



Institute of Actuaries of Australia

# Models of Care - What is best practice and what is achievable

*Prepared by David Bowen, Gaye Britt, Lorraine Mackin*

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The Institute of Actuaries of Australia  
Level 7 Challis House 4 Martin Place  
Sydney NSW Australia 2000  
Telephone: +61 (0) 2 9233 3466 Facsimile: +61 (0) 2 9233 3446  
Email: [actuaries@actuaries.asn.au](mailto:actuaries@actuaries.asn.au) Website: [www.actuaries.asn.au](http://www.actuaries.asn.au)

## 1. INTRODUCTION

Compensation schemes that provide no-fault benefits and periodic payment of medical and care services for people with serious injury are major purchasers of care and services. For a person with catastrophic neurological injury, the compensation scheme will fund all elements of care from the point of injury through to a person's return to the community. Many of these people will not return to full function, and so the compensation scheme will fund the lifetime care of the person.

The most significant lifetime care cost for a compensation scheme is the long term care costs of the catastrophically injured person. The extent of these costs is shaped by the degree a person is able to self manage and live independently in the community. Medical and rehabilitation services have a role in influencing these outcomes.

However, the current system is fragmented, medically focused, variable and elements of it are not behaving in ways that support the delivery of optimal outcomes. This can affect a person's recovery and the therefore a person's support needs when returned to the community. Additionally, the system tends to be one size fits all, and there is limited capacity of a compensation scheme to purchase services that can be delivered in a way so they will maximise outcomes.

A project was undertaken to both validate and respond to these views. The project examined current arrangements in the delivery of services, researched national and international practice in the delivery of services for catastrophic neurological injury, and described a model for delivering improved services.

This paper describes:

- An overview of the health system in Australia and a model for understanding this system
- The role of the Lifetime Care and Support Authority (LTCSA) in providing lifetime care to people with catastrophic neurological injury
- The cost of providing care and support to neuro-trauma claimants
- How medical and rehabilitation services impact on lifetime care costs
- An overview of the project to validate views and provide a response to the issues experienced in the current system
- Project findings – a consensus on the problem
- A model for an improved system of care
- Investing in a health system that will deliver improved outcomes.

## 2. APPLICATION OF MODELS OF CARE TO THE AUSTRALIAN HEALTH SYSTEM

Australia's national public health insurance scheme, Medicare, provides universal health coverage for its population. The public system is complemented by a private health system and publicly administered compensation schemes.

However, the system and the many components that make up the system are operating sub-optimally. Based on an international survey of seven countries on health expenditure, statistics on mortality and life expectancy, and the perceptions of patients and physicians of different aspects of care, Australia's health system is performing relatively well in the areas of its population having long and productive lives, relatively low spending per capita, and patient and physician perceptions on the effectiveness of care. However, issues of access to care and safety of care (e.g. medical mistakes and medication and diagnostic errors) are reported as being more prevalent in the Australian health system than in health systems in other jurisdictions. Co-ordination of care in Australia was seen as average (see Figure 1).

