Serious traumatic brain injury project brief

Aim of project

The purpose of the project is to develop national consistency in the acute management of serious traumatic brain injury (sTBI) (isolated or complex) patients that reduces mortality and secondary injury morbidity regardless of location of injury.

Rationale for project

Traumatic brain injury (TBI) can be broadly defined as an alteration in brain function, or other evidence of brain pathology caused by an external force (Menon et al 2010). This definition acknowledges the limitation of using clinical examination as the exclusive determinant for delineation of brain injury. Identification of patients who will benefit from specialist intervention therefore requires a coordinated regional approach focused on detailed clinical triage, early imaging and rapid transportation to appropriate expertise.

Analyses of data from the New Zealand Trauma Registry (NZTR)[1] estimate 35 percent (approx 700–800 per year) of all major trauma experienced in New Zealand have an associated sTBI. Early analysis of this data suggests there is some variation by population, geography and destination hospital. This variation is likely driven by a combination of diagnostic, prognostic and system factors and may present barriers to accessing the right care in the right place at the right time following serious injury. Such variation is not well understood and may have consequences for use of health care services and costs of care, and impact patients' and whānau long-term recovery. Managing variation in this population would offer significant improvement at a national level. It may also present opportunities for empowering local or regional approaches to be tested.

When considering isolated sTBIs, more than half (53 percent), are isolated AIS 3[2] head injuries that would not otherwise qualify as major trauma.[3] This includes approximately 800 additional patients per year who may benefit from managing this variation. As such, we propose including isolated and complex sTBIs with an AIS score ≥ 3.

Survivors of sTBI, particularly after more severe injury, frequently face multiple physical, cognitive, emotional and neurobehavioural problems, which can have long-term and far-reaching consequences. These include an increased all-cause mortality, loss of independence and employment, relationship breakdown, social isolation, mental illness, addiction and homelessness (Li et al 2021).

[1] New Zealand Trauma Registry (NZTR) only holds data on trauma that crosses a threshold of severity (injury severity score [ISS] > 12), therefore not all or perhaps even most sTBIs are recorded in it. The ISS is calculated from squaring maximum AIS severity scores from up to three body regions, with the threshold requiring at least one AIS 3 and one AIS 2 injury in different body regions, or one AIS 4 injury.

[2] The Abbreviated Injury Scale (AIS) is an anatomically based injury severity scoring system that classifies each injury by body region on a six-point scale. AIS is the system used to determine the injury severity score (ISS) of the multiply injured patient. A score of 3 is considered serious.

[3] Recognising a number of moderately severe isolated TBI (AIS=3) were not included in NZTR analyses, we used the New South Wales Institute of Trauma and Injury Management (NSWITIM) Mapping Tool to estimate incidence of sTBI, with AIS=3, over the last three years.

In New Zealand, for the most severe injuries, destination protocols are well established. However, there is a cohort of moderate sTBI patients that may be susceptible to variations in care across the country. For individual cases, the term ‘moderate’ is a grey area where differentiation of symptoms and injury severity are difficult to ascertain. Mortality for patients with moderate TBI is reported at a rate of up to 15 percent (Godoy et al 2016) where 75 percent of those deaths occur in patients with an initial Glasgow Coma Scale (GCS) of 9–10 (Dixon et al 2020). However, there are known limitations when using GCS to classify TBI including difficulty of use, inconsistent application by providers and confounding patient factors such as age-related cognitive decline, intoxication, drugs and polytrauma injuries. Additionally, GCS is symptom based and has poor correlation with specific intracranial pathology (Dixon et al 2020; Godoy et al 2016).

In these cases, the lack of a formal TBI care pathway means the majority of acute TBI patients not requiring critical or neurosurgical care are initially seen by clinicians who are not trained in the diagnosis and management of consequences at the level of pathology and neurological impairment. These patients often find themselves scattered throughout a hospital under various specialties (eg, orthopaedics, general surgery, internal medicine or care of the elderly), and may be discharged without specialist input or follow-up (Li et al 2021).

Models of care are emerging that aspire to improve patient outcomes, reduce societal impact of sTBI and generate cost savings. Such models are exploring the use of a neuroscience-led acute sTBI pathway which may be helpful in New Zealand. Further, a better understanding of health service delivery models and areas for change, including the use of technology and telehealth, may improve equitable access to health care (Keeves et al 2021).

The identification of a larger number of isolated moderate and potentially severe sTBI presents a challenge specific to identification and early management of injury. A specific pathway for sTBI could focus clinical attention, improve patient flow and outcomes, increase cohesion of the care pathway, reduce the cost of preventable disability and length of stay in acute beds, avoid disruption of the overall function of a trauma service and release acute neurosurgical beds for patients with other pathologies. Given the principle of early and appropriate care for sTBI patients, the project team wants to ensure sTBI patients have their brain injuries identified rapidly, are transported to the right facility for their immediate care and have seamless transitions into appropriate rehabilitation.

