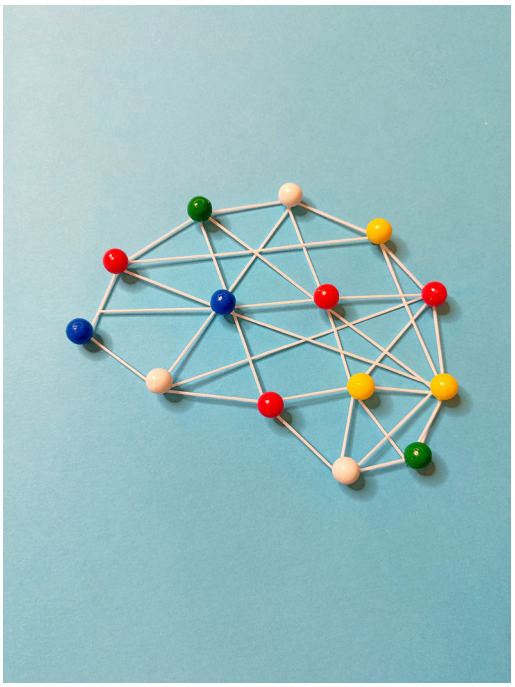
Multidisciplinary care in concussion management



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Background
About 30% of people who experience a concussion have longer-lasting symptoms and complex care requirements. The new Australian and New Zealand clinical practice guidelines for the management of concussion, mild traumatic brain injury and persisting concussion symptoms provide guidance for their management, which often requires the involvement of multiple disciplines in a collaborative approach – the multidisciplinary concussion team.

Objective
The aim of this article is to review the characteristics of people with concussion who may need multidisciplinary concussion care and current service models.

Discussion
Across Australia, publicly funded concussion services are few, and models of care vary depending on funding time and availability of expertise. Given their knowledge of the patient's premorbid and social background, the general practitioner often plays a large part in diagnosis, referral and care coordination, especially in complex cases such as those with repeated concussions, vestibular or cervical dysfunction, severe pain and/or psychological concerns.

ALTHOUGH CONCUSSION is classified as a mild traumatic brain injury (mTBI), its manifestations experienced by a substantial proportion of affected children and adults with concussion are often far from mild. In Australia, concussion affects approximately 206,000 individuals annually, with an estimated 30% experiencing persisting post-concussion symptoms (PPCS, longer than 4 weeks) such as headache; vision, balance and sleep disturbances; cognitive difficulties; and emotional dysregulation.[1]

These sequelae frequently interfere with return to education or employment, reduce social participation, and significantly diminish overall quality of life.[2–5] These complex symptom constellations often have multifactorial origins (Box 1) – including biological, psychological and social – with injury-related factors contributing less to symptom persistence over time.[6–8] Hence, contemporary clinical guidelines, such as the new Australian and Aotearoa New Zealand (ANZ) clinical practice guidelines,

Box 1. Factors associated with increased risk of delayed recovery[9,22]

Children	Adults
• Previous concussion/mTBI with delayed recovery	• Previous concussion/mTBI with delayed recovery
• Female, older (>12 years)	• High symptom burden at initial presentation
• High pre-injury symptom burden	• Neck pain
• High symptom burden at initial presentation	• History of migraine or headache
• Clinical evidence of vestibular or oculomotor dysfunction	• Clinical evidence of vestibular or oculomotor dysfunction
• Personal and family history of migraines	• Injury obtained during traumatic circumstances (eg assault/fatal car crash)
• History of learning or behavioural difficulties	• Post-traumatic stress symptoms/disorder
• Personal and family history of poor mental health	• Mental health problems, depression and/or anxiety pre-injury
• Low family socioeconomic status/education	• Litigation

mTBI, mild traumatic brain injury.

underscore the importance of identifying and treating such barriers to recovery using a patient-centred biopsychosocial approach.[9,10] This process, however, is often constrained by siloed models of care, limited time, funding constraints and insufficient expertise.[10] It is within this context that multidisciplinary concussion care has become increasingly relevant, offering a structured and collaborative approach to address the diverse and complex needs of this population.