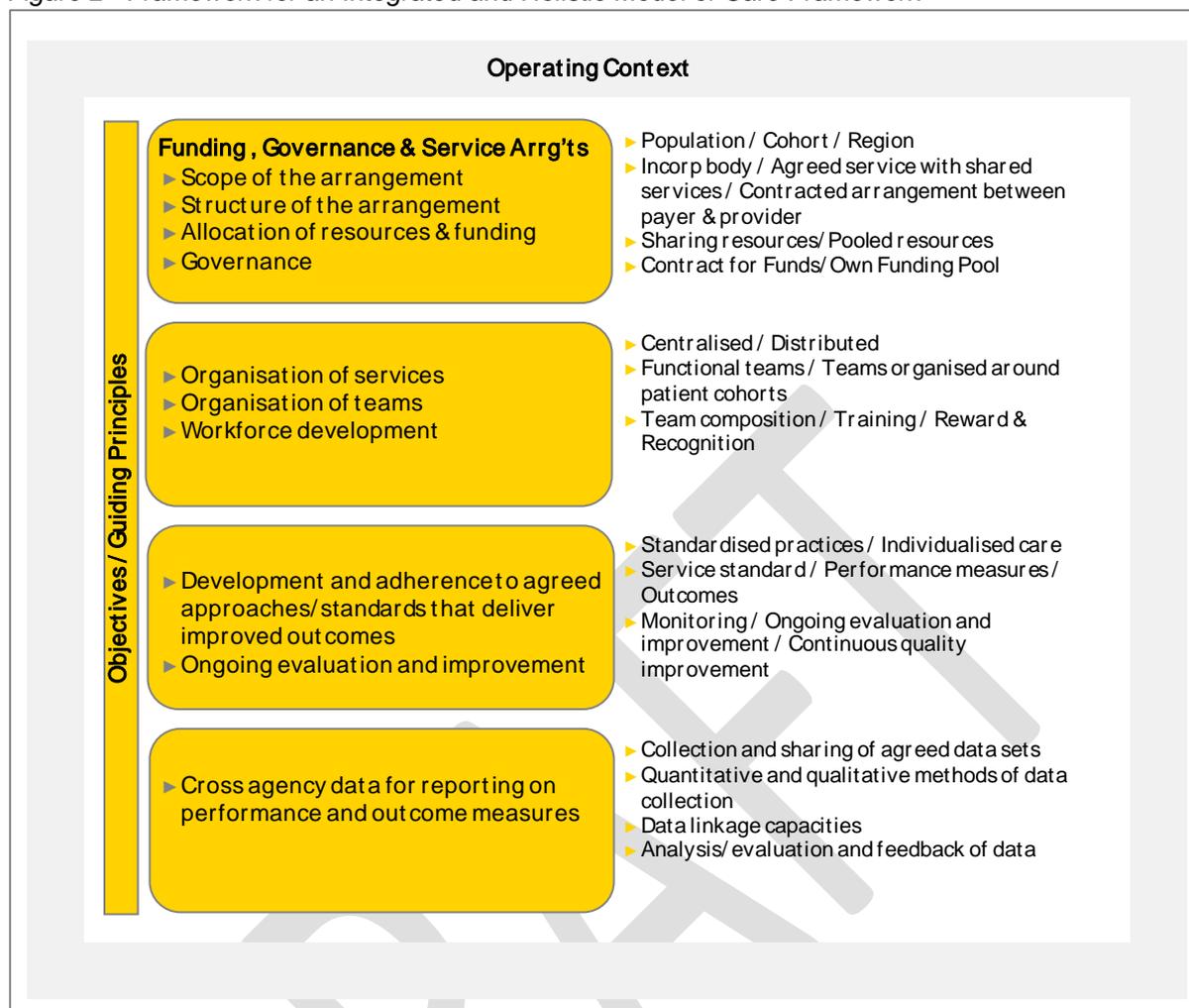
Figure 1 –Overall Rankings of Commonwealth Fund of International Survey of Health Services (2010)

Commonwealth Health Fund International Survey of Health Services (2010)								
Country Rankings		AUS	CAN	GER	NETH	NZ	UK	US
	1.00–2.33							
	2.34–4.66							
	4.67–7.00							
OVERALL RANKING (2010)		3	6	4	1	5	2	7
Quality Care		4	7	5	2	1	3	6
Effective Care		2	7	6	3	5	1	4
Safe Care		6	5	3	1	4	2	7
Coordinated Care		4	5	7	2	1	3	6
Patient-Centered Care		2	5	3	6	1	7	4
Access		6.5	5	3	1	4	2	6.5
Cost-Related Problem		6	3.5	3.5	2	5	1	7
Timeliness of Care		6	7	2	1	3	4	5
Efficiency		2	6	5	3	4	1	7
Equity		4	5	3	1	6	2	7
Long, Healthy, Productive Lives		1	2	3	4	5	6	7
Health Expenditures/Capita, 2007		\$3,357	\$3,895	\$3,588	\$3,837*	\$2,454	\$2,992	\$7,290

**Method:** International survey of seven countries on health expenditure, statistics on mortality and life expectancy, and patient and physician perceptions to specific questions relating to quality and access to care.  
**Source:** K. Davis, C. Schoen, and K Strmiki, *Mirror, Mirror on the Wall: How the Performance of the U.S. Health Care System Compares Internationally 2010 Update*, The Commonwealth Fund, June 2010.

An optimal health system requires a model of care whose many components are aligned to achieving desired outcomes within its operating context. The system can be shaped by utilising levers in the model of care so different outcomes can be attained (see Figure 2).