In addition, there are no consensus-based quality indicators specific for the treatment of adult patients with TBI (Huijben et al 2019). We want to be able to measure the most valuable areas for improvement. It’s also important to use measurement so we are confident the changes being made are resulting in an improvement. As such it may be helpful for this project to identify what measures may best support this conversation over time.

This project brief highlights some of the early considerations of the National Trauma Network and the Health Quality & Safety Commission. These insights are merely to foster a meaningful conversation with an expert advisory group (EAG) to be formed to influence, inform and guide a national quality improvement programme for sTBI identification, acute management and early rehabilitation.

Right diagnosis → targeted management → effective rehabilitation → better long-term life quality

Project objectives

- Identify opportunities for improvement in identification and rapid transportation and/or transfer of sTBI patients to most appropriate facility.
- Achieve national equity in access to acute specialist intervention and standardised management pathway for sTBI.
- Optimise early recovery through a consistent rehabilitation plan that offers equitable transitions in care for all sTBI patients and whānau.
- Develop a suite of national measures that support the ongoing measurement and management of sTBI.

Out of scope

- Given the confounding effect that age-related cognitive decline may have on a reliable GCS assessment, people aged ≥ 70 years with isolated or complex sTBI will be excluded from this project (see Figure 1 for volume of isolated sTBI in older persons).
- With the well-defined pathways in place for paediatric patients, we propose excluding patients ≤ 19 years with isolated or complex sTBI.
- The management of mild sTBI for quality improvement presents a significant challenge with respect to volume of patients. As a result, patients with mild sTBI will be excluded.

