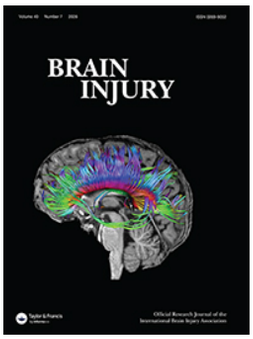

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Managing concussions in New Zealand secondary schools: Let's take it seriously

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ABSTRACT

Introduction: Concussion can cause lasting cognitive, physical, and emotional challenges, impacting academic performance. New Zealand secondary schools lack sufficient knowledge and resources to support affected students. We co-designed and implemented the Framework for Management of Concussion in New Zealand Secondary Schools (FRANCS).

Aim: To explore experiences and perceptions of school stakeholders during 2 years of FRANCS implementation.

Methods: Sixty-nine participants from 12 schools (students, parents, staff, and healthcare providers) took part in semi-structured interviews or focus groups. Data were analyzed using framework analysis to identify themes.

Results: Four themes were developed: (1) Flexibility of implementation – friend or foe; (2) Owning the process; (3) The process is too onerous; and (4) External context and confounders.

Conclusion: FRANCS' flexibility enabled some schools to adapt and integrate it into existing communication pathways, supporting students' return-to-learn. Others faced challenges, resource limitations, and low engagement. Effective implementation requires initial external support to tailor FRANCS to school contexts, establish communication and monitoring systems, and embed return-to-learn processes.

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Concussion; secondary schools; return-to-learn processes; qualitative methods; mild traumatic brain injury

Introduction

Adolescent concussions (mild traumatic brain injuries) pose increasing concerns internationally (1). Compared to adults, children and adolescents have higher risks for sustaining concussions and for prolonged symptoms, such as headaches, fatigue, loss of concentration, and emotional regulation (2). Collectively, such symptoms can impact their learning, physical activity, mental- and health-related quality of life, and their family and social relationships (3). Early detection of concussion and graduated return to learning and sport/activity are important to optimize recovery and long-term outcomes (4). Yet it is estimated that up to 50% of concussions in youth are under-reported or reported late (5,6), delaying recovery (4). Poor concussion reporting may be due to poor knowledge of signs and symptoms, low awareness of potential long-term impacts, limited access to health services, and in a sport setting a desire to continue competing (7,8).

Optimal concussion management in school settings involves multiple stakeholders in decision making: students, parents or caregivers, school and sports staff (teachers, administrators, coaches), and healthcare providers. Guidance exists around graduated return to learn (RTL) and some countries have developed policy or legislation to support implementation (9). RTL entails a structured, symptom-guided plan for students to safely resume academic activities and may include increasing duration of cognitive load, screen time and school attendance, brief rest periods and accommodations for assessments and examinations (10). Facilitators of implementation of RTL and return-to-sport (RTS) guidelines include stakeholder concussion training, using existing school processes, and having well-defined roles and communication systems (9–12).

We previously evaluated a New Zealand Rugby community Concussion Management Pathway (CMP) which highlighted a lack of knowledge and resourcing in schools to support players with concussion (13). The rugby-focused study indicated that although RTS guidelines were generally implemented well, RTL guidelines were often not followed. To address this gap, we co-designed and implemented a FRAmework for maNaging Concussions in secondary Schools (FRANCS) (14–16).

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Box 1. Implementation components of the Framework for Management of Concussion in Secondary Schools (FRANCS) (15).

1. Defining a designated school concussion officer (or coordinator)
2. A direct concussion reporting line to report a suspected concussion of a student and to facilitate communication within the schools and with coaches, parents and external healthcare providers. That could include a designated e-mail address (e.g. concussion@schoolname.schools.nz) linked to the concussion officer's e-mail address
3. An automated e-mail response from the reporting e-mail address, providing immediate concussion advice.
4. Defined responsibilities for identifying and reporting a concussion to and within the school.
5. Monitor appropriate immediate referral for medical care and access to on-going healthcare. While school staff are not responsible for making healthcare appointments, they should encourage the student and their parents/whānau to do so. The exception is for students of boarding houses, in which case the house parents organize such appointments and follow-up.
6. Define a communication plan for all relevant stakeholders.
7. Defining and monitoring students' academic adjustments and return to learn and physical activity/sports until medical clearance has been confirmed.

FRANCS was developed independently to the New Zealand Rugby CMP to include all sporting and non-sporting concussion injury mechanisms.

The framework includes appointing a designated concussion officer, establishing clear reporting processes, defining staff responsibilities for identification, communication and coordination with families and healthcare providers (Box 1). Concussion training and resources are provided for school and sports staff, students and parents. The framework includes ongoing oversight of students' academic adjustments, RTL and RTS, encouraging appropriate medical clearance before returning to contact sports. The framework is designed to be flexible, enabling schools to tailor implementation to their needs and resources. We implemented FRANCS in 5 schools in 2022, expanding to 7 additional schools in 2023 (14). At the end of each year, stakeholders were asked to complete a post-implementation survey. Stakeholders from 11 of the 12 socio-economically diverse schools reported in a post-implementation survey that they would use FRANCS beyond project completion, suggesting sustainability (14). Yet challenges were also evident, including inconsistent buy-in from some stakeholders (14). This study aimed to explore participants' (students, parents, and school staff) experiences of barriers and facilitators to FRANCS implementation, and their views on its value, utility and outcomes for school-based concussion management. The findings of this study will inform future development and implementation strategies, particularly for a national roll out.

