NEW ZEALAND
TE ARA TIKA O TE HAUORA HAPORI
MEDICAL JOURNAL

PUBLISHED BY:
PMA PASIFIKA MEDICAL ASSOCIATION Group

Vol. 138 | No. 1611 | 14 March 2025

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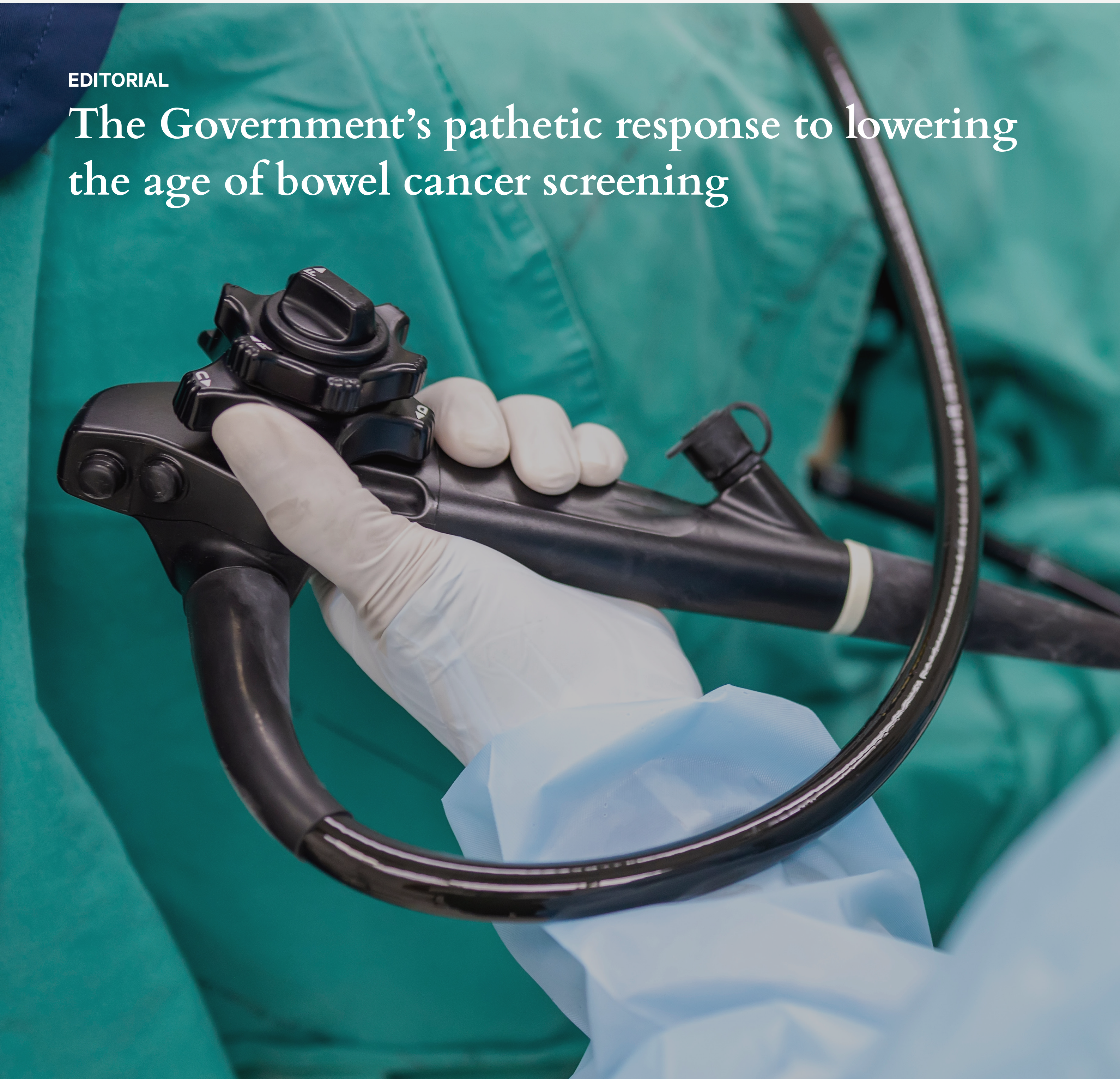
EDITORIAL

# The Government's pathetic response to lowering the age of bowel cancer screening



# Publication information

published by the Pasifika Medical Association Group

The *New Zealand Medical Journal* (*NZMJ*) is the principal scientific journal for the medical profession in New Zealand. The *Journal* has become a fundamental resource for providing research and written pieces from the health and medical industry.

The *NZMJ*'s first edition was published in 1887.
It was a key asset of the New Zealand Medical Association (NZMA)
up until July 2022.

It is owned by the Pasifika Medical Association Group (PMAG).

The PMAG was formed in 1996 by a group of Pasifika health professionals who identified a need for an association with the purpose of "providing opportunities to enable Pasifika peoples to reach their aspirations".

ISSN (digital): 1175-8716

## Editorial Board

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published by the Pasifika Medical Association Group

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**Further information**

ISSN (digital): 1175-8716
Publication frequency: bimonthy
Pubication medium: digital only

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# Summaries

## The Government's pathetic response to lowering the age of bowel cancer screening

*Frank Frizelle, Oliver Waddell*

In the buildup to the 2023 general election, during the televised leader's debate, the leaders of the two main parties were asked about whether they would lower the bowel cancer screening age. The Chrises (Hipkins and Luxon) both stated they would match Australia for bowel cancer screening, which at that time would have seen the age lowered from 60 to 50, and to 45 for some people. Eighteen months later, Australia has further lowered the age of colorectal cancer (CRC) screening to 45, and made it available to anyone from 40 following the patient having a discussion about the issues with their general practitioner—while in Aotearoa New Zealand, the new minister of health (the sixth in 5 years) announced on 6 March the lowering of the age from 60 to 58. Bowel cancer is increasing dramatically in those under 50 by 26% per decade overall, and for Māori it has increased by 36% per decade. The process around the introduction of bowel cancer has taken 24 years of delays, deferments and procrastination with failure to deliver in a timely manner, and has led to the potentially avoidable deaths of thousands of New Zealanders. This announcement on 6 March is the latest in a series of bad decisions, and delays in bowel cancer screening will cost further lives; the present Government's failure to deliver on its election promises is entirely consistent with the shocking approach to bowel cancer screening New Zealanders have had to live with and die because of since the 1990s.