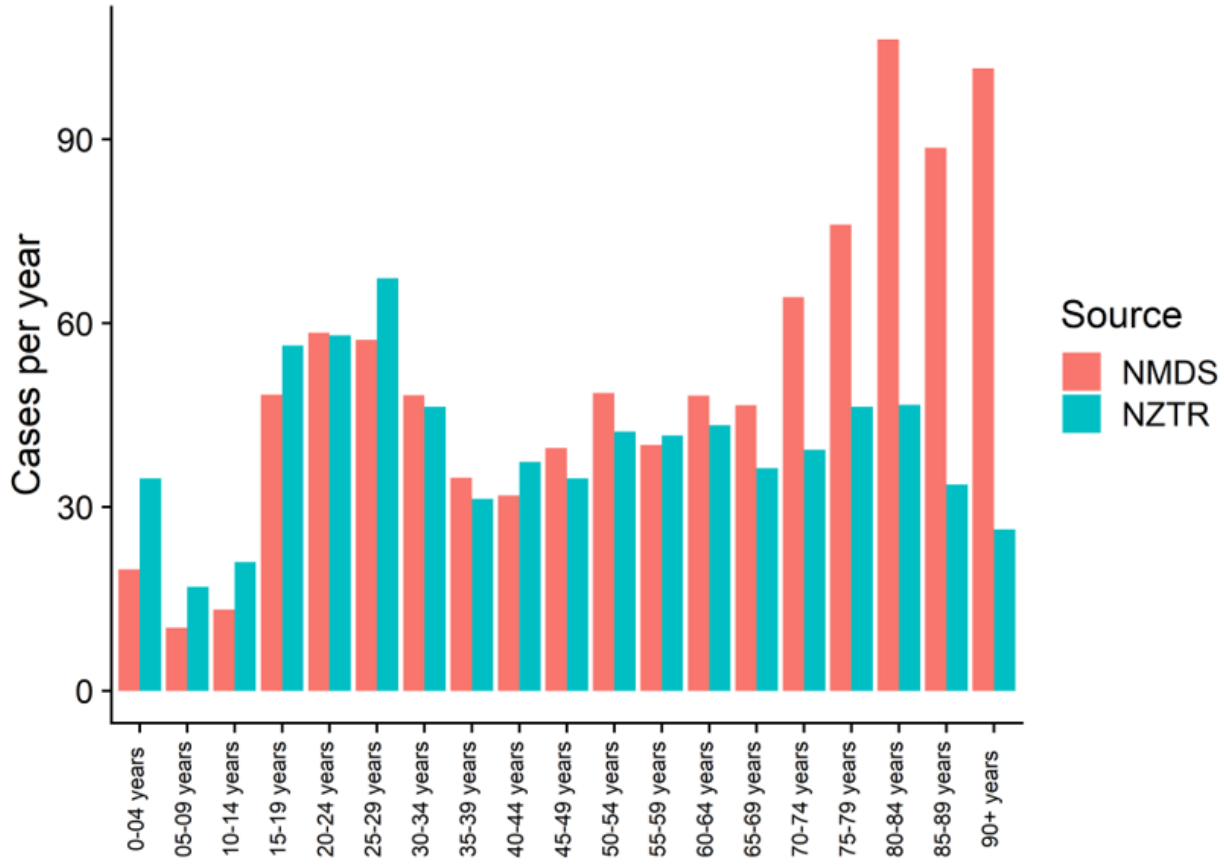

Figure 1. Annualised case volume of major trauma sTBI from the NZTR and estimated from NMDS using NSW ITIM Mapping Tool and corrected for mapping estimates of AIS scores. Estimates are stratified by age, with corrections calculated separately for each age bin. Data sources: NZTR and NMDS 2017/18–2019/20.

Approach

We propose adopting quality improvement methods that will support problem identification, design and testing of solutions and dissemination of new knowledge that will support the implementation of an enhanced model of care and management pathway for sTBI in New Zealand.

Initially, we propose focusing our attention on three distinct but inter-connected workstreams:

1. Identification of sTBI
    a. hospital identification and rapid transport to nearest appropriate facility
    b. early head CT and planning for specialist intervention.
2. Acute specialist intervention
    a. equity for acute specialist intervention
    b. Interhospital transfer from receiving hospital to specialist hospital
    c. intensive care admissions to neuroscience and non-neuroscience centre
    d. neurosurgical intervention
    e. acute neuroscience delivery in non-neuroscience centres.
3. Recovery
    a. equity for services central to optimal recovery
    b. identification of all patients with sTBI
    c. defined local plans for optimal recovery
    d. smooth and consistent pathway from acute management to rehabilitation
    e. early and intensive in-patient rehabilitation delivery, including both neuroscience and non-neuroscience centres.

Delivering improvement on a national scale will take time and effort. Most often, national improvements are seen by undertaking smaller, local or regional projects where shared learning enables adoption of the most promising practices across the country. Essentially, we can be confident we are adopting only those changes that result in an improvement. The EAG will be required to take an active and engaged leadership role in their local projects and share their learning/experiences nationally.

To facilitate this, the Commission can support a number of approaches, including the following:

1. National sTBI collaborative
    a. Local teams will be supported by Commission quality improvement advisors to identify, scope and deliver improvement projects. Learning from across the country can be pooled to support new processes to be implemented nationally.
    b. Local quality improvement facilitators will be trained, in parallel, to support their respective projects through a training programme offered by the Commission.
    c. Advantages:
        i. All team members will be exposed to quality improvement projects and processes.
        ii. Time and space will be created by local leadership for teams to undertake an improvement project.
        iii. The project EAG can choose topics of national importance across each of the workstreams.
        iv. National guidelines/resources can be generated from the shared learning across all improvement projects.

d. Assumptions:
    i. Projects will likely require working across facilities or organisations, so leadership engagement will be essential.
    ii. The project EAG will need to prioritise workstreams and be active champions in their local improvement projects.

2. National quality improvement advisor programme
    a. One local team member will be identified to receive professional development in improvement science and apply that knowledge to a quality improvement project at a local/regional level.
    b. Quality improvement advisors-in-training will be supported by coaches and faculty to scope, design and implement a change project.
    c. Advantages:
        i. Individual team member will receive world-class improvement science training.
        ii. Time and space will be created by local leadership for teams to undertake an improvement project/
        iii. The project EAG can choose topics of national importance across each of the workstreams.
        iv. National guidelines/resources can be generated from the shared learning across all improvement projects.
    d. Assumptions:
        i. Only one team member per facility/region will receive training.
        ii. Projects will likely require working across facilities or organisations, so leadership engagement will be essential.
        iii. The project EAG will need to prioritise project workstreams and be active champions in their local improvement projects.

3. Quality improvement campaign towards a shared/agreed national goal
    a. Less common but can be effective.
    b. Leverages peer and social networks. Seeks endorsement and co-messaging by relevant professional societies. Uses a network of ‘nodes’ to pursue campaign’s improvement goals. Requires communication and engagement strategies.
    c. Advantages:
        i. Can be effective when you have a shared goal and resources to support adoption and engagement.
    d. Assumptions:
        i. High activity will be required by EAG to engage and motivate ‘nodes’ for participation.
        ii. Often requires up-front development of resources, pathways or other materials to support engagement and adoption of a programme.

Current measures

Measurement is key to understanding what problems we want/need to solve and whether the change we are making result in an improvement. It builds confidence in staff and leaders that the time taken to test and implement a change (when/if scaled up) will benefit providers and patients alike.

