Submission 074
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Neuroscience Research Australia
Discover. Conquer. Cure.

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23 February 2011

Committee Secretary
House of Representatives Standing Committee
on Infrastructure and Communications
PO Box 6021
Parliament House
CANBERRA ACT 2600
AUSTRALIA
email: ic.reps@aph.gov.au

Dear Ms Bird,

Re: Inquiry into the role and potential of the National Broadband Network

Background
Neuroscience Research Australia (previously the Prince of Wales Medical Research Institute) is the nation's leading medical research institute dedicated to fundamental and clinical neuroscience research. It is accredited by the National Health and Medical Research Council as an independent, not-for-profit, medical research institute.

The vision of Neuroscience Research Australia is to prevent and cure disease and disability of the brain and nervous system through leadership, excellence and innovation in neuroscience research. These diseases and disabilities pose the largest health, economic and social capital burden of any disease group.

Our research portfolio includes both clinical and laboratory research into neurological, psychiatric and psychological disorders. Our research activity is organised into five major themes: (i) ageing and neurodegeneration, including Alzheimer's and Parkinson's disease and other forms of dementia, and stroke rehabilitation; (ii) brain structure and function, including brain mapping for research and clinical use; (iii) neural injury, including spinal cord injury; (iv) mental illness, including schizophrenia, bipolar disorder and depression; (v) sensation, movement, balance and falls, including human movement, balance and vision, and falls in older adults.

Further details of Neuroscience Research Australia are provided in Appendix 1.

Researchers at Neuroscience Research Australia have nationally and internationally recognised excellence in a wide range of areas, but of particular relevance to this inquiry are the skills and experience of Dr Stuart Smith in the development of games for health, and telehealth, Dr Penelope McNulty in spinal injury and stroke rehabilitation, and Professor Stephen Lord in falls and balance research. Each of these researchers works in an area in which the National Broadband Network could greatly facilitate the community uptake and benefits of their research discoveries. Accordingly, our submission addresses terms of reference b, g and h in particular.

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Neuroscience research, telehealth and games for health

Neuroscience, the study of the brain and nervous system, presents the greatest challenge known to man. Our brain, itself a high-speed, broadband neural network, is the most complex mechanism we have ever encountered and understanding its intricacies requires a profound research commitment. When disrupted by either the process of ageing, injury or disease, disorders of the brain and nervous system pose the largest health, economic and social capital burden to Australia of any disease group. Furthermore, disorders of the brain and nervous system have a significant impact on the ability of individuals to continue living independently in their own homes.

Successful and continued independent living in older people or those with neurological damage or disease depends on a number of key physical, cognitive and social markers of health. Monitoring these markers of health over time, and comparing them to clinical models, enables us to draw conclusions about the current physical, cognitive and social health of the individual. However, this necessitates labour intensive assessment by clinical professionals that requires the individual to travel to a central clinic or hospital facility. In remote and rural communities, especially in a country like Australia, the distance, inconvenience and expense of travel often make routine assessment of function very difficult. There is therefore a pressing need to develop data on routine or semi-routine measures that can be gathered from peoples' home environments.

Daily, weekly or monthly home-based monitoring of health also improves our ability to detect and act upon changes in these markers should they deviate significantly from an individual's history or accepted clinical models of good health. Telehealth technology, which combines digital data acquisition and broadband communication technologies to monitor health status in the home, is gaining attention as a promising strategy for acquiring accurate, reliable and time critical health marker data. For individuals who may be isolated, either by distance in regional, rural or remote Australia, or functional impairment following neurological damage or disease, telehealth technologies will be critical for clinicians to fully understand the progression of disease course, or the effectiveness of intervention strategies, over the long term.

The following three projects illustrate how Neuroscience Research Australia is developing and critically evaluating how use of broadband enabled health technologies.

In a research project funded by a $440,000 grant from the National Health and Medical Research Council, Dr Penelope McNulty and her team at Neuroscience Research Australia have shown that by using engaging video game therapy, patients can significantly improve their movement and the range of tasks they can perform using their stroke-affected hand and arm. More importantly, patients no longer consider rehabilitation therapy a chore. This form of therapy is highly effective after only two weeks of therapy. Further details are provided in Appendix 2.

An opportunity to accelerate the potential delivery of our research programs to the broader community presented itself via the generous philanthropic donation of Neuroscience Research Australia board member and NBNCo Chief Executive Mike Quigley in 2010. As part of a larger $2 million donation to Neuroscience Research Australia, a portion of the funding was specifically allocated to expand the stroke rehabilitation project to examine the opportunity and effectiveness of using the National Broadband Network to deliver this new form of rehabilitation to patients in their own homes. The press release and selected media coverage are included in Appendix 3.