## A falls early response service in Aotearoa New Zealand: a scoping review

*Heleen Reid, Celeita Williams, Teresa Cousins*

This study examined the available evidence on a joint service between occupational therapy and paramedics in a community falls early response service. The source information used involved a range of participants and different combinations of healthcare professionals. The findings suggest that a combined occupational therapy and paramedicine falls early response service in the community could bring benefits to people who fall, the ambulance service and hospital care providers.

## Accessing care in an unfamiliar environment: experiences of tūroro Māori and their whānau when transported outside their local area after a cardiac emergency

*Aroha Brett, Maia Watling, Felicity Bright, Sarah Penney, Bridget Dicker, Graham Howie, Karen M Brewer*

After an acute cardiac (heart) event, tūroro (patients) are often transported to a hospital with specialist cardiac services, sometimes far from home. Tūroro Māori and whānau who had been transported away from home following a serious cardiac event described the challenges associated with receiving care in an unfamiliar environment. The resulting uncertainty for the tūroro and travel and financial burden for whānau added to what was already a stressful time. Many of the challenges in this situation can be overcome with mana-enhancing communication.

## Variation in emergency medical service use for acute coronary syndromes by ethnicity: an Aotearoa New Zealand observational study

*Bridget Dicker, Vanessa Selak, Haydn Drake, Graham Howie, Andy Swain, Rochelle Newport, Sandra Hanchard, Shanthi Ameratunga, Corina Grey, Matire Harwood*

This study looked at how often different ethnic groups in New Zealand used emergency medical services (EMS) when they had a heart attack or similar serious and sudden heart problems between 2019 and 2021. The researchers found that out of 19,283 patients, Māori, Pacific, Indian and non-Indian Asian people were statistically significantly less likely to use EMS compared with Europeans. This was true for two types of heart attacks studied: STEMI and NSTEMI. The study suggests that there are barriers preventing these groups from using EMS. Strategies have been shown to improve healthcare access, such as good quality information, reduced costs and health professionals who are culturally aware and safe. By implementing these strategies, it may be possible to improve access to emergency heart care for non-European ethnic groups in New Zealand, so that they experience the same level of access as Europeans in this country.

### Distribution of prehospital times of major trauma cases attended by emergency medical services in Aotearoa New Zealand

*Bridget Dicker, Luisa Montoya, Gabrielle Davie, Rebbecca Lilley, Bridget Kool*

This study focusses on the time it takes for emergency medical services (EMS) to reach and transport major trauma patients in New Zealand, a topic not previously reported. The study found that patients who died before reaching the hospital had a faster EMS response time (median of 11.5 minutes) compared with those who survived (14.5 minutes). Similarly, patients who died within 24 hours of admission had quicker response and transport times. Researchers analysed data from 3,334 patients of all ages who suffered severe injuries (Injury Severity Score >12) or died between 2016 and 2018. Among these patients, 3.1% died before reaching the hospital, and 3.6% died within 24 hours of admission. Additionally, it highlights significant disparities in care based on sex and ethnicity. Patients of Māori ethnicity are over-represented in the total cohort (22%) and among those who died (29%), compared with their proportion in the New Zealand population (17%). The study also confirms that major trauma in New Zealand most commonly occurs among males and patients aged 15–64 years, with motor vehicle collisions (MVCs) and falls being the most common mechanisms of injury, while penetrating injuries are uncommon. This research is the first to map out prehospital times for major trauma patients in New Zealand, providing a crucial baseline for evaluating EMS timeliness.

### Injecting-related injuries experienced by people who inject drugs in New Zealand: impact, healthcare access and stigma

*Stephen Potter, Geoff Noller, Lavanya Pillay, Rose Crossin*

People who inject drugs (PWID) are at risk of injecting-related injuries and diseases (IRIDs), but little is known about these in Aotearoa. We aimed to characterise the impact of IRIDs and explore barriers to accessing healthcare for PWID, using mixed methods. IRIDs are a significant health risk in the Aotearoa injecting community and issues of stigma, discrimination and cost are significant barriers to healthcare. Needle exchange clients are seeking support from peer staff on IRID prevention and treatment, which reinforces the need for training to support staff in this role, and to recognise when clients may need to seek healthcare. This study highlights the importance of expanding harm reduction in Aotearoa and further destigmatisation of healthcare to ensure access to vulnerable and marginalised communities.

### Māori healthcare professionals' perceptions of psychedelic-assisted therapy: a qualitative study

*Carly Hanna, Eva Morunga, Alesha Wells, Lisa M Reynolds*

This study aimed to explore Māori healthcare professionals' current awareness, attitudes and perspectives on psychedelics and psychedelic-assisted therapy. Thirteen Māori healthcare professionals were recruited to participate in semi-structured qualitative interviews investigating psychedelic awareness, knowledge and attitudes using Māori health models Te Whare Tapa Whā and Te Wheke as a framework for data collection and analysis. Four key themes were identified as above. Our sample of Māori healthcare professionals generally supported research investigating psychedelic therapies in Aotearoa New Zealand. Improving awareness of this novel treatment is likely to influence its acceptability as a treatment option and will inform the cultural safety of its use with Māori.

### The readability of online laryngectomy patient information: how do Australia and New Zealand compare?

*Howard Webb, Jason Toppi*

Our paper aimed to look at the readability of online patient information materials for laryngectomy (removal of the voice box). We also aimed to compare Australian- and New Zealand-produced resources to resources produced in other parts of the world. Overall, it seems that these patient information materials are at risk of not being fully understood by the general population.