Figure 2 –Framework for an Integrated and Holistic Model of Care Framework



Examples of some recent initiatives to drive change within Australia's health system are:

- Pooled funding models for specific populations (e.g. Sunrise Health Service Aboriginal Corporation)
- Output funding models, such as activity based funding
- Specific purpose services with agreed arrangements with other services (e.g. Victorian State Trauma System)
- Orienting care around the needs of a patient through the placement and arrangement of services, skills and team arrangements of care givers, and the use of data and technology.

These mechanisms exist in recognition that optimal care needs to be considered broadly in terms of the outcomes to be achieved. Achieving outcomes requires teaming of different participants, including the consumer themselves. It also requires recognition that a one size linear system will not deliver optimal outcomes for all consumers, as factors that affect a person's recovery are often much broader than the presenting medical condition, and services need to be arranged to acknowledge and support these differences.

### **3. THE LIFETIME CARE AND SUPPORT AUTHORITY**

In NSW, the Lifetime Care and Support Scheme (LTCSS) was established in 2006 to provide medical rehabilitation, care and support services to people catastrophically injured in motor vehicle accidents. As at the end of September 2011 it has over 600 participants of whom 99% have a traumatic brain injury (TBI) or spinal cord injury (SCI).

On average 35 people enter the scheme each year with a spinal cord injury. In NSW this represents about 40% of all spinal cord injury by incidence and around 45% by cost due to higher severity from motor vehicle accidents.

On average 115 people enter the scheme with a traumatic brain injury. In NSW this represents about 50% of those with a TBI and around 55% by costs, again due to higher severity injury from motor vehicle accidents.

This makes the LTCSA a major purchaser of health and rehabilitation services for TBI and SCI.

A core recommendation of the recently released Productivity Commission report investigating the feasibility of a national disability care and support scheme includes the establishment of a National Injury Insurance Scheme (NIIS) that would provide lifetime care and support coverage across all injury causes. In NSW this scheme would represent an expanded version of LTCSA and become the sole payer for all neuro-trauma services in the State.

#### 4. WHAT ARE THE COSTS IN LTCSS

The liabilities associated with lifetime care and support consists primarily of the cost of medical rehabilitation and overwhelmingly long term care. For an annual cohort in the NSW scheme the breakdown between, medical, rehabilitation and care is as follows:

Table 1 - Annual Incurred Cost 2011

Benefit type	Inflated and Discounted (\$'000)/%	
Medical	17,039	5.1%
Rehabilitation	18,958	5.7%
Attendant Care	296,489	89.2%
Total	332.486	100%

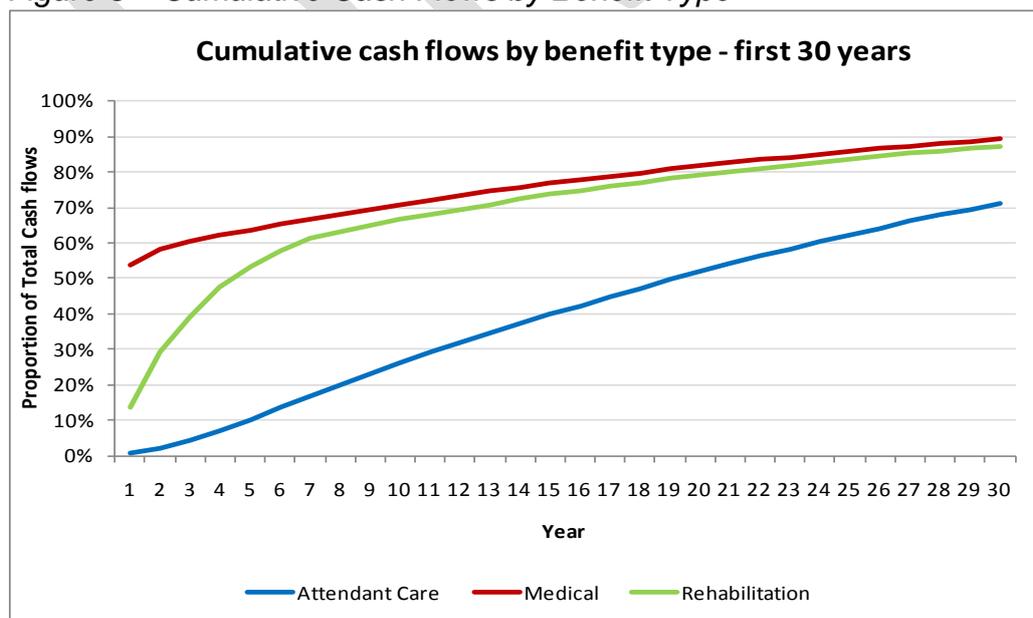
Source; PWC Actuarial valuation

The medical costs include pre-hospital; retrieval; surgical; acute care, including Intensive Care Unit (ICU), and specialist services. Much of this is paid under a bulk billing arrangement with NSW Health.