Methods

Design

This study is part of a broader Community-Based Participatory Action Research (CBPR) study involving school stakeholders in the co-design of FRANCS (16–19). To ensure our findings were both practically relevant and theoretically grounded, we adopted a descriptive qualitative approach situated within a pragmatic paradigm (18). Descriptive qualitative research aims to provide a comprehensive account events using everyday language of those involved. Pragmatism emphasizes 'what works' to address the research question, viewing knowledge as a tool for action and valuing ideas or intervention according to their practical consequences and capacity to generate workable solutions for real-world problems (20).

Our analysis and interpretation were further informed by principles of realist process evaluation (19). Pragmatism aligns with realist process evaluation in that both move beyond determining whether an intervention works, toward investigating how, for whom, and under what circumstances it succeeds or fails. While pragmatism primarily seeks to determine if an intervention provides a functional response to a problem, the realist lens adds explanatory depth by exploring underlying mechanisms and contextual conditions that drive those outcomes. We thus conceptualized FRANCS not as a rigid set of rules, but as a resource and how these responses were influenced by contextual factors. Guided by realist principles, we aimed to provide a descriptive account of the implementation process and the factors influencing how that process was experienced and perceived. The University of Otago Human Ethics Committee approved the study. All participants and parents of students aged below 16 years, provided written or orally recorded informed consent.

Positionality

Researchers' interpretations of findings were also shaped by their own beliefs and values. Within our team, a subset of members holds a strong passion for rugby and for player welfare. It was this focus on player welfare that identified the gap between RTS and RTL processes, prompting the development of FRANCS. One researcher (DS) was previously the research officer of New Zealand Rugby and had led implementation of the CMP. While her role was in initiating FRANCS, New Zealand Rugby had no further input. The involvement in the CMP was complemented by the expertise of the multidisciplinary team, including sports physiotherapy, youth sports development, secondary school health and physical education, work-integrated learning, ethnic and cultural considerations, and sports ethics. Two team members (AZ, KM) and three additional team members (CS, MH, RC) undertook the face-to-face communication with the schools, providing concussion education, supporting the schools and monitoring students with reported concussion with near-weekly visits, as well as leading the post-implementation interviews.

Participants

In 2022 and 2023, stakeholders involved in the implementation of FRANCS in 12 secondary schools in Auckland, Hawkes Bay, and Otago, New Zealand, were invited to be interviewed (14). Each school had a concussion officer appointed at the onset of FRANCS who sent study information to students with

a reported concussion and their parents, then forwarded interested respondents' details to the researchers. School staff and healthcare professionals involved in the FRANCS implementation were invited to participate in interviews or focus groups toward the end of both school years. School staff included administrators, teaching and boarding house staff, and sports coordinators and coaches. Healthcare providers could include school nurses, physiotherapists, and medical doctors and were based in or were associated with the schools.

Data collection

We took a pragmatic approach, combining individual interviews, dyad interviews (21), and focus groups facilitating access for a broad range of stakeholders. Data were gathered by a team of six researchers experienced in both quantitative and qualitative methods. Team members experienced with qualitative research methodologies trained the team to ensure a consistent approach to all interview formats and focus group sessions.

Throughout the school year, five members of the research team (AZ, KM and three additional team members) conducted near-weekly school visits to provide concussion training, support implementation, and to follow up with concussion officers and students. Those five researchers also conducted semi-structured individual or dyadic interviews with students post-recovery, some accompanied by parents, and facilitated focus groups with school staff and healthcare providers

Stakeholder-specific interview and focus group guides explored participants' experiences with the FRANCS implementation and their views on its value, utility, and outcomes for school-based concussion management (Appendix 1). All sessions were held face-to-face, audio-recorded, and had median durations of 16 minutes (individual interviews), 26 minutes (dyads) and 69 minutes (focus groups).

Analysis

Audio-recordings were transcribed via Otter.ai, verified by researchers and organized in NVivo V20 (Lumivero). We used framework analysis to compare results across schools and stakeholder groups (22). Framework analysis is ideal for cross-site comparisons as it organizes data into a matrix, with rows for cases/participants (schools in our study) and columns for themes, enabling a detailed comparison across themes. First, three researchers (DSk, MB, AZ) familiarized themselves with the data (22). Each researcher then independently coded (inductively) a subset of transcriptions. By comparing and discussing these codes within the team, we built an analytical framework. The transcripts were organized into matrices that summarized the data by category (AZ, DSk). We created summaries for each school and stakeholder group, using the matrices to define patterns and themes. We examined agreement and disagreement within each school, then compared findings across schools to identify broader trends and differences. All team members reviewed findings until we were satisfied the themes comprehensively described the data.

Table 1. Student, parent, school staff, and healthcare provider participants.