### Refining predictive risk models for stroke in atrial fibrillation: a scoping review and meta-analysis for Aotearoa New Zealand, Māori and Pacific peoples

*Karim M Mahawish, Harvey White, Valery Feigin, Rita Krishnamurthi*

Doctors use risk prediction models to estimate a patient's chances of developing a disease or experiencing a health event, like a stroke. These models are typically created using medical knowledge and data from specific populations, but risk factors can vary between different groups and regions. Our study reviews existing research to show how stroke risk prediction in patients with atrial fibrillation may not always be accurate for all populations. By identifying these differences, we highlight the need to refine risk models to ensure they work effectively for diverse patient groups.

### Fibrous dysplasia of the temporal bone presenting as a parotid abscess

*Kimberly D'Mello, Tanja Jelicic*

Fibrous dysplasia of the temporal bone (FDTB) is a rare condition in which fibrous tissue gradually replaces normal bone, leading to deformity and functional impairment. In this case, a 22-year-old Samoan man developed a painful swelling on the right side of his neck. Imaging revealed an abscess in the deep lobe of the parotid gland and abnormal bone changes in the skull, resulting in ear canal narrowing and infection. The abscess was drained, and the patient underwent surgery to remove the affected bone. This is the first reported case of FDTB presenting as a parotid abscess, highlighting key prevention and management strategies and underscoring the importance of early imaging in Pacific patients with similar symptoms to ensure timely diagnosis and treatment.

### Suicide attempts assessment in the medical wards: factors influencing admission to a psychiatric unit

*Pablo Richly, Matthew Jenkins*

When someone harms themselves, hospitals need to decide who needs ongoing mental health care in a psychiatric unit. To help make this decision, Waikato Hospital tested a new interview method for patients admitted after self-harm over 1 year. While most patients who harmed themselves did so impulsively and many had personal conflicts as triggers, the study found that only one factor—showing little regret after the attempt—helped predict who would need psychiatric hospital care. This finding suggests that detailed questionnaires might be less helpful than expected, and that mental health professionals should focus more on understanding each person's individual needs rather than using standard checklists to assess risk. The study also highlighted that many people who die by suicide in New Zealand have no previous history of attempts, emphasising how complex and challenging suicide prevention can be.

# The Government's pathetic response to lowering the age of bowel cancer screening

Frank Frizelle, Oliver Waddell

In the buildup to the 2023 general election, the televised leader's debate gave a chance for the public to see the main parties explain their policies and inform voters on how they would approach issues. The leaders of the two main parties were asked about whether they would lower the bowel cancer screening age. Both Chrises (Hipkins and Luxon) stated they would match Australia for bowel cancer screening, which at that time would have seen the age lowered from 60 to 50, and to 45 for some people.[1] Eighteen months later, Australia has further lowered the age of colorectal cancer (CRC) screening to 45, and made it available to anyone from 40 following the patient having a discussion about the issues with their general practitioner[2]—while in Aotearoa New Zealand, the new minister of health announced on 6 March the lowering of the age from 60 to 58.[3]

This announcement came alongside the decision to abandon the planned lowering of the screening age from 60 to 50 for Māori and Pacific peoples. The money that had been budgeted for this will now be used fund the cost of lowering bowel screening for everyone to 58, as it was claimed by the minster that this will diagnosis more cancers. Māori historically had lower rates of bowel cancer; however, this gap is rapidly closing. Māori are diagnosed at a younger age, experience higher rates of emergency presentation and are more likely to have advanced disease at diagnosis. Once diagnosed they face a significantly higher risk of death from bowel cancer. The disparities are driven by multiple factors, including inequitable access to diagnostic investigations and treatment. Given these challenges, Māori and Pacific peoples stand to benefit significantly from earlier screening. Lowering the screening age would have been a meaningful step toward reducing these inequities, and the decision to withdraw funding for this initiative also disregards Te Tiriti o Waitangi obligations.

The reason why reducing the age of screening is important is because CRC is increasing dramatically in those under 50 (early onset colorectal cancer [EOCRC]), while incidence in the total population is decreasing. The reason for this dramatic increase in younger people with bowel cancer is unknown; however, we do know that the best predictor of survival is stage at diagnosis, and that early diagnosis is likely to be beneficial and that population screening may facilitate this.[4,5] A recent New Zealand study[6] found that there were 56,761 new cases of CRC diagnosed in New Zealand between 2000 and 2020, of which the incidence of EOCRC increased by 26% per decade overall, and for Māori increased by 36% per decade.[5]

Patients with CRC are either diagnosed by the development of symptoms or by screening. In younger patients, particularly, waiting for symptoms to develop and then investigating them is a logistical challenge. Symptoms such as rectal bleeding, abdominal pain and altered bowel habit are non-specific, and very common in the general community with the vast majority of times due to benign pathology. As such, the significance of these symptoms in patients with CRC is easily overlooked, especially in young people. One study reported that the median time from symptom onset to starting treatment in those under 50 years of age was 217 days compared with 29.5 days in those over 50 years of age.[7] There are also many barriers to patients accessing primary health, with these being most pronounced in certain populations including younger patients,[8] as well as certain ethnic and lower socio-economic status groups.[9] There is also evidence these populations are less likely to be referred on for investigation or assessment by specialist services,[10] driving inequities in the diagnosis of bowel cancer.[4] While improving the diagnosis of symptomatic patients is critical, the reality is that for many patients, by the time symptoms appear, the cancer has already spread. This is most pronounced in younger individuals and Māori, who with our current approach face unacceptably high rates of stage 4 disease at diagnosis (up to 36%).[11]

Diagnosis of bowel cancer *prior* to the onset of symptoms remains the best way to improve survival. Screening asymptomatic patients (with faecal immunochemical test [FIT] and subsequent colonoscopy with a positive FIT) has been proved to be effective in older patients (>60 years).[12] Bowel cancers diagnosed by screening prior to symptoms developing have far better outcomes, with studies showing a 74% lower CRC-specific mortality compared with symptom-detected cancers.[6] In younger populations, the decreasing incidence rates of CRC previously made cost effectiveness, compliance and therefore benefit questionable. Now, with the increasing incidence of CRC in those under 50 years of age, modelling suggests screening with FIT and colonoscopy is cost effective from 40 years of age.[13] There is evidence that some countries screening below 50 have prevented the rise in EOCRC incidence.[4]

The increasing incidence of CRC in those under 50 has been reflected in the recommendations for screening for several major organisations in the United States (the National Comprehensive Cancer Network,[14] the US Multi-Society Task Force on Colorectal Cancer[15] and the US Preventive Services Task Force[16]), which are now recommending that screening starts from age 45. American health insurance companies are now required by law to fund CRC screening in their patients from age 45.[17] There have been similar calls to lower the screening age to 45 across Europe,[18] but as yet none of these countries have followed Italy and Austria in screening below the age of 50.

