory aids and appliance programs

State/Program	Aids covered	Website
QLD – Medical Aids Subsidy Scheme (MASS).	<ul style="list-style-type: none"> • Communication aids • Continence aids • Daily living aids (e.g. bathroom aids) • Medical grade footwear • Mobility aids • Orthoses • Oxygen cylinders and concentrators 	http://www.health.qld.gov.au/mass/
VIC – Victorian Aids and Equipment Program (AEP)	<ul style="list-style-type: none"> • Non-disposable continence aids • Electrolarynxes and voice prostheses • Electronic communication aids • Environmental control units • Equipment for personal use • Basic home modifications • Lymphoedema compression garments • Mobility aids • Orthoses • Oxygen • Pressure care equipment • Ramps (permanent and portable) • Wheelchairs (manual / electric) • Wigs 	http://nps718.dhs.vic.gov.au/ds/disabilitysite.nsf/sectionthree/aids_equipment?open Further information on programs can be found at: http://www.wwda.org.au/portaid.htm#qvt
NSW – Program of appliances for disabled people. (PADP)	<ul style="list-style-type: none"> • Communication aids • Aids to nutrition • Alarms • Beds and sleeping equipment • Mobility aids • Pain management aids • Pressure garments, • Orthoses • Toileting and showering aids • Transfer aids • Continence aids • Continuous Positive Airways Pressure (CPAP) devices 	http://www.health.nsw.gov.au/policies/pd/2005/PD2005_563.html
SA- Independent Living Equipment Program (ILEP)	<ul style="list-style-type: none"> • Mobility aids • Communications aids • Medical grade footwear • Transfer aids • Personal care aids • Prostheses 	http://www.familiesandcommunities.sa.gov.au/Default.aspx?tabid=924
WA- Community Aids and Equipment program (CAEP)	Loan of: <ul style="list-style-type: none"> • Mobility aids • Seating equipment • Walking aids • Orthoses • Transfer aids • Bed equipment • Personal care aids • Prostheses 	http://www.disability.wa.gov.au/DSC:STANDARD::pc=PC_90385
TAS – Community	Loan of:	http://www.dhhs.tas.gov.au/services/

Equipment Scheme (CES)	<ul style="list-style-type: none"> • Mobility aids • Transfer devices • Self-care aids • Seating and sleeping aids • Surgical footwear • Continence aids • Communication devices • Home modifications • Respiratory aids • Lymphoedema compression bandages 	view.php?id=352
ACT – ACT Equipment Scheme (ACTES)	<ul style="list-style-type: none"> • Continence aids • Wheelchairs and scooters • Prosthesis • Walking aids • Wigs • Personal aids • Home modifications 	http://www.health.act.gov.au/c/health?a=sp&pid=1059610195
NT – Territory Independence and Mobility Equipment (TIME) Scheme	<p>Loan of:</p> <ul style="list-style-type: none"> • Mobility aids • Incontinence aids • Personal care aids • Home modifications • Respiratory or breathing aids • Other-such as feeding equipment 	http://www.nt.gov.au/health/comm_sv/aged_dis_ccs/time/index.shtml

