Healthcare Innovation Awards entry

The Healthcare Innovation Awards recognise the diverse ways in which innovation and excellence in public health and healthcare is achieved. The six categories, which are aligned to the Victorian Health Plan 2022, honour initiatives and services that demonstrate excellence, innovation and quality.

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<th>Organisation</th>
<th>The Royal Children’s Hospital</th>
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Which Healthcare Innovation Award are you entering?  
Tick one Award

- Optimising the health status of Victorians
- Excellence in supporting self-managed healthcare
- Excellence in person-centred care
- Excellence in quality healthcare
- Excellence in service provision  
  - Y
- Optimising healthcare through e-health and communications technology

Entry title  
The RCH Gait Analysis Laboratory

Has this initiative previously been commended or won a Victorian Public Healthcare Award (Y/N)  
No

The subject of this entry has not been entered into another Awards category  
No

Abstract

Gait analysis is a diagnostic and evaluative service which is used to determine the most effective treatments for children with a wide range of physical disabilities and conditions, affecting the way they walk. The Royal Children’s Hospital (RCH) established the first Australian paediatric Gait Laboratory with clinical outcomes for Victorian children with cerebral palsy now the best by international standards.
Planning and preparation
The most common form of surgery to improve walking in children with cerebral palsy is the lengthening of the Achilles tendons. International evidence in the 1990s showed that Victorian children were experiencing poorer outcomes than those children with access to clinical gait analysis. Most of those who had presented to the hospital with toe walking ended up in the reverse and much worse problem of "crouch gait" - that is walking with their knees and hips sinking downwards. Many were unable to sustain the effort of walking and opted to use wheelchairs instead. It became clear that clinical gait analysis played a major role in solving this particular problem and more generally inform the care and treatment of children with physical disabilities, especially spina bifida and cerebral palsy.

Consistent with the RCH goals of improving children’s health and showing leadership and innovation, the hospital took on the challenge of developing the very first, purpose-built clinical paediatric Gait Laboratory in Australia. With the philanthropic support of the Hugh Williamson Foundation, a fully equipped laboratory with state-of-the-art motion analysis hardware and the latest generation of software was built at the previous RCH site. With the move to the new RCH and drawing upon more than a decade of data and treatment, a new laboratory was designed to extend the service to a broader population, leverage the use of new technology and optimise the research capability of the service.

Objectives
The primary role of the Laboratory is to provide objective assessment of children with physical disabilities impairing their gait which is used to inform medical and surgical treatments. With a strong focus on patient-centred care, the information meticulously gathered in the laboratory supports parents and clinicians in advancing plans for various treatments to improve the gait which may include complex orthopaedic surgeries, rehabilitation programs and many other therapies.

The main cohort of patients is those with cerebral palsy, with approximately 120 new cases seen every year. However, there has been a growing demand from other clinicians to utilise gait analysis to assist a different population of patients. This includes adolescents with hip disease and increasingly children experiencing sports injuries. These new objectives are consistent with the aim to improve health outcomes for children and providing a patient focused approach.

Methods and implementation
Clinical gait analysis requires a multidisciplinary approach between experienced physiotherapists, biomedical engineers, rehabilitation specialists and orthopaedic surgeons.

A clinical gait analysis session for an individual child is led by a senior physiotherapist who works simultaneously with a biomedical engineer who is largely responsible for ensuring reliable data collection processing and generation of relevant reports.

Ensuring reliable reports by standardising each phase of the measurement and assessment process has been integral to success. In areas where appropriate assessments had been developed by other institutions, we have adapted and utilised them. In areas where suitable measurement tools did not exist, the team has undertaken robust clinical research to establish new tools, evaluate their utility and introduce their use locally, nationally and internationally. The team is consistently controlling and improving the accuracy of the measurements it makes. Once the analysis has taken place, physiotherapists, biomedical engineers and medical personnel join together to interpret the data and make treatment recommendations which are implemented by a wide range of medical, surgical and allied health professionals.
Results and outcomes
Clinical gait analysis has opened the way to implement and develop new programs of medical, surgical and rehabilitative technologies for children with a wide range of disabilities. This includes Single Event Multilevel Surgery (SEMLS) where children undergo multiple surgical procedures at one time, spasticity management including selective dorsal rhizotomy (SDR), intrathecal Baclofen (ITB) and multilevel Botox/Phenol programs.