New Zealand has had one of the highest incidence rates of colorectal cancer globally for the past several decades.[19] Yet despite this, the history of bowel cancer screening in New Zealand has been disgraceful, with a very long gestational period.[20] A 1998 report stated that the benefit of CRC screening was likely to be similar to breast screening (which was well established and benefit proven in New Zealand by 1998); however, it had many reservations best summarised in this quote from that report: "*Given the modest potential benefit, the considerable commitment of health sector resources, and the small but real potential for harm, population-based screening for colorectal cancer with faecal occult blood tests is not recommended in New Zealand.*"[20] Subsequent to this, a 2004 report in bowel cancer screening in higher-risk groups recommended screening in high-risk patients.[20] A further report in 2006 from the Colorectal Cancer Screening Advisory Group recommended a specific faecal occult test.[21] Eventually in 2008, the incoming National Government was forced to support the introduction of screening after the exiting Labour Government included it in the electoral promises. This eventually lead to a pilot in the Waitematā District Health Board Region, and then to a rollout of the national programme starting in July 2017 and finishing in May 2022. This 24-year period of delays, deferments and procrastination with failure to deliver in a timely manner led to the potentially avoidable deaths of thousands of New Zealanders, which would have been avoided if screening had been introduced earlier. In any aspect of government responsibility other than health such omissions with such resulting mortality would likely have led to a royal inquiry.

A lot of this delay was said to be due to the need to increase colonoscopy capacity and quality, and the need for further infrastructure—however the length of time it took—reflects poorly on these efforts, and such justifications are being used again for the present inadequate response. This is especially difficult to justify given that modelling from the Government's own bowel cancer screening pilot found that starting screening at age 50 would result in an average overall saving of $98 per person screened:[22] evidence that much of the required investment to increase our screening resource will be returned with savings elsewhere, this being on top of lives saved. While we welcome the Government's announcement of an extra $603 million in funding for expensive new cancer treatments[23] (costing many thousands of dollars per patient treated for advanced colon cancer), doing so while neglecting proven, cost-effective screening methods that would prevent the need for these treatments in many cases entirely lacks both economic and common sense.

It is the gap between a government's re-election promises and its ability to deliver that determines its creditably, and as a result its re-election chances. Unfortunately for the last Labour Government, this gap was huge. As that Government found out, it's easy to promise things, it's hard to deliver them. The combination of a changing economic environment, a better understanding of issues and the constant firefighting of urgent issues can mean that issues around delivering election promises and, more importantly, maintaining the strategic direction can get lost in the reality of getting through each day. That said, this is a clear example that the present Government is unable to deliver its pre-election promises and is doing as little as it can to give an impression of fulfilling them, but the gap between what is needed and what it is being done is huge and will further undermine this Government's credibility.

This latest in a series of bad decisions and delays on bowel cancer screening will cost further lives; the present Government's failure to deliver on its election promises is entirely consistent with the shocking approach to bowel cancer screening New Zealanders have had to live with and die because of since the 1990s.

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**COMPETING INTERESTS**

Frank Frizelle is the President of the Colorectal Surgical Society of ANZ (CSSANZ); Dept Chair of the Binational Bowel Cancer Registry (BCOR); a Medical Advisor to Bowel Cancer NZ; and a Colorectal Surgeon treating patients with bowel cancer.

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**URL**
https://nzmj.org.nz/journal/vol-138-no-1611/the-government-s-pathetic-response-to-lowering-the-age-of-bowel-cancer-screening

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# A falls early response service in Aotearoa New Zealand: a scoping review

Heleen Reid, Celeita Williams, Teresa Cousins

## ABSTRACT

**AIM:** To understand the extent and type of evidence available on a joint service between occupational therapy and paramedics in a community falls early response service (FERS).

**METHOD:** Three databases and Google Scholar were searched for published and grey material that combined occupational therapy and paramedicine community FERS. Two independent reviewers screened citations and then assessed articles for selection. Data extraction was performed by a third researcher and verified by the two reviewers.

**RESULTS:** Fourteen sources were included from the initial 6,432 screened, and 128 were subsequently assessed. The 14 sources were published between 2010 and 2023, with over 50% published after 2019. The number of participants in the studies ranged from 23 to over 35,000, with a variety of combinations of healthcare professionals.

**CONCLUSIONS:** This review suggests that a combined occupational therapy and paramedicine FERS would benefit people who fall, the ambulance service and hospital care providers from a cost and resource point of view. A pilot study to further evaluate the cost and benefits of this kind of service is being explored based on the results of this scoping review.