Annex B Essential Care List Costs

ECL Category	ECL least conservative cost (may include device)	ECL most conservative cost (consumables/rental only)
Oxygen supplies/consumables	13,766 x \$3,945 (average cost of concentrator and \$200 consumables) = \$54,306,870	13,766 x \$1,700 = \$23,402,200
Compression hosiery, bandages and garments for lymphoedema	300,000 (assumes funding for patients with all forms of primary and secondary lymphoedema) x \$300 = \$90,000,000	10,000 (this number assumes funding for chronic patients only) x \$300 = 3,000,000
Continence products	18,000 x \$610 ¹⁹ (this is the average of the subsidies for each state/territory, incorporating the \$490 from CAAS = \$10,980,000	18,000 x \$490 = \$8,820,000
Modern wound care devices (including wound dressings)	200,000 (chronic wounds), includes venous leg ulcers x \$259 ²⁰ = \$51,800,000	Chronic ulcers: 200,000 x \$154 ²¹ = \$30,800,000
Breast prosthetics (non-implantable)	\$6,200,000 (allocated pa)	\$6,200,000 (allocated pa)
Insulin pumps and continuous flow pumps, and consumables (pens, strips, pump consumables)	~\$8,444,233 per year allocated for IPCs ²² . The cost of covering additional IPCs for pump users is: batteries (\$84 pa) + lancets (\$24 pa) + skin adhesives and swabs (\$335 pa) [5,000 x \$443 = \$2, 215,000]. The cost of covering 2,500 ²³ pumps at \$8,000 each = \$20,000,000 Total: \$30,659,233	~\$8,444,233 per year allocated for IPCs ²⁴ . The cost of covering additional IPCs for pump users is: batteries (\$84 pa) + lancets (\$24 pa) + skin adhesives and swabs (\$335 pa) [5,000 x \$443 = \$2, 215,000]. Total: \$10,659,233
CPAP/sleep apnoea devices	16,000 ²⁵ x \$1,800 (machine) + \$350 (consumables) (\$2,150) = \$34,400,0	16,000 x \$350 (consumables only) = \$5,600,000
Laryngitic products	500 x \$5,000 (speech generating devices and accessories) = \$2,500,000	500 x \$1200 (basic artificial larynx and accessories inc batteries) = \$600,000 Or 500 x \$450 (voice prosthesis) = \$225,000 Consumables ²⁶ only; shower protector (\$60), stoma cover (n=50, \$65), laryngectomy tubes (n=4, \$265), cleaning kit (\$66) = 500 x \$456 = \$228,000
Home dialysis devices, consumables and set-up costs	10,062 x \$38,424 = \$386,622,288	10,062 x \$12,727 = 128,059,074
TOTALS	\$667,468,391	\$216,768,507

¹⁹ Moore et al. (2006).

²⁰ Gross, P. & Graves, N. (2006).

²¹ Approximated cost taken from funding p.p. for 2010-2011 Epidermolysis Bullosa Dressing Scheme.

²² NDSS statistics.

²³ Approximate number of new users of insulin pumps per year.

²⁴ NDSS statistics.

²⁵ In 2004 there were 68,000 full PSGS performed in Australia. If you assume 66% were diagnostic, half went onto CPAP and most (70%) stayed on it, the CPAP figure would be 16,000.

²⁶ www.trachs.com.

Annex C Essential Care List Costs Savings

ECL Category	Cost savings associated with reducing hospitalization
Oxygen supplies/consumables	Of 13,766 assume 9.3% ²⁷ (n=1,280) will be inappropriately admitted to hospital at an average cost of \$1,718 (\$1,788 average DRG cost, public; \$1,648 average DRG cost, private) ²⁸ = savings of \$2,199,040.
Compression hosiery, bandages and garments for lymphodaema	In 2007-08 there were 3,274 ²⁹ separations (2,347 public, 927 private) for enlarged lymph nodes and oedema. The cost of treating circulatory disorders is \$7,850 (average DRG cost, public) and \$6,202 (average DRG cost, private) = \$24,173,204. Assume 9.3% (n=304) will be inappropriately admitted to hospital = savings of \$2,248,108.
Continence products	In 2007-08, there were 3,862 separations (1,403 public, 2,459 private) for faecal and urinary incontinence with an average cost of \$3,885 ³⁰ per separation = \$15,003,870. Assume 9.3% (n=359) inappropriate admissions = savings of \$1,395,360.
Modern wound care devices	In 2007-08 there were 72,599 separations for skin ulcers, open wounds and burns (63,202 public, 9,397 private) at a cost of \$3,885 per separation = \$282,047,115. Assume 9.3% (n=6,751) inappropriate admissions = savings of \$26,230,382.
Breast prosthetics	n/a (2007-08 there were 10,568 separations for breast cancer surgery).
Insulin pumps and continuous flow pumps, and consumables	In 2007-08 there were 237,119 ³¹ separations for potentially preventable diabetes complications at a cost of \$8,603, (average DRG cost, public) ³² or \$7,017 (average DRG cost, private) per separation. Average = \$7,810 = \$1,851,899,390. Assume 9.3% (n=22,052) inappropriate admissions = savings of \$172,226,643.
CPAP/sleep apnoea devices	In 2007-2008 there were 43,277 (7,257 public, 36,020 private) hospital sleep studies ³³ . There were 36,135 hospitalizations for sleep apnoea (7,598 public, 28,537 private) at a cost of \$1,394 (average DRG cost, public) or \$653 (average DRG cost, private) – per separation ³⁴ = \$29,226,273. Assume 9.3% inappropriate admissions (n= 3,361) = savings of \$2,718,043.
Laryngitic products	In 2007-08 there were 242 laryngectomy procedures performed (198 public, 44 private) and 319 application, insertion or removal procedures on the larynx (203 public, 116 private).
Home dialysis devices, consumables and set-up costs	In 2007-08 there were 990,787 ³⁵ (825,331 public, 165,456 private) separations for dialysis care and 9,397 (5,728 public, 3,615 private) separations for peritoneal dialysis. These cost \$470,480,890 (average DRG costs, public) and \$72,832,110 (average DRG costs, private) = \$543,313,000. Assume 9.3% (n=92,184) inappropriate admissions = savings of \$50,528,109.
TOTAL	\$257,545,685