Stakeholder	Format	Total participants
Students	Individual interviews	17 students
	Dyads	2 students
Student/parent	Dyads	3 students, 3 parents
Parents	Individual interviews	6 parents
School staff	Individual interviews	6 school staff members
	Dyads	14 school staff members, including 1 nurse
	Focus groups	16 school staff members
Healthcare provider	Individual interview	1 nurse, 1 physiotherapist

Findings

We included 69 participants across both years (17 in 2022): 22 students (11 girls), 9 parents, 36 school staff, 1 school nurse and 1 physiotherapist (Table 1). Students had a median age of 15 years (range 13 to 18); 2 identified as Pacific Islanders, 2 as Māori, 1 as Chinese and the remainder as NZ European or European.

Our analysis of participant experiences and perceptions identified four inter-related themes representing factors influencing FRANCS implementation (Figure 1). Across-school variability was evident for the implementation processes.

Theme one: flexibility of implementation – friend or foe

The first theme described the inherent flexibility of the framework, as a catalyst for how the process would unfold in different schools. The framework's flexibility required active engagement from school leadership and staff to adapt it to their context. During the design of FRANCS, it was clear that the framework would have to be flexible to meet the needs of diverse school contexts. However, a pivotal factor determining successful implementation was the level of engagement and support from school leadership and staff. Implementation was influenced by schools' resources, clear concussion officer designation, defined staff responsibilities, individualized RTL and RTS processes, and support for researcher-led concussion training. Schools demonstrating commitment valued the framework, leveraging its inherent flexibility to modify guidelines according to their needs and resources. These schools had high staff engagement and promoted it to other schools and sports clubs.

> [FRANCS] just gave us guidelines. So that then we could maybe [modify] it to what we wanted it to be and then to what would work for us (. . .). It's always good to fall back on you know, the templates that we can give out to parents. And I've actually shared it with the girls' school next to us just because they had nothing and they found the same - it kind of gives you an idea of what you should be doing and what should be happening and then you do as much as you can, and adapt it to the situation in the school. (School Administrator, School K focus group, 2023)

Schools struggling with implementation perceived the flexibility to be a burden on staff time and resource. These schools remained reactive rather than proactive, leaving concussion management largely to the individual student and their family.

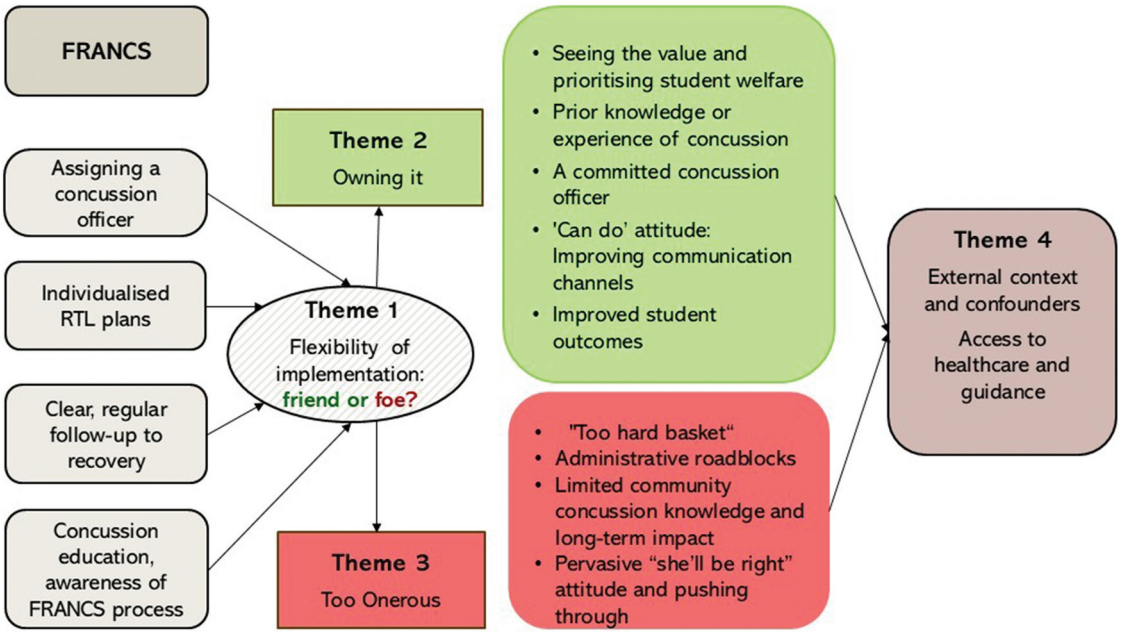

Figure 1. Model of the themes and sub-themes. RTL: return-to-learn; RTS: return-to-sport.

> So there's probably only three groups that were involved and the person reporting it. So once it came to me and I gave it to [the researcher], I didn't really have too much more to do with it, to be perfectly honest. And then they got their referral sorted, and then I left it to them, really, they've left them to the doctors and the specialists to sort out what was going on. (Director of Sport, School T interview, 2023)

The next two themes explore factors that influenced implementation from schools who either bought into the process (owning the process) or did not buy into the process (too onerous).

Theme two: owning the process

Participants who believed the framework was successfully implemented in their schools noted the importance of alignment between school leadership and staff, a recognition the framework's value, and commitment and capacity to operationalize it effectively.

Seeing the value and prioritizing student welfare

Successful implementation from participants' perspective meant schools took ownership of and valued the framework. Their leadership prioritized students' recovery and welfare over sporting success and demonstrated clear commitment to the framework to the school community.