In another research project funded by a $375,625 grant from the National Health and Medical Research Council, Professor Stephen Lord and his team have demonstrated that older adults can, and do, engage with video games that deliver exercise interventions known to reduce the incidence of falls. With the National Broadband Network, it will be possible to deliver such interventions to older adults living in regional, rural and remote Australia. Further details are provided in Appendix 4.

Finally, in yet another research project led by Dr Stuart Smith, his team have shown that telehealth technologies that make use of broadband internet can be used to monitor the progression of motor dysfunction in Parkinson's disease. This work shows that individuals living with Parkinson's disease can have their disease monitored by clinicians who may be distally located in metropolitan areas. It will be possible to significantly reduce the time and expense involved delivering assessment of this neurological condition to sufferers of Parkinson's disease in regional Australia. Further details are provided in Appendix 5.

The results obtained from each of these research projects have led to pilot studies to examine the potential applicability of the data transfer using the enhanced bandwidth of the National Broadband Network. Our assessment of these studies is that use of the National Broadband Network will allow a multitude of enhanced health outcomes to be achieved broadly across the community, but will be of particular benefit to rural and remote communities. This will enable the application of these innovative, and potentially highly cost-effective, interventions to be delivered to individuals living in the community, and will provide opportunities to significantly reduce the health, economic and social burden of these diseases and disabilities on the Australian community.

The institute and its researchers would be pleased to provide further information should this be of value to the Committee.

Yours sincerely

Professor Peter R Schofield

Appendix 1

Neuroscience Research Australia

Neuroscience Research Australia is an international leader in brain and nervous system research based in Randwick, Sydney. Our vision is to prevent and cure disease and disability of the brain and nervous system through leadership, excellence and innovation in neuroscience research.

The institute hosts over 260 neuroscience researchers and is accredited by the National Health and Medical Research Council as an independent, not-for-profit, medical research institute. It is affiliated with the University of New South Wales and South Eastern Sydney Local Health Network (previously South Eastern Sydney and Illawarra Area Health Service).

Neuroscience Research Australia (NeuRA) was previously called the Prince of Wales Medical Research Institute. On 1 June 2010, we officially launched our new identity at an event at Sydney's Parliament House. The new name reflects accurately what we do (neuroscience research) and denotes that our research benefits all Australians.

Our research

The focus of NeuRA's work has always been on neuroscience. Our research portfolio includes both clinical and laboratory research into neurological, psychiatric and psychological disorders. Our research activity is organised into five themes:

- **Ageing and Neurodegeneration**: Alzheimer's disease, frontotemporal dementia and other dementias, Parkinson's disease, Motor Neurone Disease, ageing research in indigenous populations, stroke rehabilitation
- **Brain structure and function**: brain mapping for research and clinical use, on-site MRI scanning, assessment of dyslexia and binge drinking in teenagers
- **Neural injury**: spinal cord injury, assessment and prevention of road trauma in children
- **Mental illness**: schizophrenia, bipolar disorder, depression and autism
- **Sensation, movement, balance and falls**: human movement, fatigue, sleep apnoea, balance and vision, neural control of muscles, falls in older adults, chronic pain

Neuroscience Research Australia houses several specialist research facilities, including the Sydney Brain Bank and Genetic Repositories Australia. The institute has an on-site 3T MRI imaging research facility.

History

1991 – Neuroscience Research Australia was established as the Prince of Wales Medical Research Institute by Professors Ian McCloskey, David Burke, Simon Gandevia and Erica Potter with the support of the Eastern Sydney Area Health Service and the University of New South Wales.

1993 – The institute was established as an independent, not-for-profit company and researchers moved into 'Villa Two' on the site of the old Randwick Chest Hospital, next to the Prince of Wales Hospital in Randwick.

1993 – The site was officially opened by the Commonwealth Minister for Health, Graham Richardson, and the NSW Minister for Health, Ron Phillips. Both governments had provided funding to convert the old wards to specialised laboratory facilities.

2000 – 'Villa One' was converted and linked to 'Villa Two'. The new building which more than doubled the research capacity was officially opened by Premier Bob Carr.

2003 – The clinical research imaging facility was opened, providing a 3T MRI scanner for research use. In mid-2010, the institute sold the facility to Diagnostic MRI Services Pty Ltd on the understanding that research scans would continue.

2009 – The Prince Henry Wing extension was opened by Jodi McKay, Minister for Science & Medical Research.

2010 – The NSW government approved concept and project plans for a Neuroscience Research Precinct to be built on the existing site. Building works began on the first phase of the project in March 2010.