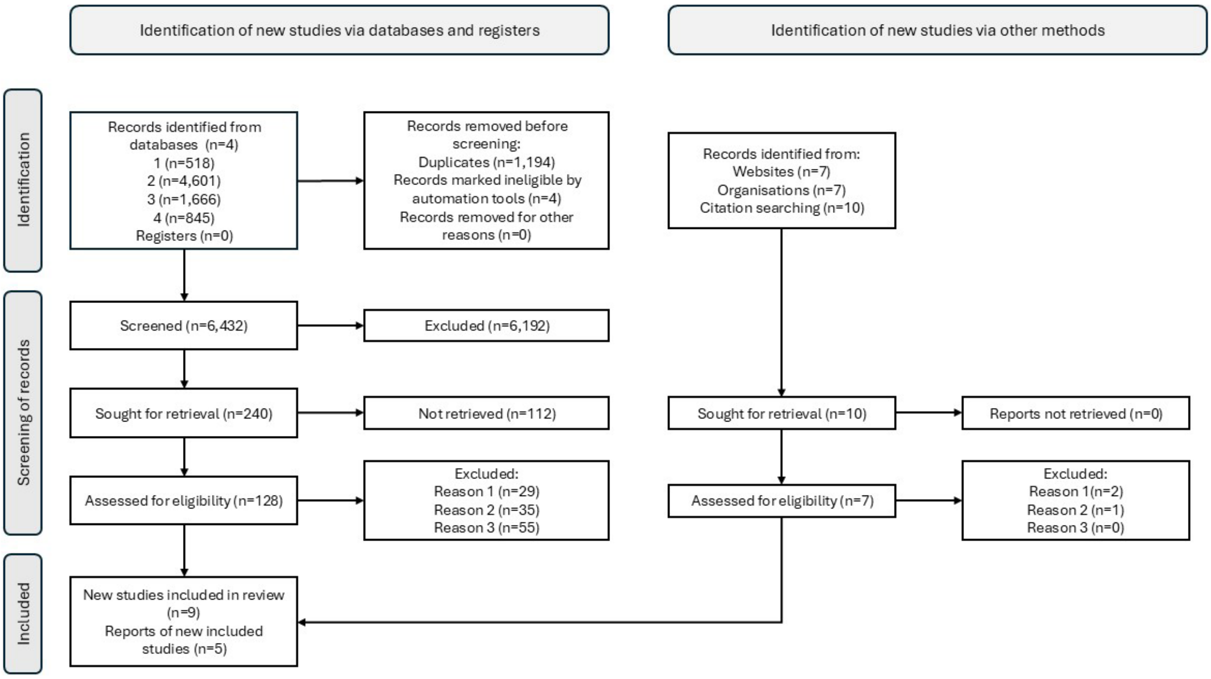
In Aotearoa New Zealand, the ageing population is experiencing increasing health needs, leading to a rise in urgent and emergency care demands. Many individuals, especially older adults, call emergency services when they have fallen, which can strain ambulance resources.[1] Data from Hato Hone St John (HHSJ) suggests many callouts and presentations to hospitals are related to falls, imposing substantial economic and personal costs.[2] Research from other countries, including Australia, highlights the potential benefits of a falls early response service (FERS), especially for vulnerable populations.[3–6]

In addition to an ambulance response, occupational therapists (OTs) also help with the community management of falls. They work across both physical and mental healthcare settings and are well placed to meet health and social care demands. OTs visit older adults at home to conduct cognitive, physical and occupational performance assessments. They recommend modifications and equipment to enhance safety, aiming to reduce falls and support independent living for as long as possible.[7] An OT service could complement that of the paramedic, which assesses and treats people ascertaining their clinical condition and potential risk for deterioration, before making an informed decision about the best outcome for the person who has fallen.[8] Paramedics complete advanced patient assessments[9] and look for both intrinsic, extrinsic and situational causes of a fall.[10] The aim of their assessment is to rule out sinister causes, and assess a person for further risk of falls, before determining if transport to hospital or referral to community health services is required.[11]

It is proposed the integration of OTs into a FERS with paramedics could improve access to timely interventions and prevent hospital admissions. This joint response could benefit healthcare services and the person who has fallen. A further aim of a FERS is to reduce ambulance responses for low acuity calls to falls, emergency department attendance by those who have fallen and, ultimately, unnecessary hospital admissions.[1,12–16] A report produced in 2015 by The Royal College of Occupational Therapists (RCOT) suggested significant cost savings and reduced hospital bed occupancy for people who had fallen in the community when using collaborative OT and paramedic interventions.[17]

Despite the evident need and potential benefits, there is a lack of understanding about what a combined OT and paramedic FERS could achieve. This scoping review examined the evidence and effectiveness of a combined OT and

**Figure 1:** PRISMA 2020 flow diagram.[18]



paramedic FERS for adults living at home in the community. The review specifically focussed on:

- What services currently exist that combine both occupational therapy and paramedicine in a call-out response service?
- Does a FERS combining occupational therapy and paramedicine benefit the person and/or health outcomes?

It is hoped that this review may inform future research and healthcare pathways in Aotearoa New Zealand and help address falls-related experiences in the ageing population.

## Methods

A systematic literature review was conducted using the Joanna Briggs Institute (JBI) Framework for scoping reviews. The search explored the extent and type of evidence available on a joint service between OT and paramedics responding to falls in the community. The inclusion criteria were expanded to include paramedic services combined with other professionals to discover what practices were being undertaken internationally. The search strategy reviewed Medline, CINAHL and Scopus databases. These databases were searched for English articles using the predetermined key terms such as (fall* OR slip* OR trip*) AND ("occupational therap*" OR "emergency medical technician" OR paramed* OR ambulance or pre-hospital OR prehospital OR EMS OR "emergency medical services" OR paramedic OR "medical service" OR EMT).

The date range was kept broad due to the relative novelty of this topic. A copy of the detailed search protocol is available on request from the authors. The primary outcomes investigated were reduced acute secondary healthcare utilisation, decreased extensive individual healthcare funding and improved longevity of living in place.

## Results

The Preferred Reporting Items for Systematic reviews and Meta-Analyses (PRISMA) flow diagram in Figure 1 shows the process of literature searching and the inclusion and exclusion of sources for further appraisal. A total of 128 sources were assessed for eligibility after their full-text articles were retrieved. Of the 119 reports excluded, 29 were focussed on the wrong or a single discipline, 35 were purely fall prevention or intervention focussed and 55 were not relevant to the topic.