²⁷ 9.3% preventable separations for chronic conditions: AIHW. Separation statistics for selected potentially preventable hospitalisations for chronic conditions for all states and hospitals, 2007–08.

²⁸ DRG Costs in Public and Private Hospitals 2007-2008. Policy Directive NSW Health Episode Funding Policy 2008/2009. Document number PD2008_063.

²⁹ AIHW: Selected separation statistics(a) for all principal diagnoses in 3-character ICD-10-AM groupings, public hospitals, Australia, 2007–08.

³⁰ DRG Costs in Public Hospitals 2007-2008. Policy Directive NSW Health Episode Funding Policy 2008/2009. Document number PD2008_063.

³¹ AIHW. Separation statistics for selected potentially preventable hospitalisations for chronic conditions for all states and hospitals, 2007–08.

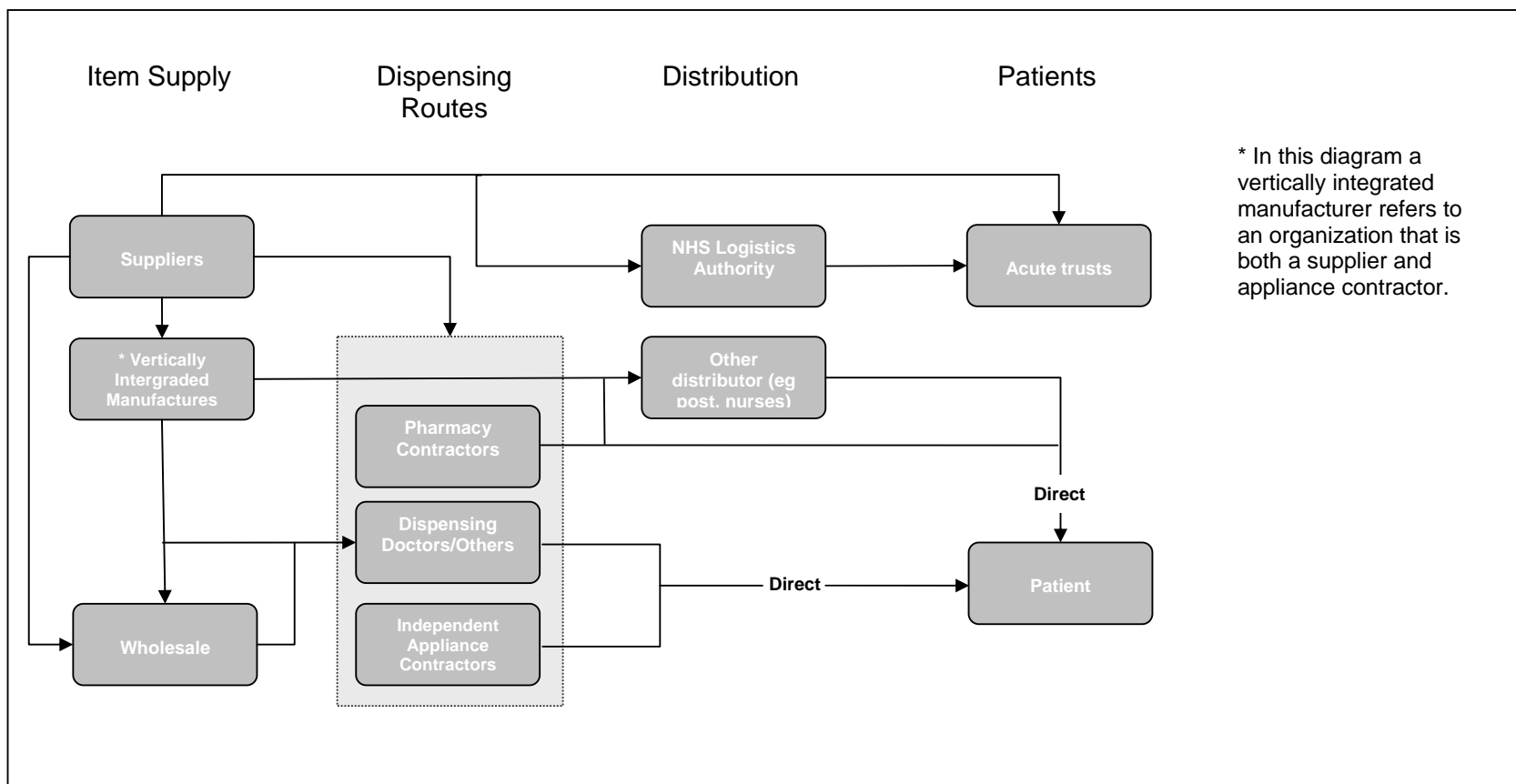
³² National Hospital Cost Data Collection. Cost weights for AR-DRG Version 5.1. Round 12 (2007-08).