Early concussion management is grounded in patient education regarding the expected symptoms, their management and their trajectory. This approach aims to normalise early symptoms, provide reassurance of expectation of favourable recovery, offer actionable strategies for symptom management and give guidance on avoiding excessive rest while promoting a gradual return to daily activities and vocation/education.[10] Small-scale studies suggest that, when implemented early and effectively, this strategy facilitates recovery for a substantial proportion of individuals.[11] Although these relatively simple strategies could alleviate most patient concerns, around 50% of Australians with concussion do not receive the effective care they need.[12]

But what about the management of more complex cases with delayed or static recovery patterns? About 25–30% of cases are challenging because of the presence of intractable mood, anxiety or headache disorders, and/or the complexity of pre-existing comorbid and environmental factors that complicate recovery. Often symptoms that were present before injury are worse post injury (eg headaches, anxiety, sleep problems) because of a complex interplay of injury-related, biological, psychological and social factors. Emerging evidence supports the efficacy of multidisciplinary interventions involving neuropsychology or psychology, occupational therapy and physiotherapy.[11] These programs are designed to begin early in treatment (ie between 1 and 3 months post injury), before maladaptive compensatory behaviours take root. Multidisciplinary team (MDT) programs target dysfunction across multiple systems while promoting structured re-engagement in daily activities (Table 1).[9,10] People with complex symptom patterns that fail to decrease over the first month and people who are unable to return to work/school should be considered for referral. Pacing strategies designed to facilitate community reintegration while minimising symptom exacerbation are commonly used. Key aspects include fatigue management, promotion of sleep hygiene and treatment of any autonomic, vestibulo-ocular and cervical spine dysfunction.[13,14] Psychoeducation, cognitive restructuring and graded exposure are often needed to address maladaptive illness fear avoidant behaviours. Both cognitive and physical symptom management techniques are integrated alongside relaxation and behavioural therapies to support overall recovery.

An MDT refers to a coordinated group of healthcare professionals from distinct clinical disciplines who collaborate to address complex patient presentations. There is emerging evidence for multidisciplinary,[15] particularly interdisciplinary, approaches[16,17] in reducing post-concussive symptoms and

Table 1. The multidisciplinary concussion team

Clinician	Role in concussion management
Doctor/s	• Diagnose concussion • Provide education about concussion and natural history of symptoms • Assess for comorbidities and complicating factors • Monitor recovery • Coordinate care • Order investigations • Provide letters for school, work, return to play • Make referrals to non-GP specialists • Pharmacological management of headaches, sleep, mood and/or anxiety
Nurse	• Administer symptom questionnaires • Provide education (verbal and written) • Monitor symptom progression • Ensure MDT appointments are scheduled and attended • Monitor nutrition • Assess orthostatic symptoms
Physiotherapist	• Assess for and manage any neck, vestibular (peripheral and or central), oculomotor and balance impairments relevant to persistent symptoms and signs such as cervicogenic headaches, dizziness, unsteadiness and visual disturbances • Prescribe graded exercise programs for management of ANS dysfunction, return to activity, sport-specific return to play and fatigue management • Provide advice and education on symptom management
Exercise physiologist	• Prescribe graded exercise program • Manage sport-specific return to play • Support therapeutic exercise for comorbidities • Support mental health
Occupational therapist	• Educate and develop strategies for pacing and energy management to promote participation in usual household, social, community and leisure activities • Provide education to support a graded return to work/school

Table continued on the next page.

Table 1. The multidisciplinary concussion team (cont'd)

Clinician	Role in concussion management
Psychologist	• Assess and treat comorbid mental health conditions such as anxiety, PTSD and depression • Support with identification of strategies to manage mood, coping, stress and interpersonal relationships during recovery • Identify and address any unhelpful thoughts that may influence recovery • Support management of sleep disturbances
Neuropsychologist	• Provide education on concussion • Collaboratively formulate care plan with biopsychosocial framework that includes the following: – persistent concerns – identification of maladaptive illness beliefs and behaviours – psychoeducation and cognitive behavioural therapy to address maladaptive cognitive biases (eg misattribution, negative expectations for recovery) and behaviours (eg fear avoidance) – cognitive restructuring – graded exposure with relaxation strategy training • Assist with returning to education and work • Identify and support cognitive concerns, with education on expected recovery trajectory, interplay and influence of other factors on cognition (eg sleep, fatigue, headaches, mental health, vestibular oculomotor function) • Note: Formal neuropsychological testing is not usually required and is considered only after treatment of other factors that may influence cognitive function.

ANS, autonomic nervous system; GP, general practitioner; MDT, multidisciplinary team; PTSD, post-traumatic stress disorder.

promoting return to usual activities. Ideally, treatments should be tailored to the patient's symptom profile and comorbidities,[18] such as addressing headaches, vestibular and autonomic dysfunction, comorbid mental health concerns and sleep problems. The composition of an MDT in concussion management is variable, dependent on the formulation of the patient's symptom complex, medical history, identified barriers to recovery and community context. However, core MDT membership typically includes an experienced physician – such as a general practitioner (GP), sports medicine specialist, neurologist or rehabilitation physician – alongside a physiotherapist, psychologist/neuropsychologist and occupational therapist. Additional disciplines (eg exercise physiologist, speech therapist) may be integrated on the basis of clinical complexity and setting.

