Serious Traumatic Brain Injury Collaborative progress report

He pūrongo Whara Roro Whētuki Kauneke Ngātahi

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Te Kāwanatanga o Aotearoa
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Health New Zealand
Te Whatu Ora

Te Tāhū Hauora
Health Quality & Safety Commission

This report provides a summary of quantitative and qualitative data analysis to establish the impact of the Te Tāhū Hauora Health Quality & Safety Commission (Te Tāhū Hauora) Serious Traumatic Brain Injury collaborative that was completed in June 2023.

Contents | Rārangi take

Background | He kōrero takamua

Te Tāhū Hauora and the Trauma National Clinical Network (the network) completed scoping work in 2022 with health professionals and consumers across Aotearoa New Zealand. This scoping work identified that screening for traumatic brain injury (TBI) in patients admitted to hospital with major trauma was inconsistent, and in places was very limited.

In 2022, 55 percent of surveyed trauma clinical teams reported major trauma patients were likely to be discharged home without brain injury assessment. This was a moderate occurrence (one to three incidents per month) of patients being discharged without an assessment, in 25 per cent of cases, and a frequent occurrence (most weeks) in 30 percent of cases. Forty percent of hospitals also reported having no systematic processes for identifying patients with a TBI.

If left undiagnosed, the presence of a TBI can affect long-term outcomes including delays in functional recovery and reductions in quality of life. Post-traumatic amnesia (PTA) duration is a well-known indicator of injury severity and a predictor of functional outcome in those who sustain TBI. The duration of PTA is also used by hospitals and the Accident Compensation Corporation (ACC) to help determine the severity of TBI and the intensity of rehabilitation required.

To address the concern of inconsistent assessment processes, Te Tāhū Hauora, the network and ACC jointly supported a national serious traumatic brain injury (sTBI) collaborative (the collaborative). The aim of this work was to improve identification of TBI by conducting PTA assessments for major trauma patients, to ensure all brain injured patients receive timely rehabilitation.

Between October 2022 and June 2023, teams of clinicians from across Aotearoa New Zealand came together for the collaborative.

The collaborative approach

The collaborative used the Institute for Healthcare Improvement's breakthrough series collaborative model. The teams received quality improvement training via in-person learning sessions, a series of webinars and individual mentoring.

Using quality improvement methodology and co-design teams established data collection plans (to understand their system and measure change), developed aim statements and explored change ideas. Plan, do, study, act (PDSA) cycles were used to support testing, modifying and scaling up change ideas. Sustainability, communication and spread plans supported successful implementation of their work.

Read more about this collaborative model in the white paper *The Breakthrough Series: IHI's Collaborative Model for Achieving Breakthrough Improvement* (Institute for Healthcare Improvement. 2003).

The overall aims of the collaborative's work were to improve the rates and accuracy of PTA assessment for major trauma patients, and to ensure that all those with a TBI receive timely rehabilitation.

The collaborative ran over two stages, with phase one teams completing their projects between October 2022 and March 2023, and phase two teams between February 2023 and June 2023.

The teams were:

- phase one teams: Te Tai Tokerau Whangārei, Hauora a Toi Bay of Plenty Tauranga, Te Matau a Māui Hawkes Bay, Taranaki and Dunedin
- phase two teams: Te Toka Tumai Auckland City Hospital, Te Pae Hauora o Ruahine o Tararua MidCentral, Nelson Marlborough and Waitaha Canterbury.

Although not participating as a team, Middlemore Hospital completed a similar project as part of the 2021–2022 rehabilitation collaborative, and as such were a part of the teaching faculty for this work. The Middlemore team has also been implementing continuous improvement in its services for the management of TBI patients, and so has been included with the collaborative sites for the purposes of data analysis.

Full details of the collaborative can be found in the *Serious Traumatic Brain Injury in Aotearoa New Zealand: Summary of Improvement Work report* (Te Tāhū Hauora and the National Trauma Network, 2024).