Leadership

Professor Peter R Schofield, PhD DSc, has been the Executive Director and CEO of Neuroscience Research Australia since 2004. Professor Simon Gandevia, MD PhD DSc FAA FRACP, is Deputy Director and Foundation Scientist.

Neuroscience Research Australia provides outstanding research leadership. We have both an Australian Fellow and Federation Fellow and 15 NHMRC Research and Career Development Fellows. 19 staff members hold appointments at Professor or Associate Professor level.

Governance

There are 14 Board members. The Chairman is Paul Brassil, BEc LLB ACA FTIA, a partner at PricewaterhouseCoopers. There are two nominees each from the founding stakeholders, the South Eastern Sydney & Illawarra Area Health Service and the University of New South Wales, plus one nominee each from the Commonwealth via the NHMRC and the State via the NSW Minister for Science & Medical Research. There are 7 positions for independent directors, and the CEO is also a director. The Board meets bimonthly.

Current directors are listed below:

Mr Paul Brassil, *BEc LLB ACA FTIA* — Chairman of Neuroscience Research Australia
Independent Director — Term: 31/10/1997 - 30/10/2013
Partner, PricewaterhouseCoopers

Professor Peter Smith, *RFD MD FRACP FRCPA FAICD*
Nominee of University of New South Wales — Term: 18/11/2005 - 28/8/2011
Dean of Medicine, University of New South Wales

Ms Gabrielle Upton*, BA LLB MBA FAICD*
Nominee of University of New South Wales — Term: 26/4/2007 - 30/6/2013
Pro Chancellor, University of New South Wales

Mr Andrew Bernard, *BSc MPH*
Nominee of South Sydney Eastern Local Health Network — Term: 4/9/2008 - 3/9/2012
General Manager, Northern Hospital Networks

Professor Mike Calford, *BSc(Hons) PhD*
Nominee of National Health & Medical Research Council — Term: 20/8/2009 - 19/8/2012
Deputy Vice-Chancellor (Research), University of Newcastle

The Hon Dr Andrew Refshauge, *MBBS FAICD*
Nominee of NSW Government Minister with responsibility for medical research
Holds various directorships and consultancy positions — Term: 7/10/2005 - 6/10/2011

Mr John Grill, *BSc BE(Hons) Hon DEng*
Independent Director — Term: 16/7/2010 - 15/7/2013
Chief Executive Officer, WorleyParsons Limited

Mr Michael Quigley, *BSc BE*
Independent Director — Term: 19/9/2008 - 18/9/2011
Chief Executive Officer, NBN Co Ltd

Mr Barry Shepherd, *PSM GradDipPSM*
Independent Director Term: 4/9/2010 - 3/9/2013
Has held senior positions in the health systems of NSW and Victoria. Has previously served as a nominee of University of New South Wales from 6/11/1991- June 1996 and a nominee of Area Health Service from 14/7/2005 - 3/9/2010.

Professor Peter Schofield*, BScAgr PhD DSc*
Executive Director & CEO, Neuroscience Research Australia
Appointed by Board of Neuroscience Research Australia Term 5/7/2004 - present

Funding

In 2010, our total income was $27.1million and operational expenditure was $16.9 million.

NeuRA attracts competitive external grant funding from national and international organisations. Total peer-reviewed funds for the 2010 calendar year were $12.845 million. The most significant funding body is the NHMRC which awarded $7.76 million in 2010. This included 10 research fellowships, 5 career development awards, 4 research training fellowships, 3 postgraduate scholarships and 44 research grants. $1.66m was awarded from the Australian Research Council.

Through the NSW Government's Medical Research Support Program, NeuRA secured $1.6 million in 2010. NeuRA also received $1.4 million in 2010 from UNSW for research infrastructure. We are also dependent upon the support of private funding agencies, corporate and individual donors.

The Future – Neuroscience Research Precinct

NeuRA is leading the development of a Neuroscience Research Precinct on our existing site. In March 2010, the State Minister for Planning approved the concept and project plans. The precinct will provide the opportunity for consolidation of research activities of the University of New South Wales, the Area Health Service and the Black Dog Institute.

Building works have commenced on the first of a four stage building project which will provide 8,165m^2 of new, purpose-built research space, more than doubling our existing research space. Additional funding is currently being sought from the State Government and other sources. The precinct, once fully developed, will provide six stories of research space, 25,000m^2 floor space and house up to 700 researchers.

Appendix 2

Research Project - Delivering stroke rehabilitation via the National Broadband

Background
More than 60,000 Australians will suffer a stroke this year, making stroke the second largest cause of disability in Australia (Senes, 2006). Over 350,000 Australians live with a stroke related disability and more than 50% of stroke survivors require assistance with basic everyday activities such as toileting, bathing and eating (Senes, 2006). In future years this number will only increase with the aging population and the growing epidemics of obesity, diabetes and physical inactivity (NSF, 2011). The cost of first-ever strokes to the Australian economy is >$2 billion per annum (Cadilhac *et al.*, 2009).