In the context of concussion, MDT involvement is particularly pertinent when symptom resolution is prolonged and return to work, education, physical activity and/or activities of daily living is reduced or delayed. However, even in cases where recovery follows an expected trajectory, targeted input from one or two disciplines may be warranted. This is especially relevant in scenarios requiring specialised therapeutic approaches or a closely monitored, graded return to activity – such as in elite athletes with repeated concussions, individuals with vestibular or cervical dysfunction, or those experiencing severe pain or comorbid psychological concerns (Figure 1). Given early emotional distress post injury (whether it be disturbance in mood, anxiety or post-traumatic stress) appears to be one of the most robust predictors of prolonged symptoms, referral for psychological treatment early post injury appears particularly warranted.[19]

There are several distinct models of MDT practice, each reflecting varying degrees of collaboration and role integration (Table 2). Traditional models are easier to establish but are also susceptible to variable non-aligned patient advice, miscommunication, and patient and clinician dissatisfaction. Other models require a greater investment in time, coordination, regulatory flexibility and financial resources to support their complexity and collaborative nature. The transdisciplinary model may be the most effective in community-based, resource-constrained or complex care settings such as concussion rehabilitation.[20] However, it requires careful planning, training and support to succeed. Regardless of the MDT model, clear guidance is required around the need for and timing of MDT case discussion, re-evaluation and outside referral, and clear communication about whether management is guided by strong evidence or the risk of low-value care when evidence is limited or evolving.

With their understanding of the patient and their community context, the GP has a pivotal role in the management of concussion and persisting symptoms. The GP can identify persisting symptoms early in the context of the patient's medical and psychosocial background, allowing them to tailor management plans accordingly. This might include early referral or re-referral to mental health or medical services (eg psychologist, neurologist, sleep specialist). GPs are uniquely positioned to coordinate care across services, monitor recovery and support return-to-learn and return-to-work processes. In the context of highly complex recovery patterns, the GP can offer vital continuity of care (while non-GP specialist assessments and management plans are made) and help facilitate management plans in the patient's social and environmental context.

Despite their central role in concussion management, approximately 40% of GPs report limited confidence in managing PPCS. In addition to this knowledge gap, several systemic and structural barriers constrain their capacity to deliver optimal care. These include:

- Limited access to publicly funded community-based rehabilitation/allied health services, which are essential for delivering multidisciplinary concussion care.

- Community allied health professionals' potential lack of confidence in concussion management. For example, community physiotherapists may treat vestibular or cervical spine problems, but few would be confident managing both.[13] Further, upskilling of healthcare workers is considered an important area for improving concussion management in Australia.[21]
- Delays in referral pathways to non-GP specialist services, such as neurology, rehabilitation medicine and clinical psychology – particularly pronounced in rural/remote regions.
- Fragmented communication between primary care and non-GP specialist providers, often exacerbated by the lack of interoperable medical record systems.
- Funding limitations, which impede the provision of extended consultations and integrated multidisciplinary support.
- Reduced knowledge of where to access reputable resources to support provision of education and guide return to activity.

The development of the ANZ clinical practice guideline for the assessment and management of mild traumatic brain injury (supported by The Royal Australian College of General Practitioners) represents a foundational step toward enhancing clinician knowledge and supporting