Rehabilitation includes the cost of services provided in specialist rehabilitation units, as well as community rehabilitation programs. However as attendant care workers are involved in a participant's rehabilitation program assisting the person to meet rehabilitation goals, a proportion of attendant care costs, at least in early stage post discharge from a rehabilitation unit would be on delivery of rehabilitation services.

However in terms of the payment profile, the medical and rehabilitation costs are primarily front end loaded as demonstrated when looking at the cumulative cash flow by benefit type. By ensuring optimal care is delivered during the acute care and rehabilitation stages, there is an opportunity to reduce longer term care costs and for patients to enjoy superior long term outcomes.

Figure 3 – Cumulative Cash Flows by Benefit Type



## **5. HOW MEDICAL AND REHABILITATION SERVICES IMPACT ON CARE COSTS**

The experience of the LTCSA over the first five years of operation led to four conclusions.

1. The quality of medical services can influence level of recovery and therefore the person's support needs when returned to the community. There are too many examples of failure to properly diagnose, in particular a failure to make a timely diagnosis on brain injury, often in disregard of protocols for treatment of head injury. There are also examples of sub-optimal treatment.
2. The medical and rehabilitation services are disjointed working in independent silos in which the 'outcome' is a handover to the next service. There is no continuum of care for the patient and services are output rather than outcome driven.
3. The rehabilitation system is focussed on maximum medical improvement and is linear moving a person towards a medical discharge rather than focusing on what drives a person's ability to self manage and live as independently as possible in the community.
4. The payment system involves a number of administrative layers that removes the connection between the LTCSA as purchaser of services and the area of the health services that provide service. This limits the capacity to purchase flexible or innovative service. It tends to be one-size fits all.

As a consequence, the catastrophically injured are not receiving the care they need for optimal recovery, and the care is being delivered inefficiently. These views required both validation and a response, and a project was undertaken to:

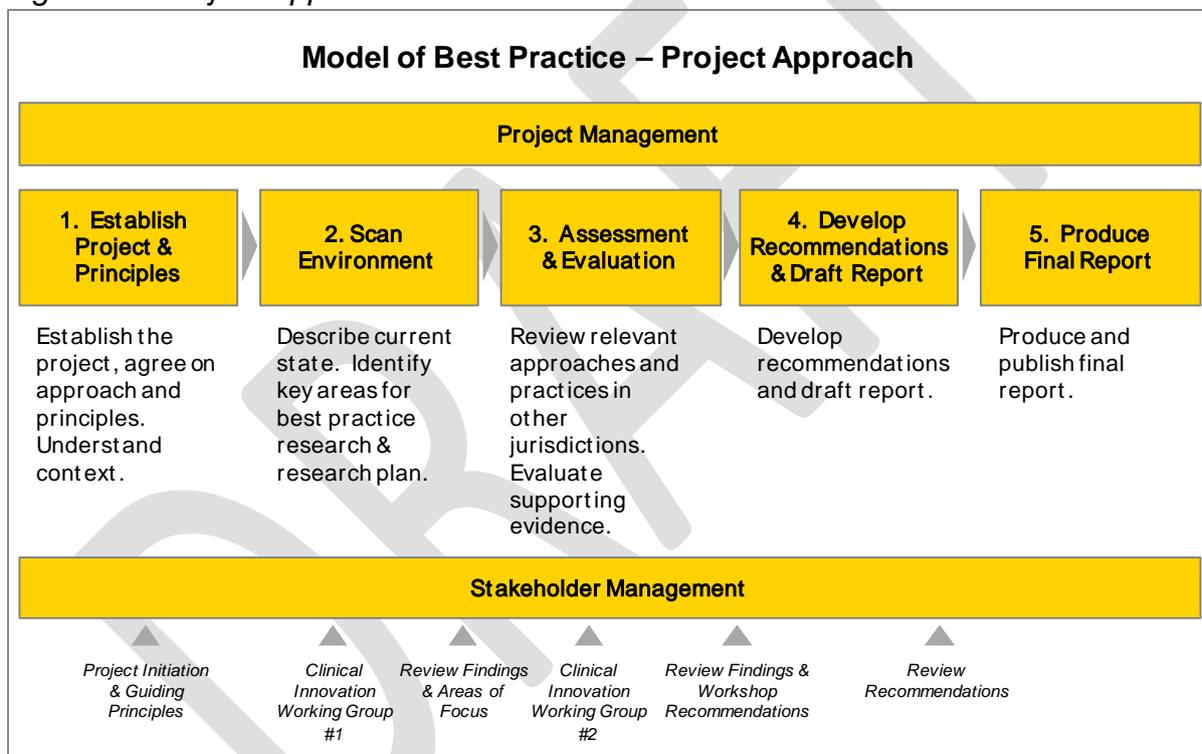
- Examine current arrangements for the delivery of medical and rehabilitation services
- Research national and international practice in the delivery of services for neuro-trauma
- Describe a model for delivering improved services for people with catastrophic neurological injury.