Quantitative results | Ngā hua inerahi

Patients who meet the threshold of major trauma (those with an injury severity score – ISS – of greater than 12) have their clinical data captured on the New Zealand Trauma Registry (NZTR). PTA assessment was added to the NZTR as a data point in October 2022. Because the collaborative started at the same time, there is no true national baseline period for PTA assessment rates.

Given the retrospective coding of ISS to identify major trauma, and to account for patients at greatest risk of missed TBI diagnosis (those admitted with high-velocity mechanisms and/or significant distracting injuries to other body systems), an assessment criteria of 'two or more body regions' (chest, abdomen, extremity, etc) or 'any injury involving the head' was used by clinical teams to identify who would benefit from PTA assessment.

Except for Waikato Hospital and Wellington Regional Hospital, the majority of services that did not participate in the collaborative were hospitals experiencing lower trauma volumes. In this report, median values have only been shown for hospital services that receive more than 50 trauma cases per year. Descriptions of hospital size classifications can be found in the appendices (Table 2, Appendices).

Note that, at the time of writing this report, the PTA data point was not available for the Te Manawa Taki trauma region, and therefore this region has been excluded from the analysis. The exception is the collaborative teams from Tauranga and Taranaki, who manually submitted their results.

For this report, PTA data was extracted from the NZTR in July 2024. The following data includes major trauma events pulled from the NZTR between 10 October 2022 and 30 April 2024.

Inclusion criteria for collaborative data analysis were all ages, and injuries involving Abbreviated Injury Scale head or face codes, or Abbreviated Injury Scale codes relating to two or more body regions (excluding external codes).

Exclusion criteria were:

- in-hospital deaths
- injuries relating to a mechanism code of poisoning
- injuries with burns as a dominant injury – these were manually reviewed and those without high-velocity injuries were excluded
- penetrating head trauma – these incidents were manually reviewed and excluded, as PTA assessment tools are not validated for use in this cohort.

In the first year of data collection (October 2022 to October 23), the median completion rate of PTA assessment for collaborative sites was 75 percent, compared to 66 percent for non-collaborative sites. The most-recent 6-months of data from November 2023 to April 2024 shows the median completion rate for collaborative sites was 84 percent, compared to 68 percent for non-collaborative sites.

The data demonstrates that from the start of data collection, all but one collaborative site demonstrated median PTA completion rates higher than the national average, as shown in Table 1.

Table 1: National median PTA assessment rates between October 2022 and April 2024

		PTA assessment with injury to head or face[1]	PTA assessment meeting criteria[2]	Total cohort volume[2]
	National	82 %	72 %	2,842
	Middlemore Hospital	100 %	89 %	294
Phase 1	Whangārei	100 %	100 %	177
	Tauranga	Unknown	88 %	155
	Taranaki	Unknown	100 %	62
	Hawkes Bay	100 %	83 %	139
	Dunedin Hospital	67 %	65 %	194
Phase 2	Auckland City Hospital	94 %	79 %	487
	Palmerston North	100 %	80 %	97
	Nelson Hospital	100 %	75 %	71
	Christchurch Hospital	83 %	75 %	693
Non-collaborative	North Shore	67 %	43 %	80
	Starship Children's Hospital	100 %	100 %	93
	Wellington Regional Hospital	75 %	71 %	296
	Timaru Hospital	58 %	33 %	54
	Invercargill Hospital	100 %	54 %	63

1 ISS ≥ 13 with injuries to the head or face, excluding in-hospital deaths.

2 ISS ≥ 13 with injuries to two body systems and or to the head or face, excluding in-hospital deaths

Examples of the progress made by the teams involved in phase one and phase two of the collaborative in completing PTA assessments are shown in Figures 1 and 2.

Dunedin was the only site from the collaborative to have PTA assessment rates lower than the national average. This is likely due to a change in trauma nurse personnel between June and November 2023 (this period is highlighted in Figure 3). It should be noted that Dunedin PTA assessment rates in 2024 have improved with a median PTA assessment completion rate of 89 percent for patients with injuries to the head and face, and 85 percent for those that met the criteria of head or face or two system injuries.