> I think too, the parents, maybe because we put it on [the School] website a couple [of] times. So it made the parents a bit more aware of the (. . .) seriousness of a concussion. Instead of thinking "oh, he's got a bit of a headache, just wait for a couple of days," and "away you go, he's got an important game coming up." (School Administrator, School K focus group, 2023)

> Participant 1: I think with FRANCs what it's done (. . .) it's heightened our awareness. So, it's made us vigilant.

> Participant 2: It's probably just streamlined our processes more because we already had processes there, but there was a few things that we probably needed to do and just streamline that. (Teacher and Sports Co-ordinator, School O focus group, 2023).

Prior knowledge or experience of concussion

Staff in schools who were satisfied with their implementation of the framework, were aware of the intricacies and the required post-injury time for students' return to function. Some had been involved in the implementation of the New Zealand Rugby's CMP. Such prior personal experience supporting a student player through the recovery process and general knowledge about concussion facilitated implementation.

> I think enough teachers know about concussion, and the length of time that it takes for students to be functioning . . . as they were, yeah absolutely. I didn't realize myself until managing rugby how long it can be for them. And the different types of concussions that they had. Just think about [named student] it's taken him ages to recover, just like it's good now, but there was a long process and we were really good at managing his days and the communication with parents and schoolwork. (Teacher, School W focus group, 2023)

When leaders' values were similar to those of the teachers and support staff, a positive internal environment was created that appeared to enhance implementation of FRANCS. Suspected concussions were identified proactively and reported to the designated concussion officer, activating processes for the student and their parents.

> Participant 1: The primary thing was having a designated person, (. . .) sort of kind of the first port of call for parents and [school administrator] establishes a good relationship a lot of our students anyway and their families and so it's easy, they'd have those discussions about other aspects of their lives, it just comes out in discussion. So, we're pretty lucky the way it's set up but without

that, I think it would struggle to be honest. (Assistant Principal, School K focus group, 2023)

Appointing a committed concussion officer

Successful schools appointed an appropriate concussion officer who championed the framework. The concussion officer did not need healthcare qualifications but was committed to the responsibility of being the 'go-to' person for staff, students and parents.

Participant 1: And the playground accidents go straight to [school administrator] anyway. It's quite good having [school administrator] as the same hat because you get all the phone calls.

Participant 2: (. . .) We have incident reports forms for anything that happens here at school. And so that was shared with me. (. . .) Hopefully there's not too many [students with concussion] slipping through. (Assistant Principal and School Administrator, School K focus group, 2023)

Having a 'can do' attitude: improving communication channels

Staff 'ownership' of FRANCS enhanced improvements and enhanced communication channels with coaches and parents. The framework's flexibility enabled schools with a 'can do' attitude to adapt and expand processes effectively.

Participant 1: I think, one thing that has been really good is when you send an e-mail and stuff to all the people involved. (. . .)

Participant 2: I think so. So, I e-mail our [Sports Co-ordinator] and [Learning Enhancement Director], and then all their teachers and coaches just saying, 'So and so has a concussion. He's on a 23 day stand down until he's reassessed by the doctor. He may need time out of class, or they may need accommodations made in class to help them may need extra time and so forth.' So, everybody's fully informed that needs to be at school, I think that's really important. Otherwise, teachers don't know why Johnny is, you know, laying on the desk with a headache and feeling horrible. (Sports Director and School nurse, School L focus group, 2023).

Participants identified a number of factors that improved communication channels (Figure 1). Successful schools developed efficient reporting systems between administration, teaching and sports coaches. Examples included e-mail communications with parents, school administration and communication systems or portals, and Microsoft ® Excel spreadsheets to track student progress, adapting these as needed. They recognized the importance of pastoral care, physical rehabilitation and well-supported RTL for their students.

I think it'd be better this year, we've got a more accurate spreadsheet. Everyone's got access to it so that if, if someone is reporting a concussion that happened during the weekend or off site, then they can go into there and do that. So, it's not just me doing everything and me having to find out. I think that worked really well. I think it was quite comprehensive. We added on the bit at the end about checking in with the boys. . . . I would check in with them once a week just to see how their symptoms were. Had they been back to the doctor or, and how schooling is going, [the teacher in charge of sports] would check in with teachers. So, I think it went reasonably well, we definitely have more reported concussions than we have in the past, I think, and I think that was just because people are more aware. (School Administrator, School K focus group, 2023)

These schools described clear staff roles and responsibilities for those monitoring individual students with concussion, and RTL and RTS requirements. Care was taken to send information only to relevant staff, with the concussion officer maintaining oversight. These schools proactively sought out students with suspected concussions, encouraging them to seek medical advice.

If I know about it, I'm encouraging them to see a doctor and I think maybe, because I know [the Physical Education teacher] is really vigilant on it, and we follow some of the other sport, we don't get it as much. But I think that I probably need to add another step and be vigilant and contacting the parents and finding out if they've gone through that process. And had that concussion identified. (Teacher and Sports Co-ordinator, School O focus group, 2023)

From a sports point of view, I think quite often there's, there's such a grey area around oh did he get concussed. (. . .) I had a boy, my basketball tournament at the end of the year. And his mom was like, he's fine to play. And I said, I'm not comfortable about this. So it was his last tournament, he didn't play at all. And I said that unless you've got a doctor's certificate. Because I just didn't want that risk. As much as you know, I felt for the kid that yeah, ultimately did the right thing. (Dean, School B focus group, 2023)

Improved student outcomes

Implementing FRANCS was perceived to enhance concussion outcomes for the school, parents and students. Improvements included recording and capturing student concussions, increased concussion prevalence awareness, and overall internal school communication and with parents and coaching staff. Staff sought to improve their concussion knowledge. The concussion officer regularly monitored students' symptoms and recovery processes. These schools found FRANCS easy to follow and students appeared to feel supported.