There is no cure for stroke, nor any forthcoming. Rehabilitation is the only means of recovering enough movement to restore independence. Current National Stroke Foundation Guidelines recommend that "Rehabilitation should be structured to provide as much practice as possible within the first six months after stroke" and "as much physiotherapy and occupational therapy should be provided as possible". Observational studies in different countries have found that rehabilitation unit inpatients are surprisingly inactive for the vast majority of the waking day. For example, Bernhardt (2008) found that only 13% of a stroke unit patients' day was spent in activities related to functional outcome such as active therapy or walking practice. It is unlikely that rehabilitation units can substantially increase the dose of repetitive exercise within current staffing levels and treatment approaches. Health care resources are limited and as rehabilitation staff costs are already over $700 million annually in NSW alone, it is unlikely that substantially more resources, such as therapy staff, could be allocated to rehabilitation services. Thus the two primary factors limiting rehabilitation outcomes are: i) poor patient compliance (Gordon *et al.*, 2004) exacerbated by the repetitive and unstimulating nature of most rehabilitation exercises; and ii) restricted access to services due to either a lack of local facilities and staff, or a lack of transportation (Joubert *et al.*, 2008; Holden, 2005). This may render patients in the inner suburbs of large cities just as isolated as those in rural and remote Australia (Holden *et al.*, 2007; O'Connell *et al.*, 2001).

Wii-based movement therapy
Dr Penelope McNulty has developed a novel stroke therapy at Neuroscience Research Australia, using the Nintendo Wii as a rehabilitation tool (Mouawad *et al.,* 2010). This research has been supported by a peer-reviewed three year project grant "Improving rehabilitation after stroke" from the National Health and Medical Research Council of Australia valued at $440,000. The Chief Investigators of this research project are Dr Penelope McNulty, A/Professor Janet Taylor, Professor Matthew Kiernan and Dr Stuart Smith. To date 16 stroke victims have participated in Wii-based movement therapy, ranging in age from 22-83 years, and 1-90 months post-stroke. Every patient improved their ability to use their stroke affected hand and arm.

Our patients improved 33% on functional tests, increased their use of the more-affected hand in everyday life by 141% and were able to move the joints of their more-affected arm 20° further on average. These improvements were obtained after only two weeks of therapy, even for patients who had completed intensive in-patient and out-patient therapy in major rehabilitation hospitals and clinics. The Nintendo Wii is used without any modifications to provide a cost-effective, fun program that can be tailored to the individual movement deficits of each patient. The program runs over a brief but intense two week period combining formal training sessions with carer-guided practice at home. Wii therapy does not require the constant presence of specialist staff to manage the computer interface. The patients in our study significantly improved their movement ability and the range of tasks they could perform in everyday life using their stroke-affected hand and arm. More importantly they were highly satisfied with this form of therapy and we did not encounter any issues with therapy compliance. With Wii therapy, the hard work of rehabilitation was no longer considered a chore.

Improving stroke victims' ability to move their affected hand and arm will increase their independence, greatly reducing demands on the health care system where access to rehabilitation is limited by financial constraints. This presents an opportunity to significantly reduce the burden of care on patients, their families, the community and the economy.

Using the National Broadband Network to deliver Wii-based movement therapy
Based on the success of the research to date, an opportunity to accelerate the potential delivery of such a rehabilitation program to the broader community presented itself via the philanthropic donation of Neuroscience Research Australia board member and NBNCo Chief Executive Mike Quigley.

A proof of concept project is currently being developed in which we will deliver Wii-based movement therapy over the National Broadband Network beginning with approximately 10 patients per test site. Formal one hour therapy sessions will be conducted in patients' homes, supervised via the National Broadband Network by the post-doctoral research therapist in Sydney on 10 consecutive weekdays. Carer-guided practice will progressively build to 3 hours per day, excluding rest breaks which may be taken as necessary. The amount and type of practice will be guided by the therapist. Each patient and their carer must complete a participation contract with the researchers. This behavioural tool emphasises the importance of patient safety, and provides a forum for patient-directed problem-solving. The participant contract will be reviewed daily and updated as necessary during the two week program. The caregiver contract increases safety for the patient by providing a detailed understanding of the program and guidelines regarding patient assistance. Daily schedules will be devised by the therapist in collaboration with the patient and their carer, and patients will complete a simple daily diary of motor activities and the Motor Activity Log. The diary, motor log and level of therapy intensity provide the basis for daily feedback and progress reports, increasing awareness of total daily use of the more-affected hand and arm. Taken together, the behavioural aspects of this study help ensure patients' therapy compliance and motivation. Patients will play Wii games which will be introduced and varied according to functional ability. Patients will vary the games played within each training session to avoid overuse discomfort.