There were notable challenges in identifying evidence that related to only occupational therapy and paramedicine. As such, criteria were broadened slightly to incorporate any literature that included the ambulance service, or transportation to emergency departments for elderly fallers, and any combination with other health professionals. In total, 14 sources were included for review, consisting of both qualitative and quantitative studies. The number of participants in the studies ranged from 23 to 35,000. Two studies included people aged over 60 years, two studies included people aged 65 years and above and the other five studies reported on people of all ages who had fallen. Because of the variance in the objectives, design and results of the selected sources, strong conclusions cannot be drawn through this scoping review.

Signposts suggesting the presence of grey literature were evident in many references in the articles. For example, the National Health Service (NHS) review suggested that integrating fall prevention practitioners with ambulance services could either prevent the need for hospital-based assessments or speed up the process.[19] Grey literature was subsequently pursued to investigate this evidence. Table 1 below provides a synopsis of each of the sources included for review. The randomised control trial protocol by Mikolaizak et al.[20] has been excluded from the table, as has one of the RCOT[21] pieces, as it is incomplete in its publication.

The articles that clearly combined occupational therapy and paramedicine were produced by Van Dam et al.,[22] Charlton et al.[23] and Dean et al.[19] The selected articles offering the most valuable information allowed us to consider if occupational therapy is the best profession to enter this kind of service. Furthermore, most of the included articles offered services in different formats, e.g., post-ambulance assessment referral and joint visitation, or there were differences in the types of intervention provided. There is a paucity of Aotearoa New Zealand-focussed research investigating alternative approaches to reducing transportation to hospital for people who fall and do not have a clinical indication for review in the emergency department. Although there were fragments in each piece of evidence that would lend itself to aspects of our query, few sources had a singular focus on an occupational therapy and paramedicine combination. This is why we extended our reach to include the reports produced by the RCOT, as described above.[19,22,23]

## Discussion

Our primary interest was to investigate if a combined OT and paramedic FERS would be beneficial in addressing the increasing number of falls experienced by older adults living in the community, with the view of informing future research opportunities. The key themes present in the literature were:

- assessment and intervention
- care coordination and monitoring
- home and environmental safety
- patient education and support

### Assessment and intervention

Comprehensive assessment by a multidisciplinary team with immediate intervention was seen to be an effective strategy, identified in seven of the sources. Charlton et al.[23] investigated the clinical effectiveness of an OT rapid response service and found it to be clinically effective when compared to a standard ambulance response. The OT assessment focussed on environmental, personal/intrinsic and behavioural/activity domains. A similar observation was made by Kanne et al.,[24] detailing that most falls risk factors identified can be addressed by an OT. These include alcohol use, cognition, equipment, home safety concerns, sleep hygiene and habit formation around activities of daily living. Notably only two of the 13 risk factors identified would be suitable for physiotherapy input (footwear, gait/balance), but these can also be assessed by an OT. Two of the reviewed studies adopted interventions combined with nurse practitioner or physiotherapy services.[20,24]

A multispecialty approach to envisioning the future of acute medical care was discussed by Dean et al., who explored potential future scenarios within the NHS. The integration of fall practitioners with ambulance services emerged as a proactive strategy, potentially preventing hospitalisation and fostering efficient assessment. As an alternative to an interdisciplinary service (allied health/paramedic), the use of the Support and Assessment for Fall Emergency Referrals (SAFER) 2 protocol by paramedics addressed a gap in evidence for older fallers not requiring hospital care.[11] This study reflected a comprehensive paramedic-delivered evaluation model, which offered valuable insights into the impact and cost-effectiveness of falls prevention initiatives. Therefore, a new pathway may be introduced by ambulance services at modest costs without further harm and a reduction in further emergency calls.[25] It is worthwhile to note that for the NHS there was no clear evidence that it improved health outcomes or reductions in emergency department workload.[25]

**Table 1:** Data extraction table.

| Citation | Objectives | Interventions | Design | Location | Outcomes measures | Results |
|---|---|---|---|---|---|---|
| Charlton et al., 2023 | Evaluated clinical effectiveness of falls rapid response service | Paramedic and OT responded between 7 am–7 pm, 7 days/week | Cross-sectional study | England | Proportion of patients conveyed to hospital compared to those not conveyed versus standard ambulance crews | Falls rapid response service is clinically effective compared to care delivered by standard ambulance crews |
| College of Occupational Therapists, 2015 | Deliver key information on OT contributions to primary care, A&E, critical care and other specialist settings | Year-long data gathering on effectiveness of OT in settings, including rapid response service | Report | England | Cost–benefit analysis | Reduction in pressure on GP services, reduce risk of admission and readmission, cost reductions in urgent care due to such things as falls |
| College of Occupational Therapists, 2016 | How occupational therapy can reduce unnecessary transfers into A&E departments and admissions, and ease the patient's journey to timely and safe discharge home | Year-long data gathering on admission to hospital and discharge to home | Report | England | Patient outcomes (health experience, QoL), hospital flow, cost–benefit analysis | Reduction in hospital admissions and time in hospital, success on transition and discharge |
| Dean et al., 2022 | Observations drawn from NHS Getting It Right First Time programme | Integrating fall practitioners with ambulance services may prevent or accelerate hospital-based assessment | Process and systems review | England | None | Acute frailty service for 7-day provision with community–ambulance collaboration was seen as plausible design option |
| Kanne et al., 2022 | A quality improvement project evaluation of a new falls reduction clinic | A nurse practitioner– and physical therapist–led assessment process<br>Participants received a 6-week phone call and a 12-week follow-up visit | Descriptive, single group | USA | 30-second chair stands, timed pp and go, 4-item Dynamic Gait Index, Activities-specific Balance Confidence Scale, end of engagement surveys | Participants reported making behavioural changes to reduce falls risk and intentions to continue with exercise programmes<br>A multidisciplinary approach combined with personalised strategies and ongoing monitoring can lead to reduced falls risk |