³³ Selected separation statistics(a) for procedures in ACHI blocks, private hospitals, Australia, 2007-08.

³⁴ National Hospital Cost Data Collection. Cost weights for AR-DRG Version 5.1. Round 12 (2007-08).

³⁵ AIHW: Selected separation statistics for all principal diagnoses in 3-character ICD-10-AM groupings, public and private hospitals, Australia, 2007–08.

Annex D Representation of Supply Chain (UK)



Annex E Clinical Evidence for Telemonitoring

Reference	Study type	Patient population	Duration	Type of intervention	Outcome
Brewer et al. (2010)	Non-controlled evaluation study	$n=127$ remote caregivers, clients and client advocates. Clients were 45 adults with developmental disabilities	Not stated	Telecare monitoring systems were developed for adults with developmental disabilities in residential care. The systems included motion sensors, smoke sensors, and cameras. Caregivers were able to view up to 35 camera feeds per night.	<ul style="list-style-type: none"> - The telecare system was perceived to be as secure, safe and private as having a staff member in the home - The findings suggest that reducing the need for onsite caregivers has implications for large cost savings
Chumbler et al. (2009)	Retrospectively matched controlled comparison using propensity scores	$n=774$ diabetes patients: intervention group $n=387$, UC $n=387$	4 years	Veterans Health Administration (VHA) care coordination/ home-telehealth (CC/HT) program using Health Buddy as communication device for education and monitoring of symptoms and health status; daily data monitoring	<ul style="list-style-type: none"> - The intervention group had a reduction in 4-year all-cause mortality: hazard ratio = 0.69, ($p<0.05$) and an increase in mean survival time (1,348 days versus 1,278 days, $p<0.05$)
Crossley et al. (2008)	RCT including from 150 US sites	$n=2,000$ patients implanted with an implantable cardiac device, randomized to UC or TM	15 months	Patients remotely monitored using wireless telemetry devices, including wireless alerts. Paper describes study, media alert outlines early results	<ul style="list-style-type: none"> - The median time to clinical decision was significantly reduced in the TM group ($p<.001$) - There was a significant decrease in mean length of hospital stays in the TM group ($p=.002$) - Hospital costs were reduced
Darkins et al. (2008)	Non-controlled pre and post evaluation study	$n=17,025$ veterans with diabetes, COPD, heart failure, diabetes hypertension and mental health problems	12 months	Veterans Health Administration: the national Care Coordination/Home Telehealth (CCHT) aids independent living through implementing home telehealth, health informatics and disease management technologies	<ul style="list-style-type: none"> - The intervention was associated with a 25% reduction in numbers of bed days of care; a 19% reduction in numbers of hospital admissions and a mean satisfaction score rating of 86%
Giordano et al. (2009)	multicenter ($n=5$) RCT	$n=460$ patients with chronic heart failure randomized to TM ($n=230$) or UC ($n=230$)	1 year	Two strategies: home-based TM or UC. The UC group were referred to a primary care physician. The TM group portable advice that transferred data to a station that had a nurse or a doctor available 24 h, 7 days/week. The nurse and cardiologist met weekly.	<ul style="list-style-type: none"> - Monitored patients had a 50% lower risk of heart failure related readmission ($p<0.001$), a 55% reduction in cardiovascular mortality ($p=0.06$), and a 31% decrease in episodes of hemodynamic instability ($p<0.001$) - Cost of hospital readmission was 35%