As I say that talk [the researcher's concussion presentation] at the beginning of the year was really valuable, highlighted a lot of good things. It can be reinforced, even those that are aware of concussion, just the reinforcements and the severity of what it could be like if we ignore the symptoms. (. . .) And keep it that, you know, getting back to school and getting back to learning is first, not getting back on the sports field. (Assistant Principal and School Administrator, School K focus group, 2023)

Parents felt supported by the school in the care of their child. Once the parents knew whom to contact (the concussion officer), they appreciated being able to communicate concerns about the students' RTL progress.

Parent: Yeah, yeah, definitely cool. In the end, she felt confident going to the office and saying, I've got a concussion. And she knew that I've been talking with [admin]. And that's the first point of contact for the students going into the office. (School W, parent interview, 2023)

Interviewer: And are you satisfied with the process of school reassuring her that she didn't need to stress?

Students expressed feeling overwhelmed when returning to school post-concussion. The school's RTL support gave them confidence and reduced their feelings of loneliness, they felt supported by the accommodation of time and provision of quiet spaces for breaks. They also appreciated the weekly check-ins from the concussion officer or the researcher and

help to prioritize classes and managing schoolwork. Students described helpful external healthcare support (such as occupational therapists or physiotherapists), assisting them to self-monitor and regulate their recovery. However, some students found that, while absence from class was encouraged, catching-up on work could be difficult, often being assisted by classmates.

> Student: Just to help the student out so they don't feel alone. They know what to do instead of just going into straight into schoolwork and make their concussion worse for themselves (. . .) (School O, student interview, 2023)
>
> Interviewer: Do you see value in having a school process in place to manage concussions?

Theme three: the process is too onerous

This theme described the perceptions and experiences of schools with limited engagement, struggling to make a commitment to adopt and adapt FRANCS within their environment. While these schools demonstrated initial support for FRANCS, its adaptable design became too onerous, requiring continued external guidance. Those schools seemed to only follow the framework superficially, depending on students, families, external health professionals, and research staff to handle concussion management and communicate with the school.

'Too hard basket'

Some schools found the concussion reporting and follow-up requirements simply extended beyond their capacity and were in the 'too hard basket,' facing staffing limitations or high turnover, communication challenges, and competing time demands. If concussions were reported, they were recorded on an ad hoc basis, with the responsibility to coordinate RTL remaining with the student and their family.

> Participant: I assume that [oversight] still happened with the individual teachers [. . .] I'm just assuming that the teacher, the parents, and the student who was concussed, were told, and they were managing their academic plans. But we need to know probably, there's probably an issue there.
>
> Interviewer: Do you know if there's anybody that was managing or coordinating extensions for exams or an assignment?
>
> Participant: Again, left up to the individual with their teachers.
>
> Interviewer: Was there anybody that was informing coaches, managers, you know, extracurricular teachers of their return to learn plan?
>
> Participant: No. (Sports Master, School T, interview 2023).

Administrative and communication roadblocks

These schools reported being challenged by the monitoring and reporting processes, struggling to fully implement or integrate the framework with existing administrative processes. Factors that impacted efficient integration included administrative overwhelm and communication breakdowns.

Multiple concussion reporting pathways increased administrative burden for some schools. Lack of concussion officers and unclear reporting systems hindered follow-up implementation. Informal reporting risked inadequate student tracking and RTL processes. These participants found the framework's practical processes overwhelming, requiring additional staff support.

> I'm happy to organize seeing the doctor and getting them assessed, and so forth, and then handing those names on to [Sports Co-ordinator]. But for us to follow-up, that's really time consuming. And I just don't have that time on my job. other than having the boys come back to be reassessed by [School Doctor] and maybe talking to the parents and on the medical side of things. I just do the medical part of it. So, yeah, that's the that's the hard part. I just can facilitate the initial part of it, but in the end part when they've been cleared, and so forth. (School nurse, School L, focus group, 2023)

These schools appeared to be dis-engaged with parents and external coaches or sports clubs, thus less proactive in establishing effective communication channels. Concussions identification relied solely on school incidents or self-reporting. These schools appeared reluctant to investigate external injuries or enforce mandatory stand-down and RTL requirements.

> If it's a skiing head knock with the family over the weekend, it's less likely to go to a GP for review. And then the boys will come in and go, "I think I'm concussed again." Yeah, so we see quite a lot of repeat ones. (Director of Learning Enhancement, School L, focus group, 2023)

All schools relied on the students, parents or caregivers to provide certifications for diagnosis, rehabilitation and medical clearance or provided consent for healthcare providers to forward medical information directly to the schools. Schools that found implementation challenging, appeared reluctant to encourage certification or confirmation of clearance for RTS.