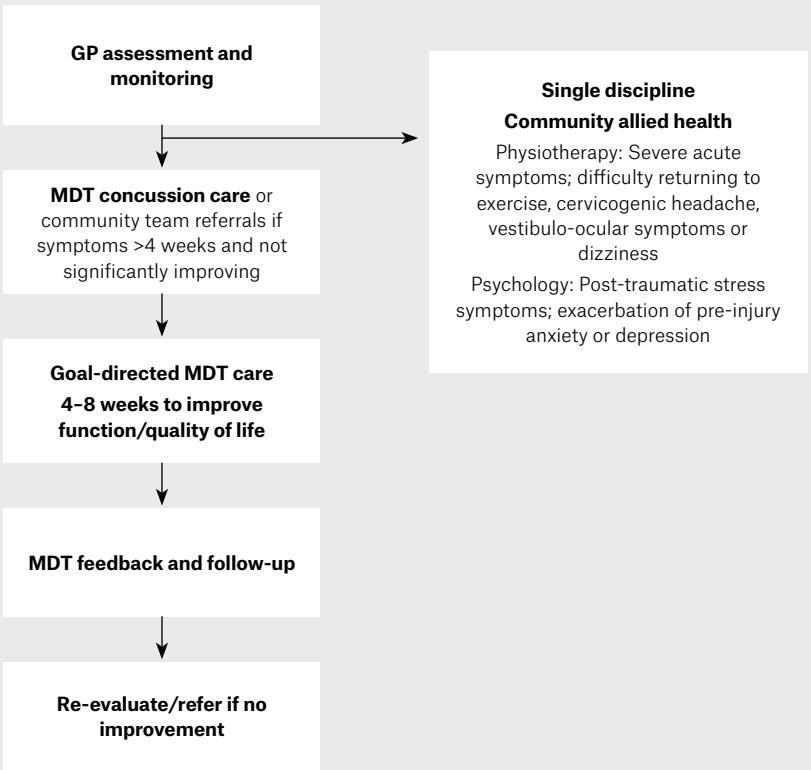

Figure 1. An example composition of MDT involvement in concussion management.
GP, general practitioner; MDT, multidisciplinary team.

Table 2. Models of multidisciplinary care

MDT model	Characteristics	Considerations
Traditional	Clinicians use a traditional framework wherein each professional contributes their professional expertise independently.	Susceptible to fragmented care and suboptimal outcomes due to limited communication and isolated decision making.
Interdisciplinary	Teams engage in close collaboration, integrating their knowledge to co-develop and implement unified care plans. The result is a coordinated, holistic and patient-centred model of care.	Requires substantial time investment, robust communication, mutual trust, shared decision making and effective leadership.
Transdisciplinary	Characterised by role fluidity and cross-training; enables clinicians to perform tasks beyond their traditional scope of practice. Well-suited to managing complex, multifactorial problems seen in people with persistent post-concussion symptoms, especially in community-based settings.	Successful implementation requires extensive training, clearly defined communication and referral protocols, and oversight from a lead physician to ensure clinical safety and role clarity.
Community-integrated	Embeds the team within primary care or community health settings, often in partnership with general practices. These teams typically engage in regular joint meetings, utilise shared electronic health records and follow coordinated care pathways.	Effective functioning depends on the availability of community infrastructure, appropriate funding mechanisms and incentivised billing structures to support integrated service delivery.

MDT, multidisciplinary team.

evidence-informed, community-based concussion care. However, active implementation strategies are urgently required to ensure uptake and integration into routine practice. Furthermore, targeted research is needed to identify and address the barriers limiting GP engagement, thereby enabling timely, coordinated and contextually appropriate care for individuals experiencing concussion and its sequelae.

Key points

- Early appropriate management of concussion can facilitate favourable recovery in the community.
- The ANZ clinical practice guideline for the assessment and management of mild traumatic brain injury provides evidence-based and locally relevant recommendations to guide concussion care.
- PPCS often require a collaborative approach across multiple disciplines to support recovery.
- Tailored, person-centred care is necessary in patients with complex symptom profiles and comorbidities.
- GPs play a pivotal part in early management and helping patients navigate community and multidisciplinary concussion care.