					lower in the TM group ($p=0.01$)
Hill et al. (2009)	Non-controlled evaluation study	$n=42$ patients with spinal cord injury, 2 modalities were investigated: telephone only contact and videoconferencing	n/a	Each participant was assessed independently using telephone, videoconferencing and in-person assessment. Each skin or pressure wound site was assessed by each of the above modalities, results were compared with the in-person method	<ul style="list-style-type: none"> - Agreement on the presence of a pressure ulcer was high (92% telephone, 97% videoconference) - Diagnosis of ulcer stage had almost perfect agreement with in-person diagnosis
Koff et al. (2009)	RCT (single centre)	$n=400$ COPD patients: intervention group $n=270$, UC $n=130$	9 months	Proactive Integrated Care including education, self-management techniques and remote home monitoring with Health Buddy; monitoring from Mon-Fri for changes in symptoms, SpO ₂ , FEV1 and steps in 6 min walk test	<ul style="list-style-type: none"> - The TM group had significant improvements in health-related QOL and a decrease in mortality ($p<0.04$); - were reductions in critical care utilizations and gross costs (depending on hospital reimbursement rates)
Mabo et al. (2010)	RCT, multicentre, prospective study (COMPAS)	Examined the safety and efficacy of long-term pace maker follow-up. 538 patients randomized to TM ($n=269$) or UC ($n=269$)	18 months	Home monitoring of implanted device. Cardiomessenger Mobile patient device transmits data via a cellular network for monitoring	<ul style="list-style-type: none"> - TM reduced office visits for follow-up and facilitated the early detection of clinical anomalies such as atrial arrhythmias - The TM group had a reduction in atrial arrhythmia events and related strokes
Russell et al. (2010)	Non-controlled evaluation study	$n=19$ individuals with nonarticular lower limb musculoskeletal conditions	1 month	The validity and reliability of remote physical assessment and diagnosis of nonarticular lower limb musculoskeletal conditions via tele-rehabilitation was assessed	<ul style="list-style-type: none"> - There was high (79%+) agreement on primary diagnosis - Physical examination findings also showed high agreement
Sarhan et al. (2010)	Retrospective review	$n=50$ patients with pressure ulcers, $n=10$ nurses	n/a	The study conducted a retrospective review of the digital images in the clinical records of patients with pressure ulcers, 10 nurses independently assessed an image from each patient	<ul style="list-style-type: none"> - The average agreements regarding wounds was: necrosis 85%, ischemia 83%, granulation tissue 81%, infection/cellulitis 69%, erythema 68% - Results suggest that a high percentage of assessments could be performed in the community using digital images and telemedicine