**Table 1 (continued):** Data extraction table.

| Citation | Objectives | Interventions | Design | Location | Outcomes measures | Results |
|---|---|---|---|---|---|---|
| Logan et al., 2010 | Evaluation of a community falls prevention service for older people who call an ambulance but are not taken to the hospital | Referral to community fall prevention services or standard medical and social care (OT, physiotherapists, nurses)<br>Strength training, home hazards assessment, medication review, and 12 2-hour, twice-weekly group programme sessions | RCT | England | Rate of falls over 12 months, Barthel Index, Nottingham Extended Activities of Daily Living Scale and Falls Efficacy Scale scores at baseline and by postal questionnaire at 12 months | A community-based service to prevent falls reduced the number of falls over a year in older people (>60 years) who had called an emergency ambulance owing to a fall but not been taken to hospital<br>The service also led to increased levels of activities of daily living and reduced fear of falling |
| Mikolaizak et al., 2017 | Evaluated tailored interventions for older community-dwellers who did not need ED transportation after a fall | Intervention group received post-acute services from physiotherapy, OT, optometry, pharmacist, specialist medical review through outpatient clinic<br>Control group received written advice to address fall risk factors and to speak to healthcare provider | Single blind parallel group RCT | Australia | Rates of falls and injurious falls<br>Ambulance re-attendance, ED presentations, hospitalisations, and QoL over 12 months, level of uptake to recommendations, health service use | The multidisciplinary intervention did not effectively prevent falls in older adults who received paramedic care but were not transported to the ED; this could be due to exercise fatigue and increased falls risk<br>Nevertheless, the intervention proved to be effective in reducing falls among participants who adhered to the recommended interventions |

**Table 1 (continued):** Data extraction table.

| Citation | Objectives | Interventions | Design | Location | Outcomes measures | Results |
|---|---|---|---|---|---|---|
| Paul et al., 2021 | Described the reach of a fall prevention programme among community-dwelling adults aged ≥65 years and assessed fall-related ambulance use and hospitalisations | A multifactorial group-based fall prevention programme incorporating behaviour change and exercise through seven weekly sessions | Observational stepped-wedge study | Australia | Fall-related ambulance usage and hospital admissions were compared within statistical local areas before and after the implementation programme | The study did not show a reduced rate of fall-related ambulance use or hospital admissions across the entire sample of older adults. However, there was a potential reduction in fall-related ambulance callouts for individuals aged 75–84 years following the programme |
| Quatman-Yates et al., 2022 | Optimised fall prevention within community paramedic operations and assessed its impact on emergency service utilisation rates | Implementation science framework and quality improvement methods used to design and optimise the fall prevention model of care<br>Interrupted time series analysis used to evaluate relative risk reduction from a 12-month baseline period to a 12-month post-implementation period | Quality improvement initiative | USA | Relative risk reduction in the number of community-level, fall-related 911 calls and fall-related hospital transports | Community paramedic home visits increased significantly over the study period, showing an increase in the number of households benefiting from the programme<br>Findings suggest that this programme offers a powerful mechanism for community paramedics to reduce fall-related 911 calls and transports to hospitals |
| Snooks et al., 2012 | Evaluating the SAFER 2 protocol allowing paramedics to assess and refer older fallers to community-based falls services | Paramedic application of SAFER 2 protocol with control group receiving care as usual | Pragmatic cluster randomised trial | England | Number of further falls, health-related quality of life, fear of falling, patient satisfaction, and quality and pathways of care at the index incident | No evidence of improved health outcomes or reductions in overall NHS emergency workload |

**Table 1 (continued):** Data extraction table.

| Citation | Objectives | Interventions | Design | Location | Outcomes measures | Results |
|---|---|---|---|---|---|---|
| Van Dam et al., 2022 | Evaluated OT outreach role providing rapid response service to high-risk individuals | 12-month trial of 7-day rapid response service offering short-term OT interventions with additional competency training in nutrition and mobility assessment<br>Interventions provided: home modifications, equipment/aides, falls education, occupation changes, person-related changes, cognition, pressure injury, mobility, nutritional, access to services, onward referrals | Convergent, parallel mixed methods | Australia | Risk of falls, malnutrition, pressure injuries, number of falls in last 12 months, socio-economic status | There is a need for the care provided by this service, and the service has made a positive impact on the lives of clients and their carers.<br>The interventions have contributed to possible hospital avoidance, benefiting clients and healthcare organisations |
| Watson et al., 2021 | Examined the impact of rapid response services with telecare services for clients with complex needs in social housing | Semi-structured qualitative interviews with service users, commissioners, service providers, adult social care and family carers via telehealth | A descriptive qualitative model | England | Thematic analysis<br>The quality of life for service users and carers, including their ability to remain independent for longer, and the resource benefits for health and social care providers | The rapid response team reduced the number of ambulance requests resulting from falls<br>Those with electronic monitoring/telecare support were able to stay in their homes longer, reducing the need for residential funding by the local authority<br>Positive outcomes for both elder and carers |

OT = occupational therapist; A&E = accident and emergency; GP = general practitioner; QoL = quality of life; NHS = National Health Service; USA = United States of America; RCT = randomised control trial; ED = emergency department.

Similarly, the reports produced in collaboration with the RCOT[17,21,26] exploring the value of occupational therapy in the NHS collectively emphasised its role in addressing urgent care needs and reducing pressure on hospitals. For example, more than 75% of people were able to remain at home after a joint OT and paramedic assessment.[26] Currently, in Aotearoa New Zealand, access to community/home healthcare services is through general practitioner (GP) referral or self-referral. Community OT waitlists are prolonged in some centres (for a low priority referral) with wait times ranging from 3 to 7 months[27] and, anecdotally, up to 2 years in certain regions.[27] An older adult at risk of falls will generally only know their risk after a fall, resulting in a call to ambulance or a visit to hospital, or through a routine visit to their GP. This highlights the necessity of care coordination and monitoring.