Figure 1: Example of phase one teams' progress – Te Tai Tokerau Whangārei hospital compared with all sites; PTA assessment rates for patients meeting assessment criteria[2]

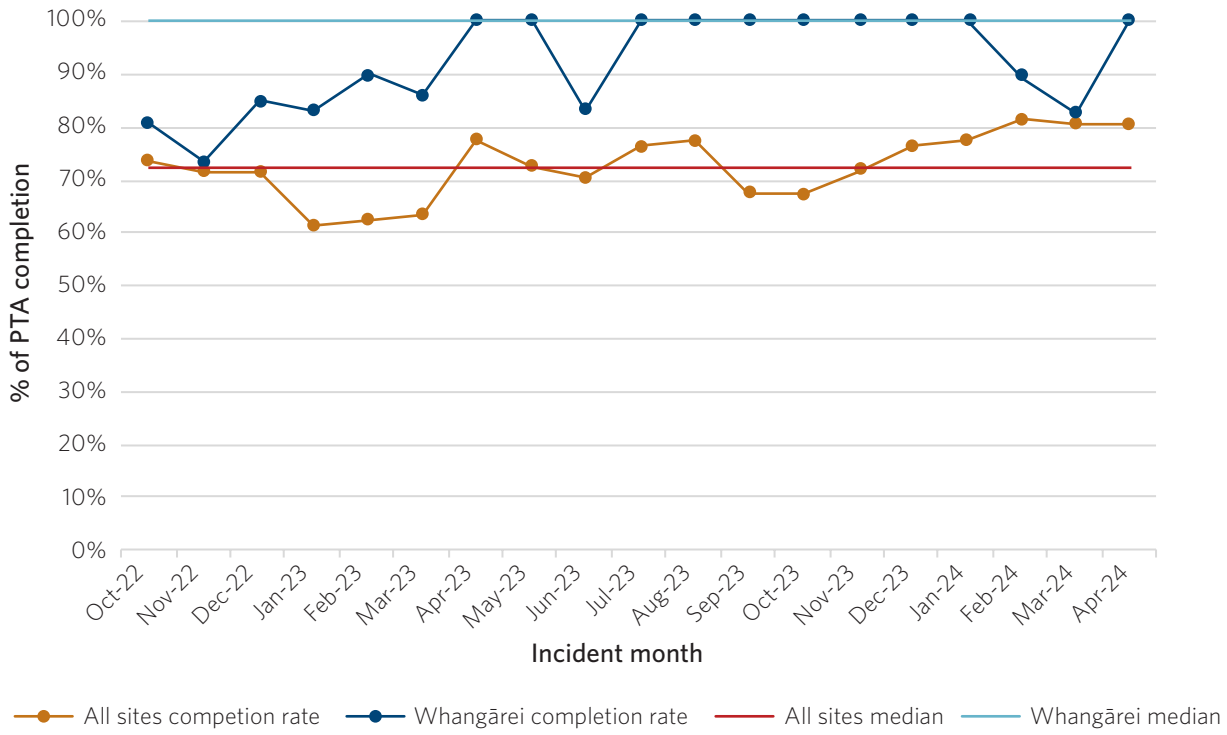


Figure 2: Example of phase two teams' progress – Waitaha Canterbury Christchurch Hospital compared with all sites; PTA assessment rates for patients meeting assessment criteria[2]