Between 2005 and 2010, the team conducted the world’s first randomised clinical trial of Single Event Multilevel Surgery as a result of clinical gait analysis.

This study was published in the Journal of Bone and Joint Surgery in late 2011. The trial confirms that multilevel surgery, based on clinical gait analysis achieves at least a 50% improvement in walking ability and the overall results are the best yet reported in the world literature. Further follow up of this study has shown improvements gained are maintained at 5 years after surgery.

Many children with spastic diplegia, a form of cerebral palsy commenced their lives walking on their toes but by adolescence, had sunk into severe “crouch gait”. As prevalence is the most useful and clear indicator of the performance of the Laboratory. We consequently conducted a population based study of the prevalence of severe crouch gait since the opening Laboratory in 1995. This landmark study showed that on a population basis, the prevalence of severe crouch gait has been reduced from 25% to an annual rate of 4% or lower. These dramatic figures are being hailed internationally as the strongest proof to date of the ability of clinical gait analysis to transform a service and to improve outcomes for children.

The Laboratory is the first in the world to introduce 3D ultrasound, as a routine measure, to find joint centres more accurately and to monitor the effects of Botox injections on muscles. These innovations are simultaneously making gait analysis more reliable and Botox therapy more effective. The results of a randomised trial of the frequency of Botox injections (once in 12 months versus 3 times in 12 months) suggest that 12 monthly is just as effective as 3 times per year. The advantages of once yearly injections are avoidance of side effects, more streamlined care and cost savings of $4,000 /child/year.

The benefits of clinical gait analysis are now well recognised as evidenced by the number of statewide referrals. The team is also in high demand to teach gait analysis, its interpretation, and the surgical techniques and rehabilitation strategies to achieve these outstanding results.

Status and sustainability
There are now highly trained clinical staff across the RCH integral to high-quality clinical gait analysis, including physiotherapy, biomedical engineering, developmental medicine, rehabilitation medicine and orthopaedic surgery. Demand for the service remains strong throughout Victoria and the RCH Gait Laboratory also cares for children from Tasmania and receives referrals from other states and overseas.

The first generation of new therapies (multilevel surgery, multilevel Botox and selective dorsal rhizotomy) have been evaluated and imbedded in clinical practice through the Laboratory’s services. However, exciting developments continue to be made both in the refinements of existing treatments and introduction of new therapies.

Budget
The service is supported by the Victorian Department of Health, Murdoch Childrens Research Institute, Hugh Williamson Foundation, RCG Foundation and National Health and Medical Research Council of Australia Clinical Centre of Research Excellence in Gait Rehabilitation.

**Achieving excellence in health**

The first research initiative of the Laboratory was an assessment of children with cerebral palsy who had received surgery to assist their walking abilities, in the 1980’s, the decade prior to the opening of the RCH Gait Laboratory. A landmark study was published (Borton et al 2001) and concluded that orthopaedic surgery for children with cerebral palsy based purely on watching children walk and clinical examination was at best unhelpful and in many cases harmful.

Cerebral palsy is one of the most common conditions seen in the RCH Gait Laboratory and affects approximately 120 Victorian children annually. Its prevalence is not decreasing and the majority of children will have difficulties walking and performing other physical activities. Most will be referred at some stage to the Laboratory for assessment. Other conditions such as spina bifida are now rapidly declining and fewer children are seen. However, because of the tertiary nature of services provided at RCH, children with much less common disorders are also increasingly referred.

Since the landmark Borton study\(^1\), the publication of the Laboratory’s world’s first randomised clinical trial of multilevel surgery for children with cerebral palsy, it has been shown they now enjoy clinical outcomes which are the best published in the literature to date, ensuring the very best outcomes for Victorian children.
Referees

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Gait papers


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Functional Mobility Scale Papers

   
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Movement Analysis Profile and Gait Profile Score


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