Prior to its initial meeting, the EAG will receive a summary report of analyses to support the refinement of project scope. A number of measures may be useful to support future conversations and decisions around improvement opportunities. To start, we propose the following measures for each of the workstreams:

1. Identification
    a. percentage of patients taken direct to neuroscience centre by region
    b. time from first hospital presentation to index CT.
2. Acute intervention
    a. trauma call
    b. time from injury to arrival at neuroscience centre by region
    c. proportion of patients admitted to neuroscience centre by region.
3. Recovery
    a. discharge destination
    b. mortality
    c. acute length of stay (acute inpatient)
    d. ACC linked data – time to community rehab services (ie, training for independence, pain management, concussion services, psychology and neuropsychology)
    e. Australasian Rehabilitation Outcomes Centre (AROC) linked data – to assess functional outcome.

Project team

This project will be led by sTBI clinical lead Dr David Knight. Commission staff will offer resources and expertise as required and be supported by the guidance and functions of the EAG, including the clinical director and programme director of the National Trauma Network, as it evolves. The project team will be responsible for working with members of the EAG to facilitate processes, organise workshops and produce deliverables further to managing the delivery of the work programme.

Commission staff are:

- Tony Mottershead – senior project manager
- Paul McBride – senior data scientist
- Jessica Lockett – quality improvement advisor
- Kat Quick – clinical lead, rehabilitation
- Sreeja Tulluri – project coordinator.

Key activities, deliverables and timelines

The activities below will kick-start the programme of work. Activities and associated timelines will be determined with an agreed workplan (proposed to be confirmed by 31 October 2021).

Project deliverables will be finalised by the EAG and clinical lead. Early considerations are being made towards development of:

- a national guideline with agreed pathways
- a series of change resources to support adoption of guidelines
- measurement and reporting framework for sTBI.

#	Activity	Deliverable	Who	Start	End
1	Clinical lead recruited and secured	Signed contract with associated DHB	Tony	Completed	
2	Expression of interest package for EAG developed and distributed	• Project brief • Terms of reference • EOI document	Tony/David	23 August 2021	30 August 2021
3	EAG submissions of interest deadline	EAG interest sent to Tony	EAG candidates	1 September 2021	10 September 2021
4	First EAG meeting	• EAG meeting package • In-person or online (dependent on public health alert level)	Sreeja (and team)		30 September 2021
5	Workplan developed and agreed	Workplan	Tony	1 October 2021	31 October 2021
6	Project implementation period	TBD	All	1 November 2021	31 December 2022 (TBC)
7	Publication and dissemination of deliverables, including a monitoring plan	TBD	All	1 Jan 2023	31 March 2023

Approvals

Final approval for the scope of the project and the work plan will be at the discretion of the clinical lead. Advice and input on the scope and work plan will be provided by the Commission leadership where required.

Local and regional change initiatives (TBD) will require sponsor and executive sponsor engagement and approval to increase likelihood of success.

Reporting

Progress on this programme of work will be reported to ACC on a quarterly basis with updates provided to the Commission and National Trauma Network leadership as required.

The EAG will receive project updates on an as-needed basis (TBC from terms of reference).

Key risks (to be completed)

Detail	L	I	O	Actions to mitigate/contingency plan	Owner
Low buy-in/engagement from key clinical leaders	M	H	M	Engage clinical leaders from varying professions early to adopt a shared understanding and co-create project scope	David
Magnitude of the problem identified is too small to warrant effort to change	L	H	M	Identify and agree a patient cohort who will receive strongest benefit from change and ensure value-add to service providers	
Magnitude of the problem identified is too large making change seem unachievable	L	H	M		
Input from consumers and Māori is diluted by a large number of clinical representatives or power is not well shared across the programme of work	L	H	M	Ensure consumer representatives are present in all aspect of the programme, including at least 2–3 consumer/whānau representatives. Also on regional/local improvement teams where required/appropriate	Tony
Key: L = likelihood; I = impact; O = overall risk rating; H = high; M = medium; L = low					

A full risk assessment will be undertaken at the start of this project and risk management activities will take place throughout.

Key stakeholders (to be completed upon workplan and EAG input – see terms of reference for EAG for defined group membership)

List of key organisations that will have an influence on the success of this project and who need to be involved in the project for successful completion.

Name	Influence	Involve	Comment

Evaluation measures (aside from mortality and those used in initial analyses; will be determined in alignment with project plan and informed by the EAG)

Concern seeking to address:		
Evidence base:		
Scale of problem:		
Project will deliver: (output measures)		
Outcome measures:		
Changes in behaviour we wish to see:		
Does a tried-and-tested measure exist?		
Does the data exist?		

If so who holds it?		
Do we have a baseline?		
Do we have an international comparator?		
Changes in practice? State which		

References

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