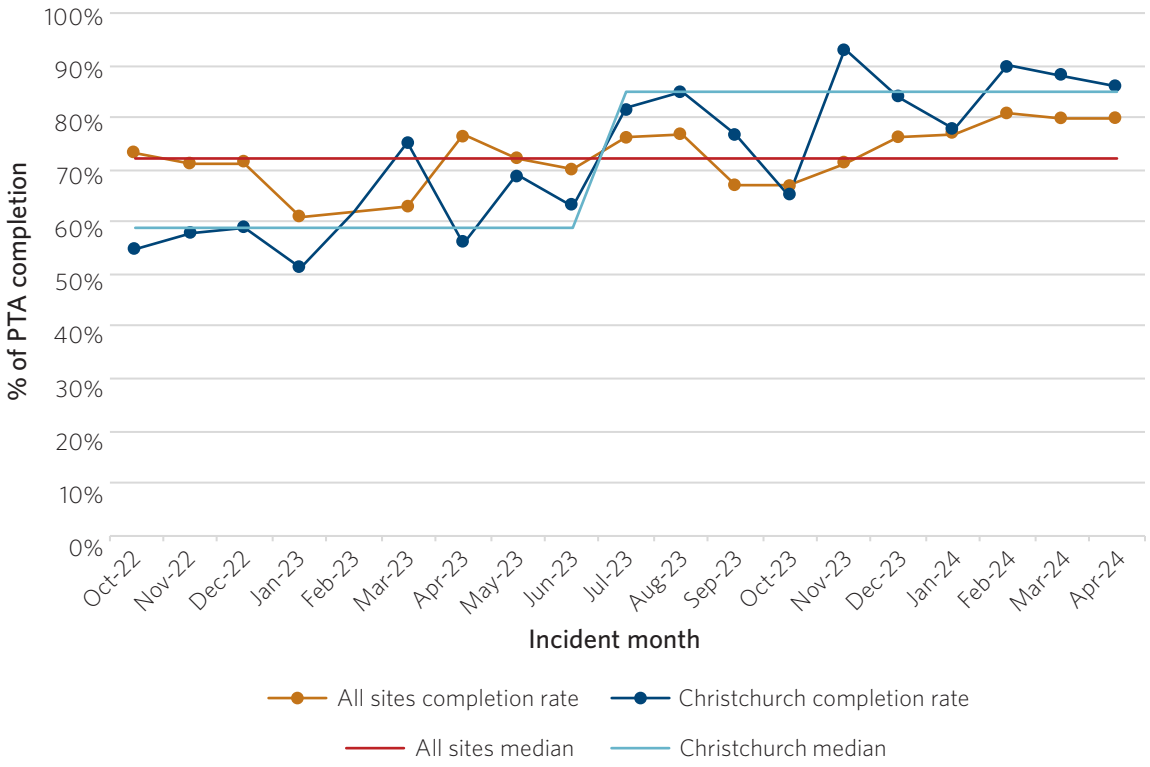
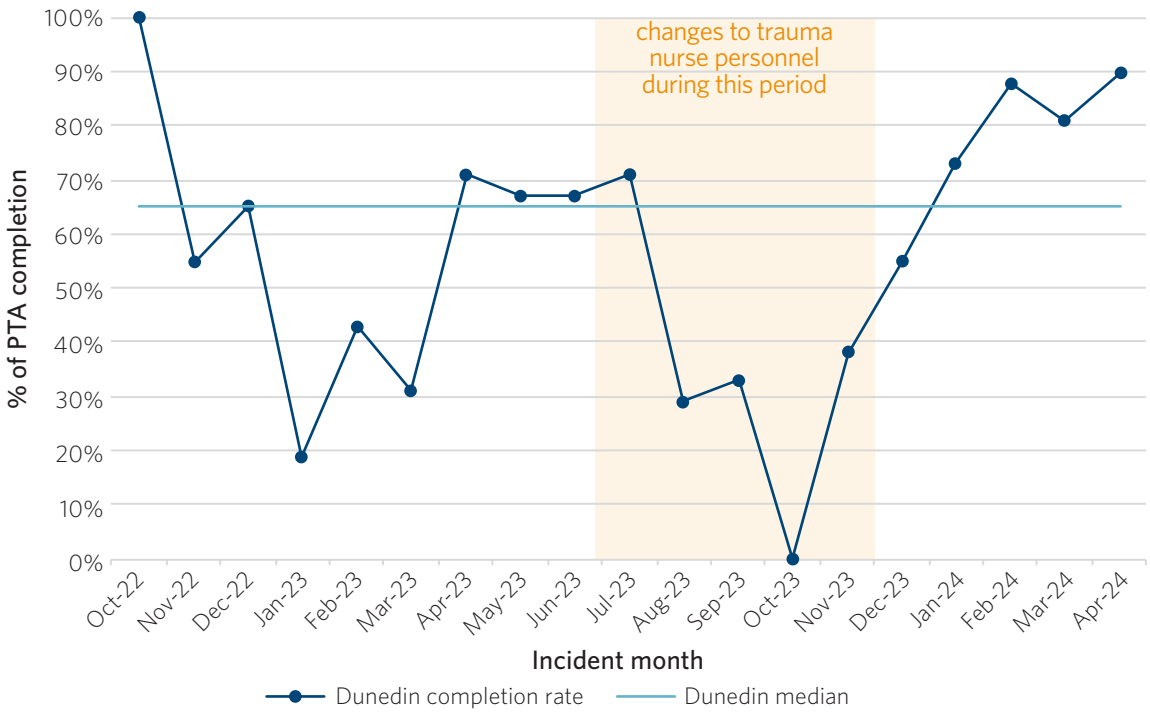