Therapy success will be assessed using the following primary outcome measures: i) reduced time taken to complete the Wolf Motor Function Test indicating improved functional movement ability and ii) by improved Motor Activity Log scores that describe the quality of use of the affected hand and arm and represents the level of independence in activities of daily living.

Broadband potential
Broadband provides the bandwidth to deliver the formal, supervised therapy sessions from a remote location and simultaneously capture the data stream from the Wii device, monitor the Wii screen display information presented to the patient, watch the participant engage in therapy in real-time, and provide instantaneous feedback to improve motor function. We will also be able to remotely monitor physiological signals during therapy such as heart rate and stepping rate. Careful monitoring of patients' movement during the formal training sessions is critical to the success of Wii therapy. Remote researchers will be looking for subtle changes in movement patterns to indicate motor relearning and recovery, and to guide the structure of therapy sessions. It is therefore essential to have high quality motion capture and transmission in real time without high latency, lag, jitter, echo, distortions and down-sampling affecting the video stream. These problems plague low bandwidth systems such as TCP and VOIP; error correction is no substitute for high resolution data. Broadband monitoring would allow a centrally located therapist to work with multiple patients each day, a caseload not possible where extended travel time is required. This provides a much more effective use of the health dollar.

Potential extensions via broadband

Once we have established the feasibility of stroke therapy via the broadband, we will develop links between stroke patients so that after they have finished therapy, they can continue to play Wii games against each other. This will promote continued therapy beyond the formal protocol and provide social interaction, reducing the isolation brought about by reduced mobility. Initially, such sessions would be guided by a therapist, but the broadband provides the means of developing such networks into patient directed support groups.

Significance and innovation

This trial will develop a novel method of delivering stroke rehabilitation to regional and rural Australia where access to therapy is currently restricted or non-existent. It will maximise the bandwidth advantages provided by the National Broadband Network to monitor and provide feedback in real-time during rehabilitation sessions conducted by a centrally located therapist. High resolution, low latency sampling will enable accurate and sophisticated analyses of movement patterns during therapy. We know this form of rehabilitation is highly effective after only two weeks of therapy, and that patients were very satisfied with the therapy and their improved function. This trial will demonstrate the feasibility and safety of delivering rehabilitation via broadband networks and develop techniques and tests to implement remote therapy to even more isolated stroke patients across Australia.

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Appendix 3

News release and selected media reports

Media Release

Contact: Maryke Steffens on 0406 599 569
Email: m.steffens@neura.edu.au

Neuroscience Research Australia
Discover. Conquer. Cure.

Embargoed until 10:00 AM, Monday 28 June 2010

Stroke patients to receive WII therapy via National Broadband Network: -
NBN Co CEO donates first year's salary to Neuroscience Research Australia

Stroke patients will be some of the first people to benefit from the National Broadband Network via a project to deliver remote rehabilitation therapy using Nintendo **Wii**.

"Stroke patients in regional or remote areas find it difficult to access rehabilitation services," said lead researcher Dr Penelope McNulty from Neuroscience Research Australia (NeuRA). "This project will assess the feasibility of offering **high-quality, remotely-monitored rehabilitation** where access to therapy is currently restricted or non-existent."

NeuRA and NBN Co **will** work together to test the delivery of the rehabilitation training to people with stroke-affected hands and arms using the National Broadband Network.

"Studies at Neuroscience Research Australia have shown that **this form of therapy can significantly improve movement** after only two weeks," said Dr McNulty.

Mike Quigley, who started as NBN Co Chief Executive in July last year and is on the NeuRA board, has **donated his first year's salary - $2 million - to fund this project**, as well as other projects at NeuRA, including the construction of the Neuroscience Research Precinct.

"This project combines my two great passions in life – medical research, from which I have personally benefitted, and telecommunications. I am a true believer in the ability of fast broadband networks to **deliver significant social and economic benefits**," Mr Quigley said.

"This research project is a great example of the **improvement in healthcare delivery** that will be possible using the speed and coverage of the National Broadband Network," said Mr Quigley. "This is particularly **important in remote locations** and to those who have difficulty travelling to receive care."

"As our population ages, neurological diseases will be a big cost to the community, and cost-effective, broadband-based health solutions will be of growing importance," he said.

Every year over 60,000 Australians have a stroke, making it a leading cause of disability (National Stroke Foundation). Rehabilitation is the only method to recover movement of stroke-affected limbs.