Stone et al. (2010)	Randomized study	Veterans with diabetes ($n=150$) were assigned to active home TM ($n=73$) or a monthly phone call ($n=77$)	3 & 6 months	The TM group transmitted blood glucose, BP and weight data to a nurse using a telehealth monitor. The practitioner adjusted medications for glucose, BP and lipid control, based on pre-established guidelines	- While both interventions improved glycemic control, the TM group showed significantly larger decreases in HbA _{1c} at 3 (1.7 vs. 0.7%) and 6 months (1.7 vs. 0.8%; $p<0.001$ for each), the most improvement occurred at 3 months
Varma et al. (2010)	RCT	$n=1,339$ patients were randomized to TM or conventional follow-up. All patients had implanted cardioverter defibrillators	1 year	The TM group were remotely monitored. Conventional patients were evaluated with office visits only. Actionable evaluations included clinically significant reprogrammable changes, medication changes, lead/generator revision	- This is the first large scale clinical trial of ICD follow-up using remote monitoring - Arrhythmias were the commonest cause for event notifications - Total in-office visits were reduced 45% in the TM group - Results have led to the approval of the system by the FDA
Vitacca et al. (2009)	RCT (single centre)	$n=240$ respiratory patients (101 with COPD) were randomized to TM or UC	12 months	Data (oxygen saturation measured by pulse oximetry) were monitored. Nurses were available 40 hours/week for consultation. A call centre received data 24 h per day. An on-duty pulmonologist was contacted if needed	- The TM group had a significant decrease in hospitalizations (-36%), fewer urgent GP calls (-65%) and fewer ER admissions (-71%)
Vitacca et al. (2010)	Non-controlled evaluation study	$n=40$ patients with ALS	mean = 8.6 months	Telemedicine-assisted integrated care program (TAIC): patients used a portable pulse oximeter during daily phone contacts to assess variation in oxygen and clinical status.	- 84% of unscheduled calls were managed by a nurse-tutor (only 16% of them required specialist intervention) - The confidence of patients to handle their disease improved in 71%
Yozbatiran et al. (2010)	Non-controlled evaluation study	$n=21$ patients with spinal cord injury	6 months	Both telemedicine and conventional assessments were conducted at baseline and 6 months. Data from TM assessments were sent to a centre 90km away	- At 6 months motor and sensory functions showed significant changes - The authors conclude that the use of TM to remotely monitor changes with spinal cord injury appears promising

TM=telemonitoring; RCT=randomized controlled trial; UC = usual care; GP=general practitioner; ER=emergency room; COPD=chronic obstructive pulmonary disease; QOL=quality of life; CHF=chronic heart failure; PTSD=post traumatic stress disorder; HF=heart failure; ALS = amyotrophic lateral sclerosis.