Figure 3: Dunedin Hospital; PTA assessment rates for patients meeting assessment criteria[2]



The data demonstrates that the following at-risk major trauma patients are mostly likely to have a PTA assessment:

- **Higher ISS**: For patients with an ISS of over 45, 87 percent had a PTA assessment, compared to 77 percent for

patients with an ISS of between 25 and 44, and 70 percent for those with an ISS between 13 and 24.

- **Mechanisms relating to transport or being stuck by or colliding with a person or object events**: 77 percent of patients injured in events involving transport and being struck by or colliding with a person or object had a PTA assessment, in contrast to 66 percent of patients injured by a fall and 57 percent of patients injured in other ways.

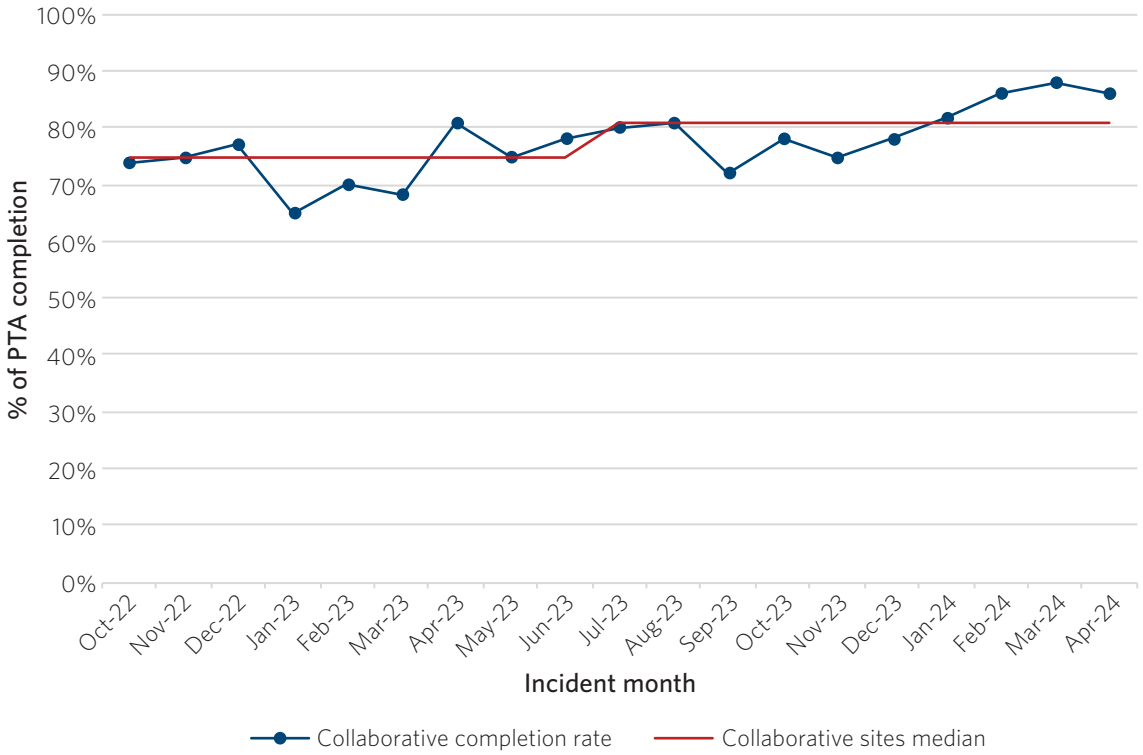
By comparison, trauma patients were least likely to receive a PTA assessment in the following circumstances.