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References

1. Feigin VL, Theadom A, Barker-Collo S, et al; BIONIC Study Group. Incidence of traumatic brain injury in New Zealand: A population-based study. Lancet Neurol 2013;12(1):53–64. doi: 10.1016/S1474-4422(12)70262-4.
2. Silverberg ND, Panenka WJ, Iverson GL. Work productivity loss after mild traumatic brain injury. Arch Phys Med Rehabil 2018;99(2):250–56. doi: 10.1016/j.apmr.2017.07.006.
3. Stålnacke BM. Community integration, social support and life satisfaction in relation to symptoms 3 years after mild traumatic brain injury. Brain Inj 2007;21(9):933–42. doi: 10.1080/02699050701553189.
4. Holmes A, Chen Z, Yahng L, Fletcher D, Kawata K. Return to learn: Academic effects of concussion in high school and college student-athletes. Front Pediatr 2020;8:57. doi: 10.3389/fped.2020.00057.
5. Theadom A, Starkey N, Barker-Collo S, Jones K, Ameratunga S, Feigin V; BIONIC4you Research Group. Population-based cohort study of the impacts of mild traumatic brain injury in adults four years post-injury. PLoS One 2018;13(1):e0191655. doi: 10.1371/journal.pone.0191655.
6. Yeates KO, Tang K, Zhang C, et al; Pediatric Emergency Research Canada (PERC) A-CAP Study Team. Symptom trajectories and their biopsychosocial correlates in pediatric concussion: An A-CAP study. J Neurotrauma 2025;42(21–22):1959–73. doi: 10.1177/08977151251365530.
7. Polinder S, Cnossen MC, Real RGL, et al. A multidimensional approach to post-concussion symptoms in mild traumatic brain injury. Front Neurol 2018;9. doi: 10.3389/fneur.2018.01113.
8. Silverberg ND, Gardner AJ, Brubacher JR, Panenka WJ, Li JJ, Iverson GL. Systematic review of multivariable prognostic models for mild traumatic brain injury. J Neurotrauma 2015;32(8):517–26. doi: 10.1089/neu.2014.3600.
9. Barlow KM, Ponsford JL, Theodom A, et al. Mild traumatic brain injury and concussion and persisting post-concussion symptoms: New guidelines to support evidence-based assessment and management in Australia and Aotearoa New Zealand. Med J Aust 2025;223(9):446–49. doi: 10.5694/mja2.70082.
10. Silverberg ND, Iaccarino MA, Panenka WJ, et al; American Congress of Rehabilitation Medicine Brain Injury Interdisciplinary Special Interest Group Mild TBI Task Force. Management of concussion and mild traumatic brain injury: A synthesis of practice guidelines. Arch Phys Med Rehabil 2020;101(2):382–93. doi: 10.1016/j.apmr.2019.10.179.
11. Turner-Stokes L, Pick A, Nair A, Disler PB, Wade DT. Multi-disciplinary rehabilitation for acquired brain injury in adults of working age. Cochrane Database Syst Rev 2015;2015(12):CD004170. doi: 10.1002/14651858.CD004170.pub3.
12. Thomas E, Chih H, Gabbe B, Fitzgerald M, Cowen G. A cross-sectional study reporting concussion exposure, assessment and management in Western Australian general practice. BMC Fam Pract 2021;22(1):46. doi: 10.1186/s12875-021-01384-1.
13. Treleaven J, Carberry K, Cook H, Fulcher D, Syme C, Galea O. Prevalence of cervical, vestibulo-ocular and or physiological impairments in symptomatic individuals 4 weeks to 6 months post-concussion. Musculoskelet Sci Pract 2025;79:103381. doi: 10.1016/j.msksp.2025.103381.
14. Ponsford J. Rehabilitation interventions after mild head injury. Curr Opin Neurol 2005;18(6):692–97. doi: 10.1097/01.wco.0000186840.61431.44.

15. Vikane E, Hellstrøm T, Røe C, Bautz-Holter E, Aßmus J, Skouen JS. Multidisciplinary outpatient treatment in patients with mild traumatic brain injury: A randomised controlled intervention study. Brain Inj 2017;31(4):475–84. doi: 10.1080/02699052.2017.1280852.
16. Rytter HM, Westenbaek K, Henriksen H, Christiansen P, Humle F. Specialized interdisciplinary rehabilitation reduces persistent post-concussive symptoms: A randomized clinical trial. Brain Inj 2019;33(3):266–81. doi: 10.1080/02699052.2018.1552022.
17. Thastum MM, Rask CU, Næss-Schmidt ET, et al. Novel interdisciplinary intervention, GAIN, vs. enhanced usual care to reduce high levels of post-concussion symptoms in adolescents and young adults 2-6 months post-injury: A randomised trial. EClinicalMedicine 2019;17:100214. doi: 10.1016/j.eclinm.2019.11.007.
18. Heslot C, Azouvi P, Perdrieau V, Granger A, Lefèvre-Dognin C, Cogné M. A systematic review of treatments of post-concussion symptoms. J Clin Med 2022;11(20):6224. doi: 10.3390/jcm11206224.
19. Terpstra AR, Louie DR, Iverson GL, et al. Psychological contributions to symptom provocation testing after concussion. J Head Trauma Rehabil 2023;38(2):E146–55. doi: 10.1097/HTR.0000000000000796.
20. Martin AK, Green TL, McCarthy AL, Sowa PM, Laakso EL. Allied health transdisciplinary models of care in hospital settings: A scoping review. J Interprof Care 2023;37(1):118–30. doi: 10.1080/13561820.2022.2038552.
21. Smith MJ, Major BP, Cowen G, et al. Research priorities for diagnosis, prognosis, and rehabilitation following concussion: Results from a national survey of Australian health professionals. Disabil Rehabil 2025;47(9):2258–66. doi: 10.1080/09638288.2024.2391108.
22. Barnhart M, McLeod TV, Bay RC. The ability of vestibular and oculomotor screenings to predict recovery in patients after concussion: A systematic review of the literature. J Athl Train 2024;59(1):49–65. doi: 10.4085/1062-6050-0429.22.

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