Each participant **will** take part in ten one-hour sessions at home over a two-week period. They will be supervised by a therapist in Sydney, who will **use the network to receive high quality video images and sensor data** to analyse the patient's movements and provide feedback.

"This generous donation is a vote of confidence in our e-health initiatives, which have the potential to greatly **reduce demands on our healthcare system**," said Prof Peter Schofield, CEO of Neuroscience Research Australia.

"With this project, we hope to **significantly increase opportunities for recovery for stroke patients** across the country. As Australia ages, we believe faster broadband will be of increasing importance in patient care and rehabilitation," said Prof Schofield.

www.NeuRA.edu.au

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Stroke patients make a play for remote recovery

Amy Corderoy
HEALTH

LESS than a year ago Marianne McDonald awoke to find herself living a nightmare. The 43-year-old mother had suffered a stroke and lost her ability to write, speak and walk properly.

But an innovative program using computer games to provide rehabilitation has given Ms McDonald back most of her speech and movement.

The program, developed by Neuroscience Research Australia, involved two weeks of an intensive rehabilitation program using Nintendo Wii sports games such as tennis.

"It gave me confidence and it also taught me how to move again," she said. "I feel blessed."

The games helped Ms McDonald learn to balance, rotate her arm, grip and use her fine motor skills. Sometimes she even beats her son Bradley, 9 – a feat any parent would find gratifying.

Next year the program will be available online for people in rural and remote areas, paid for by a donation from the chief executive of the national broadband network, Mike Quigley.

Mr Quigley, who gave his $2 million salary to pay for the extension of the program, had been interested in medical research since he was diagnosed with leukaemia in 1990.

"I wouldn't be here without medical research," he said.

"The national broadband network can enable [researchers to] find new cost-effective ways of delivering treatments such as this."

Stroke patients in Kiama Downs, near Minnamurra – one of the first places in Australia to receive the national broadband – will take part in the rehabilitation while being monitored remotely by doctors.

"Many people in remote and rural areas don't have access to rehabilitation services," said the lead researcher, Penelope McNulty. "But it is the only way to recover from a stroke."

Patients think of the treatment as a game and enjoy it. "Some patients end up playing it up to four hours each day," she said.

The chief executive of Neuroscience Research Australia, Peter Schofield, said the program would also allow staff to treat more patients than they could if they had to travel to them.

Currently 60,000 Australians have a stroke each year and the number is expected to increase.

'[Wii] gave me confidence and it also taught me how to move again. I feel blessed.'
Marianne McDonald, stroke patient

Help at hand ... Marianne McDonald, a stroke patient, uses the Wii as therapy with Dr Penelope McNulty, right. Photo: Ben Rushton

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MTWTF

Stroke patients' hi-tech help

ADAM CRESSWELL
HEALTH EDITOR

STROKE patients will be the first to receive health services through the federal government's national broadband network when researchers next year start delivering rehabilitation classes straight into people's living rooms.

The superfast communications network, which is about to start rolling out in five "test bed" sites, will allow stroke patients to do exercises required for their recovery while being supervised by clinicians hundreds of kilometres away.

The technique, which relies on patients playing on the Nintendo Wii gaming system while their movements are watched on a live video link, has already shown good results in the laboratory.

Researchers hope the trial will prove stroke patients using the system recover their motor skills as well, or faster, than people given traditional therapy — which can involve immobilising the "good" hand or limb to force the patient to re-learn using the damaged one.

If successful, the technique promises to open up access to thousands more people in rural and remote areas, who would otherwise face travelling to rehabilitation centres far from their homes.

It could also prove to be the first of what experts believe will be a plethora of health-related applications for the fibre-optic network.

The Nintendo Wii includes a hand-held controller that allows players to control the movement of an on-screen object — such as a bat, racquet, steering wheel or boxing gloves.

For the trial, patients will be lent a Wii, and will have a camera mounted on their television so the researchers in Sydney can watch as they perform 10 one-hour therapy sessions over a two-week period.

Penelope McNulty, who is leading the $200,000 study for Neuroscience Research Australia, said seven patients in a lab-based trial last year had found the Wii-based treatment more fun and were more likely to practise on it.

"Every single one of them went out to buy their own Wii afterwards — and they were aged 42 to 83," Dr McNulty said.

Announcing the trial yesterday, Communications Minister Stephen Conroy said it showed "how the delivery of health services will change when the NBN is delivered".

Stroke victim Marianne McDonald is guided by Penelope McNulty, right, during a therapy session in Sydney yesterday

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MTWTFS-

Stroke rehab study tests fun and games

DANNY ROSE

AUSTRALIAN scientists will undertake a nationwide study involving stroke survivors and an emerging "fun" form of rehabilitation therapy using the Nintendo Wii.