> Interviewer: How did the school find out about the doctor's visit? [. . .]
>
> Participant: Just been told, well, we didn't really. Probably we just didn't get any information after I sent them to the doctor. Just trusted the process that they were being looked after really [. . .] And then the players would come and tell us whether they're due back.
>
> Interviewer: Was there any information given to the school from the medical teams? Participant: No, not that I know of. (Sportsmaster, School T, interview 2023).

Limited community concussion knowledge and long-term impact

Insufficient understanding of concussion severity, long-term effects, and RTL processes contributed to limited school and parent engagement. Some parents appeared resistant to accept, or misunderstood, concussion seriousness and mandatory stand-down requirements. When schools encountered community resistance to stand-down periods or information sharing, the schools often retreated from follow-up support. The framework functioned primarily as a reporting mechanism rather than monitoring and supporting the student with concussion until healthcare clearance.

> [The student] definitely just banged heads on the corner of her eye. And she ended up in A&E [Accident and Emergency Department]

and I ended up in there with her looking after her for the afternoon. And she was vomiting. She was out of it. Not in a great space. So I had to get her back to [hometown] that night on a plane. Just got her back to her parents. And I said to her parents, look, here's all the information. I really think she needs couple of weeks off. Because at first they were like well she could play towards the end of the weekend, I was like no. But then she got out and did the [race] cycling, racing that weekend. And they're like, well, our son fell off his bike a few weeks ago. He was just out for a few days and everything was fine. And you can't, like, [the parent's] a [medical professional], right? [They're] not gonna listen to me if [they] think [they] know best. I mean, I was dealing with the doctor at the hospital and then I had to put [the parent] on and, just, they came up with the plan themselves. It's a hard one sometimes. And you just got to leave those things. (Teacher, School S, focus group, 2023)

Pervasive 'she'll be right' attitude and pushing through

These schools found it difficult to address entrenched concussion attitudes that disregarded stand-down periods, allowing students to continue playing or returning to play before fully recovered. Parental and coach pressure often negated schools' commitment to enforcing stand-down periods and RTL protocols, reflecting a 'she'll be right' attitude. These staff often took a more passive approach to concussion tracking and medical clearance, deferring responsibility to parents or coaches.

I found out the students had been concussed a week after it happened on a Saturday. That's what we heard. Someone got concussed and they're back at school, no plan no nothing. Yeah, that's an area that we probably need to work on. From a sports point of view, I think quite often there's, there's such a grey area around oh did he get concussed like is it a concussion. And then quite often I'd have conversations with coaches, and they'd be like, No, he's not. And then I'd talk to someone else, like he definitely got knocked out. And then the boys obviously go no I didn't because he wants to play. (Teacher, School WB, focus group, 2023)

Schools challenged with RTL implementation regularly left students (and parents) to manage their concussions themselves. Students in these schools appeared to have struggled with schoolwork. Students recalled 'pushing through' by taking pain relief for headaches and nausea, calling parents because they had no one to talk to at school, lacking academic support, and having to repetitively inform teachers about their concussion.

Interviewer: How did you find the next couple of days after?

Student 1: Oh, quite, I felt working like a bit harder. Because I felt like quite nauseous when I was really trying to read the words or look at the words. But I went through my days. And then it just got progressively better [. . .]

Interviewer: Did your teachers know?

Student 2: My social studies teacher noticed that, because we had a test that day, that I looked real pale and not the best. So . . .

Student 1: Yeah, my math teacher knew. I told him about it. And um, because I went, I was a bit dizzy, in class, well just a bit in class so that's when I went to go get an ice pack. (School WB, student focus group, 2023)

Theme 4: external context and confounders

This theme described external confounders affecting all schools regardless of their framework implementation success. A primary confounder was inconsistent access to healthcare practitioners and concussion advice. Some schools actively encouraged families to consult GPs, following up on advice where possible, while schools finding the framework 'too onerous' viewed limited medical access an additional barrier.

Healthcare access was facilitated differently across schools. Some had school-based nurses or on-site healthcare staff recommending GP assessments, while concussion clinics provided specific access for rugby players. In some schools, students consulted concussion-trained physiotherapists or nurses as alternatives to GPs. Lack of or delayed access to concussion-trained GPs and their cost to the families were key barriers. Lengthy GP appointment wait times meant students could be symptom-free by appointment time. Communication between GPs, parents and schools was problematic, compounded by privacy restrictions on medical information sharing. Participants reported conflicting opinions between healthcare providers, generic GP advice, parental interference with medical recommendations, unclear steps, and overly conservative approaches. Access to consistent, informed guidance from healthcare providers on concussion remained a barrier regardless of geographic location or funding.

Participant 1: The hole in the system is the doctor because of finance, or accessibility, or transport, whatever, parents don't see the need or whatever. So that's the flaw in this. We can record, we can monitor, but ultimately, they need to be seen by a doctor. If they don't, we can just keep on not letting them play sport . . . so I can see that needs to be resolved somehow.

Participant 2: I mean, as much as we can encourage people to see a doctor, it's a cost. (Assistant Principal and School Administrator, School K focus group, 2023).