## 6. APPROACH TO UNDERSTAND AND RESPOND TO CURRENT SYSTEM ISSUES

A project was undertaken to describe current services and funding arrangements from retrieval and pre-hospital care through to community reintegration. National and international best practice was reviewed to inform recommendations on how to improve the delivery of improved services for catastrophic neurological injury in NSW.

The project was conducted over a period of 12 weeks. Paul Barach was the clinical consultant on the project and co-authored the report. The project included 28 interviews with key informants, 5 workshops (3 Project Reference Groups and 2 Clinical Innovation Working Groups), review of more than 30 organisations and practices, and a critical review of more than 50 studies and research. An overview of the project is shown below.

Figure 4 – Project Approach



The project included two critical groups:

1. Project Reference Group – A group was formed to confirm the principles, review, initial and detailed assessment findings, and relevant best practices, and to provide feedback on the recommendations. The group included:
  - *David Bowen*: CEO, LTCSA
  - *Suzanne Lulham*: Director of Service Delivery, LTCSA
  - *Peter Clark*: Intensivist Westmead Hospital, Supervisor of Training Care Flight, Clinical Director Institute for Trauma & Injury Management

- *Adeline Hodgkinson*:- Director, Brain Injury Rehabilitation Unit, Liverpool Hospital, Chair Brain Injury Rehabilitation Network, Agency for Clinical Innovation
- *James Middleton*:- Associate Professor Rehabilitation Studies Unit, School of Medicine University of Sydney, Director State Spinal Cord Injury Service
- *Paul Middleton*:- Clinical Associate Professor Discipline of Emergency Medicine Sydney Medical School University of Sydney, Director of Research and Medical Director Ambulance Service of NSW.

2. Clinical Innovation Working Group – A Clinical Innovation Working Group consisting of clinicians in the areas of medical and rehabilitation met twice during the project to articulate key issues in the current model of care, and to discuss ways this can be addressed.

Agreed principles were used to assess the effectiveness of the existing model of care and researched best practices, and to guide the development of the recommended model. These principles include:

- Patient safety
- Consumer participation and centredness in the care process
- Appropriateness of care delivered
- Equitable access to care and services
- Effectiveness of care and services in delivering optimal outcomes
- Efficiency of care and services in delivering outcomes
- The focus of care and services in achieving optimal outcomes.

## 7. A CONSENSUS ON THE PROBLEM

There are on average 2,200 people in NSW injured with an Injury Severity Score (ISS) > 15 per year. Between 85% and 90% these people will survive the injury. Of those that survive, many will have a catastrophic neurological injury requiring lifetime care. Catastrophic neurological injury predominately affects males and the incidence of injury is most frequent in the 15 – 24 year age group.

The lifetime cost per incident of catastrophic injury is substantial. Access Economics estimates the lifetime cost of quadriplegia is \$9.5million per case, for paraplegia it is \$5 million. The lifetime cost per incident of severe traumatic brain injury is estimated to be \$4.8 million, and \$2.5 million for moderate brain injury. The majority of these costs are borne by the State Government and by individuals.

Services for people with catastrophic injury extend across the continuum of health care. The continuum includes pre-hospital care, acute care and management, sub-acute care and management, and community reintegration and ongoing care.