Penelope McNulty said it was hoped to replicate the results of a New South Wales-based trial last year which showed how stroke survivors could regain more limb movement by playing the motion-controlled game console.

"Studies at Neuroscience Research Australia [NeuRA] have shown that this form of therapy can significantly improve movement after only two weeks," Dr McNulty said yesterday.

"These games are fun and if patients are enjoying therapy they are more likely to do it rather than boring old physiotherapy exercises."

Stroke survivors to take part in the national study will be selected from regional centres participating in the early roll-out of the National Broadband Network – including parts of Townsville in Queensland, Armidale in NSW and Willunga in South Australia.

Patients will be monitored by a therapist in Sydney using the high-quality internet video conferencing made possible by the broadband network.

The research will serve as a test case for healthcare delivery over the network and is funded from a $2 million personal donation to NeuRA from NBN Co chief executive Mike Quigley.

Mr Quigley, who had a bone marrow transplant as treatment for leukemia in 1991, said he was "only here today because of medical research".

"I'm passionate about two things – medical research and telecom and this was a great combination of the two," Mr Quigley said.

"And I should say this is just the first of many different applications we see that the NBN could enable for health services."

The NBN's first customers, in Tasmania, will be using the optical fibre-based service within weeks. The research will begin collecting its first results next year when more trial sites are brought online.

"The NBN will get going really during next year, and then it will take quite some years to roll out to the 12 million premises in Australia," Mr Quigley said.

AAP

These games are fun and if patients are enjoying therapy they are more likely to do it rather than boring old physiotherapy exercises

Appendix 4

Research Project - Reducing the risk and incidence of falls in older adults

Background
Falls, and the injuries that often result from them, are a major health issue faced by our community. With the expected increase in the number of people living to an older age, fall-related injury threatens to place significant demands on our public health care system. A recent report commissioned by NSW Health has shown that in 2006/2007, an estimated 507,000 falls occurred in 251,000 people aged 65 and older living in NSW. The number of people in NSW aged 65 and older is estimated to be just over 931,000, which means that around 27% of the older population fell at least once during the 2006/2007 period. While the majority of older people live independently in the community, the 5.6% of older people who live in residential aged care facilities accounted for 10% of all those who fell.

According to the NSW Health report, the total estimated cost of health care associated with medically treated fall injuries in older adults living in NSW during 2006/2007 was $558.5 million. 85% of the overall cost of injuries resulting from falls was spent on hospital admissions. Overall falls in older women accounted for $384.93 million and 15% of the total cost was for falls that occurred in residential aged care settings. The report also shows that the average health care cost of medically treated, fall-related injuries in older people living in NSW was $3906 per fall injury treated. Hospital admissions accounted for the highest average cost at $18,454 versus $369 for non-hospital treatments.

Despite these sobering statistics, research conducted by the Falls and Balance Group at Neuroscience Research Australia has shown that reduction of fall risk and prevention of medical complication resulting from falls is possible. Identification of those older adults who are highly at risk for having a fall is an important first step for fall rate reduction. Professor Stephen Lord and his team have developed and validated a test of falls risk that is capable of predicting older people at risk of falling with 75% sensitivity and specificity in community settings (Lord *et al.,* 2003). The use of the FallScreen® test has been used as a routine assessment in 30 clinical settings within Australia and more than 100 clinical and research sites worldwide, including 12 other countries. However, like many other clinically based assessments, this test is usually only carried out infrequently and in a laboratory setting.

Project and Partnership grant funded research
The research leading to the development of the FallScreen® test has been supported by grant funding from the National Health and Medical Research Council over many years. Of particular relevance are the current NHMRC Partnership Grant “Implementing Falls Prevention Research into Policy and Practice” valued at $3,521,305 and NHMRC Project Grant “Development and validation of a novel, home-based intervention for training stepping ability to reduce the risk of falls in older adults” of $375,625. The Chief Investigators of these research projects are Professor Stephen Lord, A/Professor Jaqueline Close, Dr Stuart Smith, Dr Kim Delbaere and Dr Daina Sturnieks. To date, this research has shown that telehealth technologies can be used to deliver quality healthcare for fall prevention to older adults.

Remote assessment of fall risk and reduction of falls in older adults
In particular, we are exploring ways in which a remote assessment of fall risk could be conducted on a more regular basis in the homes of older adults, making use of broadband delivered web services, video conferencing and motion capture technology. Chief Investigators Delbaere, Smith and Lord (2011) have recently had accepted for publication in the *Journals of Gerontology Series A: Biomedical Sciences and Medical Sciences* results from a study reporting on the development and validation of a measure of fear of falling (Iconographical Falls Efficacy Scale). This research opens the way for regular measurement of falls risk that can be done in the homes of older adults and monitored remotely by clinical staff.