Annex F Cost Effectiveness Outcomes for Telemonitoring

Reference	Study type	Outcomes
Alwan et al. (2007)	Case-controlled study of passive health-status monitoring. Monitoring systems were installed in the homes of 21 patients. Heart rate, breathing rate, key alert conditions and activities of daily living (ADL) were monitored	There was a decrease in hospital days ($p<.01$), a reduction in billable interventions ($p=.040$) and a decrease in the estimated cost of care of \$46,566 ($p=.034$). Monitoring reduced cost of care to payers and had a positive impact on staff efficiency
Armstrong et al. (2007)	Compared the costs of a face-to-face dermatology consultation with an interactive teledermatology consultation. Data from 451 patients were included	The total cost of the standard consultation was \$346 per hour and the total hourly cost of the tele-consultation was \$274 per hour. The two main factors contributing to lower cost were low costs of technology and the decreased cost of clinic space
Dansky et al. (2001)	RCT: $n=171$ diabetic patients were randomly assigned to either an intervention ($n=86$) or a control group ($n=85$). The TM group received nursing visits and virtual visits and monitoring via medical sensors (a sphygmomanometer for BP and a stethoscope for heart rate). The UC group received nurse visits only	A number of positive clinical outcomes were translated into cost savings. Fewer TM patients needed recertification after 60 days ($p<.01$), 63.7% of TM patients were discharged to home vs. 39% of the UC group ($p=0.01$), only 10% of TM patients were hospitalized during the intervention vs. 28% of UC patients ($p=0.05$). The authors estimated hospitalization costs to be \$87,327 for TM patients and \$232,872 UC patients
Darkins et al. (2008)	Veterans Health Administration: the national Care Coordination/Home Telehealth (CCHT) program. Included $n=17,025$ veterans. CCHT aids independent living. Monitoring reduces hospitalizations and bed days of care	Large cost savings were achieved. The CCHT costs \$1,600 per patient per annum. This is much lower than the direct cost of VHA's home-based primary care services of \$13,121 (VHA internal data 2008) per annum, and nursing home care rates of \$77,745 per patient per annum
Litzinger et al. (2007)	Assessed video teleconferencing for wound care over a 2 year period. $n=35$ patients were enrolled and received multiple wound care evaluations. The technology can be used for patients with chronic wounds who are unable to leave their home to receive care	A total of 421 hours of nursing visits were saved and 916 hours of travel time avoided. There was an overall saving of 1,338 hours of time and a cost reduction of \$42,175. After all costs were considered the net saving of the program was \$25,208
Maiolo et al. (2003)	Assessed $n=20$ severe COPD patients and $n=20$ matched controls who were monitored using sensors connected to a monitoring device and a transmitting unit. Patient pulse-oximetry and heart rate were monitored twice a week and patients had face-to-face medical visits every 3 months	At 12 months follow-up the study found that monitoring resulted in a lower number of hospital visits, a decrease in the number of acute home exacerbations and a cost saving of \$1,739 per patient (a 17% gain)

Meyer, Kobb & Ryan (2002)	Assessed case management and telehealth versus usual care in 791 veterans with chronic diseases (heart failure, COPD, diabetes and hypertension) one year after telehealth (the dial up device included surveys, blood sugar, chest pain, weight and blood pressure measures, a camera was used to photograph diabetic wounds)	Patients in the TM group were 7.7% less likely to be admitted to a nursing home, ER visits were reduced by 40%, hospital admissions by 63%, and reduction in hospital bed days of care by 60%. There were similar reductions in nursing home care
Noel et al. (2004)	$n=104$ patients with lung disease, heart failure and/or diabetes were randomized to a TM or UC group for 6-12 months. The study assessed whether integrated home telehealth with electronic medical records reduces cost and increases QOL outcomes. The TM group were provided with peripheral devices to monitor vital signs and questionnaires to evaluate QOL. Out-of-range data triggered alerts	At 6 months, the TM group had a significant decrease in bed days of care ($p<.01$), urgent clinic and ER visits ($p=.023$), and A1C levels ($p<.01$). The cost reduction for the intervention group was ~5%. Time and cost saving strategies were generated by collecting data using peripheral devices, automatic data entry and alerts, patient education and feedback, eliminating unnecessary home visits and early detection, diagnosis, and intervention
Scalvini et al. (2005)	Assessed home-based TM in 426 patients ($n=230$ TM, $n=196$ UC). TM consisted of trans-telephonic follow-up, ECG monitoring, tele-assistance (via a call centre) and medical visits. Patients were followed over 1 year	The TM group had a significant reduction in hospitalizations vs. the usual care group and an increase in QOL. The total costs were lower in the TM group (€107,494) vs. the UC group (€140,874) at 1 year follow-up
Seto (2008)	Systematic review of cost effectiveness of telemonitoring vs UC for heart failure. Only articles describing systems with a component of home physiological measurements were included ($n=11$)	Telemonitoring resulted in costs savings in all of the studies (range = 1.6% to 68.3%). Cost reductions were associated with reduced hospitalization expenditure. The only study to assess indirect costs found that travel costs were 3.5% lower in the TM group
Vontetsianos et al. (2005)	Adopted home-telecare software that included real-time home-video conferencing with the hospital via the patient's television, to monitor 18 patients with advanced COPD. A nurse visited the home and monitored vital signs (ECG, blood pressure, spirometry and oximetry)	Home monitoring was associated with a decrease in hospital days and ER visits. Total overall costs were lower. The cost of hospital days in the 12 months before the intervention was €515 per month and the cost of hospital days in the 9 months after the intervention was €138