In summary, we found that the current system is inadequate for delivering optimal outcomes to the individual or to the economy as a whole as:

- Funding is short term focused, based on a provision of a particular service, and not related to longer term outcomes
- There is variability in the services and care delivered, and the focus of care is narrow and does not necessarily deliver optimal outcomes for patients
- There are disconnects and inconsistencies within the system that means there are inefficiencies and differences in access and care received by patients
- Data about how well the system is performing is difficult to obtain as usually there is only information on specific inputs and this is administratively focused and insufficient for understanding system performance and outcomes – In other words whether the care the patient has received is effective.

For each element of the system, the main issues and challenges are as follows:

1. **Funding, Governance and Service Arrangements:** Services are fragmented across the continuum of care. They are episodic and segregated by organisational boundaries. Aligning this system to delivering high quality lifelong outcomes requires substantial navigation and negotiation by both the participants and those delivering care and support. Across the system, there is a lack of clarity/accountability concerning how funds are used. Agreed standards and performance measures concerning the delivery and effectiveness of a service are limited.
2. **Organisation Arrangements:** The organisation arrangements for the delivery of care are generally narrowly focused, don't fully support development of competencies, and are fragmented. In particular:
  - Delivery of acute services is arranged across several major trauma centres. The consequences are this arrangement disperses key competencies, impedes learning and improvement, and so impedes the skills and experience of the system and the people in the system to deliver optimal care for patients

- Specialist trauma training is described as insufficient and is not as expansive as other jurisdictions and specialties
- Care tends to be organised around a narrowly focused episode rather than an end to end journey. This means there is a lack of continuity as the patient moves across the continuum of care
- Services in the community are fragmented and inadequate. This is causing blockages within the inpatient facilities and limits access for patients requiring inpatient care.

3. **Processes:** The two main issues are:

- There is variability and differences in services and practices at each stage of care. Where standards and protocols do exist, there is a lack of robust process to monitor compliance and to systematically revise protocols and standards
- The system is linear and applies a “one size fits all” paradigm of care. It tends to lose focus on lifetime outcomes, and doesn’t easily permit entry and access according to the needs of different patients.

4. **Data & Outcomes:** There is a lack of evidence and information relating to the optimal way to provide care and services to neurologically injured patients. Data that does exist tends to be limited to a particular organisation, is administratively focused, and is insufficient for understanding system performance and outcomes. There are also inadequate process and governance arrangements for seeing the findings from research implemented into practice.

These factors affect individuals, their families and the system as a whole. For example:

- Research suggests that the severity of a spinal injury can be improved if surgery is received within 24 hours. This requires faster response than older studies that suggest surgical intervention within 72 hours. If surgery within 24 hours is being followed in some units, but not others, is this resulting in variable outcomes for patients?
- Discussions with case workers of clients with catastrophic neurological injury have pointed out there are many contextual factors that contribute to their care. Many of these (such as alcohol/drug use, troubled family life, and mental health issues) exist prior to the incident, and remain with the person post injury. These factors increase the complexity of care for these people and can affect the longer term outcomes, in terms of their participation in society and the cost of their care. This can be seen by difficulties reintegrating the person into the community, neglect in self care (therefore, higher number of admissions for pressure sores etc), and high demands on the system. Taking a broader approach in terms of involving allied health staff earlier in the patient’s care may provide the opportunity to address some of these issues in the inpatient setting.
- There are too few options for places where patients in sub-acute inpatient care can be discharged. For example, there are no transitional/step down facilities for patients that are physically and functionally stable, but have poor

mobility or are unable to attend to their own personal care. These patients often stay in rehabilitation until appropriate accommodation is found. Delays finding accommodation (e.g. family home is unsuitable) results in the patient taking a rehabilitation bed. Also, not having transitional/step down facilities for these patients, means there is a lost opportunity to monitor behaviour, educate family/carers, and to integrate patients into the community.

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## **8. AN IMPROVED SYSTEM OF CARE**

The key imperatives for improving the current system of care are:

1. Develop, specialise and concentrate SCI and TBI skills and services.
2. Improve lifetime outcomes by:
  - i. Earlier intervention during pre-hospital, acute, and rehabilitation stages of care
  - ii. Broadening the definition of care during the acute and sub-acute , and broadening the focus during these earlier stages
  - iii. Providing further facilities/services for specific care needs in the community.
3. Develop funding, governance, and service arrangements to drive the standard of care and services delivered, and support increased accountability of the service and system providers.
4. Develop a system that provides evidence for best practice, and enables data to be captured so outcomes can be analysed and practices continuously improved.