- **Smaller-sized hospital**: Trauma patients attending smaller-sized hospitals have a 47 percent PTA assessment completion rate, compared to 75 percent of trauma patients in large hospitals, and 83 percent in medium-sized hospitals.
- **Those in older age groups**: Only 54 percent of people with major trauma aged over 80 received a PTA assessment and 70 percent for major trauma patients aged between 65 and 79 years, compared to 73 percent for patients aged between 45 and 64, 76 percent in patients aged between 15 and 44 and 82 percent in the under 14 age group. This is likely to be affected by PTA tools not being validated for older adults or for those with pre-existing cognitive impairment.

Similar rates of PTA assessments were completed across the different ethnicities, with the lowest rates for Asian (68 percent) and European/Other ethnicities (70 percent), compared to Māori (78 percent) and Pacific people (76 percent). The lower rates seen for Europeans may reflect the larger European population that is elderly.

Figure 4 demonstrates the sustained changes in PTA completion rates over time for the collaborative sites.

Figure 4. Collaborative sites: PTA rates for patients meeting criteria[2]



Qualitative results | Ngā hua inekounga

Qualitative data was collected from project participants via semi-structured focus groups and interviews that occurred in June and July 2024.

Data was analysed using thematic analysis of interview scripts to understand if the collaborative had been successful in achieving high rates of PTA assessment in the major trauma population, and to understand the barriers and enablers to achieving this.

The primary findings from the qualitative data are discussed below.

The collaborative resulted in successful implementation of change ideas

Nine of the ten interview participants reported that effective change ideas were implemented into their services as 'business as usual'.

Staff education about PTA assessments and processes to support early identification of at-risk patients was incorporated by all nine of these teams.

Participants reported that building relationships across the trauma multi-disciplinary team, sharing resources, incorporating change ideas into existing infrastructure and making it easy to do the right thing, all contributed to achieving sustained change.

'It's been really nice that kind of relationship with the trauma team and the Occupational Therapy (OT) department. So that's been a really positive outcome. And I think the whole thing's just like, highlighted the importance of concussion and the impacts that can have on patients and family and recovery.'

'The online training programme that we developed is continuing to be used for all of our new staff as well as across the country.'

'So the great thing that's worked for us is the online training. It has been absolutely amazing. So that has stuck. Allied health have been working really well, we use the abbreviated PTA, the full Westmead and we use Sydney Post-Traumatic Amnesia Scale for the children, which works great and we just have to work on training the nurses and the doctors from here on in.'

'We have got ourselves along to a training new emergency department (ED) staff day that they run every month, and so we have a standing slot where we talk about all the trauma policies and we really go through the abbreviated and the criteria for screening. So that I think been a really good thing in ED. We are definitely seeing people think of it.'