Identification of fall risk in itself is insufficient; it is then very important to put in place a strategy to ensure that the chance of having a fall in high-risk individuals is minimised. As with most things in life, and no more so than in relation to fall prevention, exercise is the key to better health and a reduced risk of falling. Systematic review of randomised control trial studies have demonstrated that exercise, particularly of a kind that challenges the balance control system, can significantly reduce the risk and overall number of falls that occur in older people. However, compliance with exercise routines is also known to be poor.

At Neuroscience Research Australia, we are therefore exploring the use of exercise-based video games, like the Microsoft Kinect, to engage older adults in daily exercise to minimise the risk and incidence of falls in older adults. Retirement villages, aged care facilities and independently living older adults worldwide are exploring the use of video gaming systems for fun, recreation and exercise. Our research is beginning to show that older adults willingly engage in video game play and a camera-based capture video gaming system will enable remote clinicians to deliver targeted exercise and training routines to older adults. Results of our initial studies have been published in the *British Journal of Sports Medicine* (Smith *.,* 2009) and accepted for publication in the *Archives of Physical Medicine and Rehabilitation* (Schoene *et al.,* 2011). These studies show that older adults can, and do, engage in video-game-based exercise interventions that are known to reduce the risk of falls and furthermore, that performance on these video game tasks can be used to track fall risk over time. This ability will be important for remotely tracking the fall risk of older adults such that interventions may be put in place to reduce fall risk.

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Appendix 5

Research Project - Monitoring neuromotor function in Parkinson's disease

Background
Parkinson's disease is the second most common neurodegenerative disorder after Alzheimer's and there are estimated to be some 80,000 Australians living with the disease. Diagnosis can occur at any age, with the most common age of diagnosis being 50-60 years. For individuals living with Parkinson's disease, the functional limitations imposed by their disease contribute to both a restriction of independence and decline in the quality of life.

While anti-Parkinson's medications can be effective in reducing the symptoms of the disease, their reduced efficacy over time leads to considerable fluctuation in function unless treatment options can be appropriately modified. Assessment of disease state typically involves a visit to a patient's neurologist who may prescribe a pharmacological regime to address the motor symptoms observed during assessment. Symptoms are assessed using a subjective rating system called the Unified Parkinson's Disease Rating Scale, or UPDRS. During a typical exam, patients are instructed to perform a series of motor tasks for evaluating symptoms which are observed by the neurologist. However, because patients' symptoms can vary greatly throughout the course of a day, a "one shot" clinical visit cannot adequately capture these fluctuations.

Current research - In home monitoring of Parkinson's disease
Chief Investigators Dr Stuart Smith and Professor Stephen Lord are leading a project "In-home monitoring of neuromotor function in Parkinson's disease" supported by $20,000 funding from Parkinson's NSW.

Patients living in regional, rural or remote Australia may only be able to see their neurologist on infrequent occasions when a clinical visit is made to their regional centre and current assessment of disease progression may occur only once per year or less. To overcome both the subjective nature of UPDRS assessment of Parkinson's disease and the problems of assessment frequency (and cost) imposed by the tyranny of distance, the US-based Kinetics Foundation has developed a self-contained device for objective home-based monitoring of motor control in adults with Parkinson's disease. The device combines several tests of neuromotor function which includes: a tremor watch, a speech analysis routine, a test of fine dexterity and control (pegboard test) as well as finger tapping and reaction time tests.

At Neuroscience Research Australia Dr Smith and Professor Lord are completing a pilot study to evaluate the use of this device in the homes of individuals living with Parkinson's disease in both metropolitan (Sydney) and regional (Coffs Harbour) NSW. Preliminary results have shown that Parkinson's disease patients, particularly those living in regional Australia, over a six month period adhered to daily measurement of their own motor function and enjoy receiving feedback via our internet-based data management system. The daily data can be used to track the efficacy of pharmacological treatment of the disease and better match drug dosage to current disease state.

The next phase of the research will be to combine daily monitoring of motor function in Parkinson's patients living in regional Australia with "one shot" lag-free video consultation sessions with neurologists who are located in metropolitan Sydney. This innovation will enable significant time and cost savings for the delivery of Parkinson's disease (and other neurological) assessment. For patients in regional Australia, it is currently the case that they are required to wait until a neurologist or other specialist visits their community, once a day each or other month. Alternately, patients are required to travel to Sydney or other metropolitan areas for short appointments with their specialists. Video consultation services, which leverage the National Broadband Network, will transform the delivery of neurological services to patient groups living in rural, regional and remote Australia.