Discussion

We previously reported processes and outcomes for co-design and implementation of a FRANCS for the New Zealand context (14–16). In this paper, we explored participants' experiences of barriers and facilitators to FRANCS implementation, and their views on its value, utility and outcomes for school-based concussion management. The inherent flexibility of FRANCS encouraged many schools to adopt and tailor the processes to existing communication and monitoring systems. Students reported feeling supported in their RTL, and parents valued the improved communication with school and coaching staff. Conversely, other schools preferred a prescriptive protocol, challenged to adapt FRANCS to limited resources and remained dependent on researcher and parental assistance. In those schools, students reported largely self-managing their RTL and RTS while coping with varying concussion symptoms. Delayed access to appropriate healthcare providers and inconsistent concussion advice acted as external confounders or barrier across all schools.

FRANCS is applicable to concussions from any cause: non-sporting accidents and injuries incurred across any sports (23). During the two-year implementation, around 90% of the 12 schools' recorded concussions were sports-related, with rugby accounting for 60% (14). Yet under-reporting of concussion is well documented in sports-related contexts (24,25), and that under-reporting may be even more pronounced among individuals for non-sports-related concussions (26). A concussion resulting from family violence and several accidental injuries highlighted the framework's relevance for non-sport incidents, which carry added emotional and cognitive burdens. These cases highlight the importance of a school owned, confidential, and trustworthy system for supporting affected students and their families.

Who benefitted and under what conditions?

The diffusion of innovation theory posits that adopting a new intervention depends on perceived superiority over usual practice and alignment with end-users' values (27). Recognising FRANCS's value and the seriousness of concussion, and focusing on student well-being enhanced uptake, whereas a "she'll be right" attitude (common New Zealand colloquial term meaning that 'everything will be fine') common in sport contexts (15,28), served as a barrier. System readiness for implementation is crucial (27). Implementation succeeded in schools with a favorable organizational climate: strong leadership, clear managerial relationships, dedicated staff, and robust communication and data management systems (29,30).

Communication channels and efficient reporting systems were key facilitators compared to communication breakdown and administrative overwhelm in struggling schools. Clear roles and responsibilities, appointing a dedicated concussion coordinator, and existing concussion knowledge within school were strong facilitators for successful FRANCS integration. Lack of timely healthcare access and wherewithal or commitment of staff were contextual elements that challenged implementation. Such factors have also been reported previously, despite legislation in those countries (11,31–33). Other contextual factors reported elsewhere were geographical placement of the school, and socio-economic and cultural factors (34). Despite including schools of variable socio-economic levels, various cultures and rurality, those factors did not appear to influence our findings.

Implications

Flexibility and iterations

FRANCS's adaptability and flexibility allowed it to be implemented across heterogeneous school environments (Figure 1). To facilitate implementation, the process must be adaptive to each school's context, including school structure, staffing, and active engagement from students and parents (35). Schools staff who described modifying reporting requirements or merging concussion monitoring with existing administrative tools appeared to fare better. Selecting an effective concussion officer and securing leadership backing were critical (36).

Creating buy-in

Implementation depends on negotiations between participants and the 'plasticity' of the intervention (37). Peer modeling and opinion-leader endorsement may accelerate adoption (27,30,38). One school shared FRANCS documentation with a neighbor, illustrating the value of champion schools. Engaging students, parents, and staff as advocates and presenting 'real stories' from peers, can strengthen dissemination (39).

Successful implementation requires individual stakeholder motivation, capacity, and competence (30). Our previously reported post-implementation survey results indicated low compliance reported for staff, parents and students (14). As discussed in that paper, this may be due to high staff turnover, competing demands, high workloads, and limited engagement (14). Ongoing concussion training, using opinion leaders, and emphasizing potential long-term post-concussion disability may improve reporting by students and families, and may also enhance buy-in from school and sports staff (14,40).

External support

Researcher support and mentorship were pivotal for uptake (14,41,42). School support needs varied; some schools required intensive guidance while others quickly assumed responsibility. Sustainable roll-out will likely need tiered mentoring, depending on resources and past experiences with concussion or student wellness processes. This reflects the organic and iterative intervention process requiring constant framework modification and tailoring (36). 'Top-down' or macro-level implementation from the Ministry of Education, Accident Compensation Corporation (New Zealand's national injury scheme) and from national sports organizations may be needed for nationwide rollout (15,32). Collaboration is needed with organizations, such as Brain Injury NZ (https://braininjury.nz/about/) and Headway (https://www.headway.org.nz/) to promote and enhance FRANCS' visibility across the country.

Negotiating contextual challenges

Contextual challenges are inevitable (37), and resource and time constraints are common in concussion-management (10,32,43,44). Streamlined, simple processes increase adoption and sustainability (27,30). Future research should co-design tools with schools to minimize administrative load and leverage mentor schools for peer support. Partial implementation through simple reporting processes would embed basic administration, reducing perceptions of additional burden. As students and parents should maintain control and self-responsibility of their own health, concussion training and resources should be appropriate for the different cultures and stakeholders of the communities (14,15).