The team that experienced minimal progress with their service improvement was a large neuroscience centre, which already had high levels of PTA assessment rates for the major trauma population. This team has subsequently pivoted to target PTA assessments in its ED, in order to support early identification of brain injury in trauma patients with lower ISS injuries, as this was an area where its processes were previously more ad hoc.

Innovative solutions used by teams to introduce new processes, while reducing the burden of work on busy staff included:

- placing visual reminders on hospital computer screensavers and education posters on wards
- adding checklists to existing essential assessment tools (such as the trauma tertiary survey)
- embedding the TBI pathway into electronic clinical records.

Adapting the electronic discharge summary was mostly ineffective

The change idea that was the biggest challenge for teams to introduce was adding PTA, TBI or allied health details to the electronic discharge summary. Despite best efforts, four teams were unsuccessful in either testing or implementing this.

One collaborative team already had allied health professionals documenting on the electronic discharge summary, with this success attributed to leadership support and ongoing monitoring of this practice through clinical notes audits. Another team had regional sign off to test a TBI tab on its electronic discharge summary and was waiting for this to be trialled in clinical practice.

'I think annoyingly it was just a nonstarter because it's never been done and so people expected it to be too hard to be honest. And when we talked to people about it, it was very much that … it's not gonna work … And then when I talk to the leadership, it was very much a) but that's not gonna work, b) we haven't got time for that. And I think that is just partly a culture of it's not really been done before.'

'It's actually nice to hear that everybody had a similar idea about putting something on the discharge summary because I was trying to do that at our end (a drop down box for a prompt) and I was just told "no not possible".'

'Our TOCs (transfer of cares) are not just for docs (doctors) project is still ongoing, getting the Allied health and even nursing document on the discharge summary. So that's really easy on our system, like it's not hard to do but you just have to have the time to go into it… the Director of Allied Health (DAH) has actually added it into their notes audit … so they've had a really big push from their allied health leadership because they have found it to be a really good idea.'

Staffing capacity was seen as the biggest barrier to service improvement

All participants reported that staffing issues were the most challenging barrier to implementing lasting service changes. These included rapid staff turnover, sickness, vacancies, skill mix of clinicians and high hospital capacity impacting on the time available for education and non-clinical workloads.

'We tried to get everybody on the training, the issue that we have is the nursing staff, the turnover for the nursing staff has been quite high.'

'We also lost some of our tremendous specialists, no sooner do you think that you've got it sorted, someone leaves.'

'I think unfortunately, recruitment was so bad for so long and everyone was so short staffed for so long that I think we've got into a kind of firefight.'

'We've got a whole new very junior OT workforce at the moment and very, very understaffed OT workforce as well.'

'It's become very apparent that the lack of staff and support is a really big factor.'

Influencing change was a challenge

Leadership support, the health system reforms, and ownership of responsibilities were also identified as challenges to implementing local quality improvement initiatives.

'I think on reflection ... the trauma team has quite a lot of leaders within it and to get to the right people, and get their approval is something we never quite managed to do. Our director leadership changed too, so we lost our sponsor at one point and never really got a new one.'

'It was a tricky time in healthcare to be doing a collaborative with all of the big, very national, you know, health reforms and changes of roles and jobs and everything else.'

'One of the other things that I think of is really hard and what I've heard, through the themes today, is that it really is dependent on our trauma service. I'm around, you know, really driving this and having those people ... So what happens when we're not there? It will be interesting in the future.'

'It's kind of getting out of the culture that that it's just an OT thing, and I'm still trying to promote that it's an everybody thing.'

All teams were targeting PTA assessment improvement strategies beyond their initial testing sites

Each participant interviewed had spread their successful improvement ideas to areas outside of the initial test sites, including to rural hospitals, into emergency departments and across different wards. Sustaining gains and spreading planning beyond pilot areas were included in the collaborative teaching curriculum.

Initiatives were targeted towards vulnerable populations

Three teams focused on improving OT or PTA assessment rates for vulnerable populations. These populations include people aged over 65 years, female victims of interpersonal violence, and people with pre-existing co-morbidities which might make PTA assessment difficult to complete.