An integrated model of care is described based on research and review of practice both locally and in other jurisdictions, and is designed to support these imperatives and to address the issues described earlier. The model is shown in Figure 5 on the next page.

Figure 5 – Integrated Model of Care for Neuro-Trauma



## 9. CONCLUSION – INVESTMENT IN AN IMPROVED SYSTEM FOR NEURO-TRAUMA

The LTCSA is a major funder of neuro-trauma services in NSW. The Authority has an interest in improving the system to deliver better outcomes for scheme participants. The Authority also has responsibility to prudentially manage the scheme to ensure that funds are available to meet lifelong expenses.

Bringing these two aspects requires the Authority to move from a funding model to an **investment** model.

The investment in the neuro-trauma system will be about system improvement and change. Thus the first focus is upon creating a single system to achieve benefits from co-ordinated care and cross-disciplinary learning. The main areas of investment will therefore be:

- Targeted interventions to improve service delivery and individual functional outcomes across the care continuum
- Improvements in cross disciplinary learning
- A recognition that acute and rehabilitation services must be integrated into life planning
- A new model for rehabilitation services.

Some examples will demonstrate the opportunities for investment in both research and service improvement.

### **Pre-hospital**

#### *HIRT*

In NSW the MAA funded the Head Injury Retrieval Trial which is a random controlled trial to examine the impact on functional capacity of people with a head injury from providing quick and expert on site services through an aero medical retrieval service. The study has been completed and results are expected shortly. Part of the evaluation is to compare the lifetime care cost of each cohort using the LTCSA life cost estimator. If this trial meets the hypothesis then it will provide the basis for LTCSA to fund the severe trauma component of a roll out of a rapid response aero-medical service.

#### *On-site diagnosis*

The LTCSA is currently examining the feasibility of becoming a funding partner in use of near infrared spectroscopy as an on-site tool for early identification of a haematoma which would change the protocol and timing for delivery of a head injury patient direct to surgery.

## **Acute care**

### *SCI acute pathways review*

The LTCSA is currently examining becoming a funding partner in a project looking at treatment of spinal cord injury. This project will examine timeliness of access and quality of care, rate limiting steps and decision-making processes along the early care pathway from scene of injury to definitive treatment in a specialised Spinal Cord Injury Unit, and resultant health outcomes following traumatic spinal cord injury. The primary hypothesis being tested is that early access to definitive care (within 24 hours of injury) will reduce morbidity, reduce hospital lengths of stay and costs, and improve health-related quality of life. This is a multi-state project and involves health practitioners along the care continuum.

### *Early surgical intervention*

The LTCSA has been examining the results of a program undertaken by Michael Fehlings from the University of Toronto providing early surgical intervention for spinal cord injury (within 24 hours of injury) which is showing some promising results in increasing functionality following spinal cord injury.

## **Rehabilitation**

There is general acceptance amongst rehabilitation physicians in NSW that a new model is needed. The key elements are:

- Flexibility in delivery that is individualised to the person and their goals.
- A wider view of the elements of rehabilitation to focus on return to the community not just medical recovery.
- Specialised services for those with very high care needs.

For the LTCSA the opportunity is to use knowledge about what factors over and above the injury limit scheme participant in maximising return to the community so that these can be addressed through active rehabilitation. The following examples illustrate this approach.

### *Family Resilience*

Family support is critical after injury, yet many families are left feeling unable to cope. The LTCSA funded a pilot program conducted by Graeme Simpson from the University of Sydney aiming to build resilience in families of people with a recent spinal cord injury. This has been so successful that the Authority will extend this to a State wide family support program.

### *SCI In-Voc Project*

Return to employment is a critical consideration. The Authority has recently commenced the in-voc program based on the ACC kaleidoscope project. It is a vocational program that commences in and is supported by the spinal cord injury rehabilitation units. The Authority is now developing a similar program for people with brain injury.

*TBI Slow recovery rehabilitation*

Intense community based rehabilitation for participants with severe brain injury has shown continued improved in functional ability for people who were previously consigned to nursing homes. The Authority has concluded that this warrants a development of a specialised slow recovery program which is being developed.

*Neuro-behavioural program*

The needs of people with significant behavioural problems following brain injury are not well dealt with in NSW. The Authority is in discussion with Royal Rehabilitation Centre to introduce a residential neuro-behavioural program.

The importance of these examples are not to illustrate good ideas or show off funding initiatives but in every case are framed around an investment in improving individual outcomes. This is what compensation schemes can bring to health services.

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