Timely GP access remains challenging in New Zealand (45,46). While schools are not responsible for arranging appointments, they can encourage care-seeking and collaboratively design RTL processes. School nurses, where available, were vital in initial care, diagnosis, and follow-up support (47). External physiotherapists critically identify possible concussions and support students in recovery and determining RTS

Box 2. Proposed phased approach to implementation Framework for Management of Concussion in Secondary Schools

1. Build concussion knowledge and address entrenched attitudes • Use real-world examples, credible role models, or internal opinion leaders to challenge 'push through' or 'she'll be right' beliefs. • Embed concussion messaging within existing pastoral, academic, or sports-related activities rather than creating parallel systems.	**Concussion Awareness**
2. Develop efficient, low-burden communication processes • Establish locally appropriate systems for reporting concussion, sharing medical clearance, and communicating academic adjustments. • Prioritise approaches that minimize administrative burden and align with existing school systems and workflows.	**Communication processes, responsibilities and accountability**
3. Assign clear leadership and accountability • Identify a dedicated concussion lead or small coordination team responsible for overseeing the RTL process. • Ensure this role has sufficient authority, visibility, and time to coordinate across staff.	
4. Clarify roles and responsibilities across staff • Explicitly define a concussion officer who is responsible for identifying and communicating with families, and for academic adjustments and monitoring progress. • Avoid reliance on informal knowledge or goodwill, which can undermine consistency and sustainability.	
5. Promote shared understanding of the value of FRANCS • Articulate how FRANCS supports student wellbeing, academic recovery, and staff confidence, rather than adding compliance burden. • Support early adopters and internal champions to model use of the framework and build broader staff buy-in.	**Enhance understanding support and confidence**
6. Building healthcare provider relationships • Recognise that access to healthcare may remain outside school control; where possible, develop local strategies to mitigate delays (e.g., clear interim academic supports while awaiting assessment).	**External relationship**

readiness (47–51). As direct-access professionals, physiotherapists and occupational therapists can be consulted without medical referral, initiating care when timely medical access is unavailable (50). Schools could pro-actively explore healthcare networks, advising students and parents lacking GP access.

Targeted implementation processes

Targeted processes that schools can consider are outlined in Box 2. Schools lacking capacity for immediate full implementation could consider staged approaches. Full competent implementation of FRANCS may require 2 to 3 years, acknowledging the general challenges, competing demands and burden schools face (15). The first phase of implementing the framework may begin with concussion education to enhance awareness of school and coaching staff as well as students and parents, and embedding messaging within existing systems (#1). The second phase could entail developing low-burden communication processes for reporting concussion, sharing medical clearance (with parent and student consent) and communicating academic adjustments (#2). Such reporting processes could be integrated with existing absence and student welfare systems. Based on our findings, clear leadership assignment and accountability (#3) as well as clarifying roles and responsibilities (#4) were considered critical. In a third phase, focus would be in enhancing understanding of how FRANCS supports overall student wellbeing and academic recovery (#5). Clear school leadership support is required for early adopters and internal champions to enhance broader school staff, coaches and parent/student confidence. Finally, building healthcare provider relationships could develop in parallel or in subsequent years (#6).

Methodological considerations

This study was informed by realist process evaluation principles rather than constituting a full realist evaluation. Although this approach enabled exploration of the interaction between context and mechanisms, we did not develop or formally test specific Context – Mechanism – Outcome (CMO) configurations (52). As a result, our findings provide a high-level, conceptual understanding of factors influencing FRANCS implementation rather than a detailed, theory-testing analysis of individual pathways. Nevertheless, this realist-informed approach offers valuable, practice-relevant insights into key implementation barriers and facilitators.

Participants were interviewed by the researchers who had supported them with the FRANCS implementation throughout the school year. In designing the study, we reflected on how the researchers' dual roles might influence the interview process. Pragmatically, we decided that their familiarity with FRANCS would facilitate richer, more nuanced data than an outsider could obtain. The researchers encouraged open and honest dialogue through open-ended questions. The resulting data, in which participants clearly identified barriers and challenges, suggest that they felt free to share their experiences. However, it must be considered that because of these existing

relationships, participants may have felt unable to communicate some barriers. The multidisciplinary author team acted as a critical sounding board throughout analysis, promoting critical thinking, helping to challenge assumptions and maintain reflexivity.

Conclusion

FRANCS was purposefully designed to be adaptable to individual schools' contexts. This flexibility was a seen as both a facilitator of implementation and a source of tension. School staff who reported satisfaction with the implementation, described integrating FRANCS into existing school-specific reporting systems, prioritizing student welfare, and drawing on prior knowledge or experience with concussion. In these schools, students and parents appeared to feel supported throughout concussion recovery and the RTL process. Establishing clear reporting and communication processes between families, school and sports staff may be critical to effective school-based concussion management. Barriers to implementation included limited prior concussion experience, low concussion knowledge or buy-in among staff and the wider school community, and administrative burden. Initial external support, tailored to each school's context, may be needed for establishing communication pathways, monitoring processes and RTL and RTS plans, paving the way for sustained, school-driven concussion management.

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Disclosure statement

Danielle Salmon was employed by New Zealand Rugby at commencement of this study and is currently employed by International Rugby Players Association.

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Data availability statement

Data are available on reasonable request to the corresponding author.

Ethics approval

This study involved human participants and was approved by Ethics name: University of Otago Human Ethics Committee H22/025, 28th February 2022. Participants gave informed consent to participate in the study before taking part.

Patient and public involvement

Patients and/or the public were not involved in the design, conduct, reporting, or dissemination plans of this research.

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