'Our OT lead is pretty innovative, and she wanted to trial using female face cards for like victims of assault and things like that, for patients that don't wanna look at men's faces.'

'We're gonna do a quick session on how to modify the Westmead and still keep its validity when your patient has communication and other issues … We've moved on to screening to eliminate rather than screening because somebody's picked it up, so even those patients who have a background history of previous stroke, or potential mild cognitive impairment are still being seen, screened and looked at from a head injury perspective and not just ignored because they have a pre-existing condition.'

'We're going to look at the pathway to central, a lot of our elderly don't actually fit into that criteria to be transferred. But what we want to do, is identify these people and just even have a discussion with ABI to see if they should be involved with some referrals so that we're just kind of setting that up at the moment and working with them.'

Ongoing monitoring processes of PTA assessment were variable

Some teams had systematic processes to track PTA assessment rates over time, whereas others were more ad hoc.

'Unfortunately, at the moment because of the new IT changes that we're having to our patient booking systems and whiteboard systems are all being replaced, our IT teams are just say no to any kind of request to start to look for any data.'

'We're collecting data sheets on all trauma. So when we go through, if there's people that are meeting their criteria that aren't on there … we can go, yes, they had a PTA screen, but generally if there's no PTA screen then we look at why not and then if they didn't need it.'

Improvement didn't stop with the collaborative

Teams discussed the next steps in improving the management of TBI for patients in their services, which included developing cohesive patient information systems, reviewing referral pathways into community services and using IT systems to track and flag allied health referrals.

'Patient information in a nicely packaged way, we're still working with lots of different pieces of paper. I'd like something a little bit more encompassing.'

'There wasn't really a robust process of referring from ED to the OTs on the ward. With the new IT systems that are coming in, we're kind of hoping we've got kind of tracked care being implemented and we've got a few software systems that we're hoping will kind of help us fix that problem.'

Conclusion | He kupu whakatepe

All but one of the collaborative sites have demonstrated median PTA completion rates that are higher than the national average for both patients with head or face injury ISS codes and those that met the assessment criteria of head or face or two system injuries. Following this national improvement campaign, more major trauma patients are now being assessed for the presence and duration of PTA, ensuring that brain injuries are being identified earlier in the care journey. Early identification enables patients to get the care and rehabilitation they need to support their recovery.

Work being led by others on the identification and management of mild TBI in ED is also underway in Aotearoa New Zealand. The Trauma National Clinical Network Rehabilitation and Transitions of care Rōpū Rangatira and Te Tāhū Hauora trauma programme will remain connected to these projects to ensure that TBI assessment remains in line with best practice.

The next step of this project is to focus on sharing resources and learnings from the collaborative with non-collaborative sites. Collaborative teams will be provided with progress summary documents, including guidance on supporting the ongoing sustainability of their work.

Now that most trauma services have systems to identify TBI, future improvement opportunities could focus on equitable access to rehabilitation services for patients with a TBI, no matter where across the motu you live. The NZTR PTA data point reflects whether an assessment was completed, but information on PTA duration would positively inform the direction of future work.

Appendices | Ngā Āpitihanga

Table 2: Size classification of hospital trauma services with more than 50 trauma admissions per year

	Trauma hospital size
Te Toka Tumai Auckland City Hospital	Large
Te Tai Tokerau Whangārei Hospital	Medium
North Shore Hospital	Small
Starship Children Hospital	Large
Middlemore Hospital	Large
Hauora a Toi Bay of Plenty Tauranga Hospital	Medium
Taranaki Hospital	Small
Wellington Regional Hospital	Large
Te Matau a Māui Hawke's Bay Hospital	Medium
Pae Hauora o Ruahine o Tararua MidCentral	Medium
Waitaha Canterbury Christchurch Hospital	Large
Nelson Hospital	Small
Timaru Hospital	Small
Dunedin Hospital	Large
Invercargill hospital	Small

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