### Care coordination and monitoring

Studies by Van Dam et al.[22] and Watson et al.[28] demonstrated that most people seen by OTs were able to stay home with better quality of life compared with those who were conveyed to hospital. These studies had different approaches in their service delivery (e.g., referral from other services for an OT to assess a person in their home and via telecare services respectively), but both resulted in participants feeling safer and more confident through the tailored and focussed care provided. Kanne et al.[24] and Logan et al.[29] emphasise the positive impact of tailored interventions in reducing falls and improving clinical outcomes. Additionally, the integration of rapid response services with telecare presents a promising model for enhancing safety and wellbeing among vulnerable clients.[27] The combined approach not only reduced ambulance requests but also allowed individuals to remain in their homes longer, alleviating the burden on healthcare resources. The effectiveness of some interventions, as demonstrated by Mikolaizak, Lord et al., [30] may hinge on participant compliance, emphasising the importance of individualised and sustained approaches. The drawback of the research in this scoping review is that all studies used varied approaches to the provision of care and data sharing across healthcare professions, which makes it hard to determine which model has the most benefit for the patient and health system.

### Patient education and support

A lesser theme present in the literature was the use of falls prevention programmes as an adjunct to a FERS. The Stepping On Programme by Paul et al.[31] did not show an overall reduction in fall-related ambulance use or hospital admissions, but revealed a potential age-specific benefit (see Table 1 above). Quatman-Yates et al.[1] found that incorporating a community-level perspective, in this case the Community-FIT falls prevention programme, achieved a significant reduction in fall-related callouts and transports. Insights from Paul et al.[31] highlight the necessity of considering demographic variations and tailoring interventions to specific age groups.

## Conclusion

The 14 sources reviewed collectively advocate for a holistic and collaborative approach to falls prevention, encompassing clinical, community and telehealth dimensions. While tailored interventions demonstrate positive outcomes, especially when delivered by an OT, there is a need for more research to refine and optimise the intervention strategies used. An emphasis on participant compliance, demographic considerations and community-level interventions is important.

Falls by elderly in the community continue to be a health concern for multiple disciplines. The findings from this scoping review present a possible interprofessional solution to what appears to be an increasing issue. A joint response between OTs and paramedics in a FERS can provide valuable benefits. Occupational therapy assessments can help prioritise resources by providing a comprehensive and broad understanding of individuals' needs, focussing on factors contributing to a person's falls risk. Collaborating with paramedics, OTs can provide immediate on-scene interventions, reducing the likelihood of recurrent falls and mitigating further injury. OTs can assess a person's home environment and performance factors while paramedics conduct an advanced patient assessment to determine if the clinical presentation requires transport to the hospital. Utilising this model could improve patient outcomes, reduce fall-related healthcare utilisation and improve quality of life for individuals at risk of falling. A joint service could ensure seamless coordination of care, with OTs providing post-fall support and paramedics facilitating referrals to ongoing support and documentation that could enable tracking of fall incidents, informing tailored interventions and ongoing research.

### COMPETING INTERESTS

There are no competing interests to declare.
This study was funded by the Auckland University of Technology Faculty of Health and Environmental Sciences Summer Research Awards 2023/2024.

### ACKNOWLEDGEMENTS

We would like to acknowledge the tireless work of Teresa Cousins throughout her summer studentship towards this scoping review.

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https://nzmj.org.nz/journal/vol-138-no-1611/a-falls-early-response-service-in-aotearoa-new-zealand-a-scoping-review

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# Accessing care in an unfamiliar environment: experiences of tūroro Māori and their whānau when transported outside their local area after a cardiac emergency

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## ABSTRACT

**AIM:** After an acute cardiac event tūroro (patients) are often transported to a hospital with specialist cardiac services, sometimes far from home. While such hospitals offer specialist care, it is unknown how transport out-of-area affects tūroro and whānau (family) holistically. This study explored tūroro Māori and whānau experiences and perceptions of transport away from their community after an acute cardiac event.

**METHODS:** Using a Kaupapa Māori research approach, five semi-structured interviews and two focus groups were undertaken with tūroro Māori and/or whānau. A general inductive approach was used for analysis.

**RESULTS:** Participants reported a wide range of positive and negative experiences. There was one overarching theme—accessing care in an unfamiliar environment, and two sub-themes—whānau support and mana-enhancing communication. Receiving care in an unfamiliar environment placed added stress on tūroro and whānau and meant that mana-enhancing communication was of utmost importance (a holistic view ensuring the tūroro and whānau retain their power and decision making with all communication).

**CONCLUSION:** Tūroro and whānau transported away from home following a serious cardiac event described the challenges associated with receiving care in an unfamiliar environment. The resulting uncertainty for the tūroro and travel and financial burden for whānau added to what was already a stressful time. Many of the challenges inherent in this situation can be mitigated with mana-enhancing communication.

Aotearoa New Zealand emergency medical services (EMS) destination policies currently dictate that tūroro (patients) with a ST-elevation myocardial infarction, a specific type of heart attack presenting with electrocardiogram (ECG) changes, are to be transported by EMS to hospitals with specialist cardiac capabilities such as percutaneous coronary intervention (PCI).[1] In transporting to these hospitals, local hospitals are commonly bypassed and tūroro are transported away from their home area (rohe).[2] Routine transport to hospitals that offer PCI or other specialist cardiac care may improve equity in outcomes for Māori, who sustain significant inequity in both incidence and outcomes relating to cardiac events.[2] However, Māori are also more likely to live rurally,[3] meaning there are much greater distances to travel to tertiary hospitals offering specialist cardiac care. The holistic impact on tūroro and whānau (family) of bypassing a local hospital in favour of potentially improved specialist care and better clinical outcomes at a more distant hospital is not known.

Hospital admissions in emergency situations are highly stressful,[4] with some describing it as a "*time of chaos*", accompanied by fear, uncertainty, hope and vulnerability.[5] Out-of-area transport brings additional challenges: travel, accommodation, carer burden and communication.[6] Whānau stress is likely to be greater if the tūroro does not survive, although little is known about this. Existing research on Māori experiences of out-of-area hospital transport for diverse health conditions has highlighted that services focussed on the unwell individual and did not provide a whānau-centred approach.[7] If the transport is at the expense of whānau support, connectedness to whenua (land) and the holistic wellbeing of the tūroro, there may be inequity in experience and in more holistic outcomes for both tūroro and whānau.[8] Urgent transport away from whānau and whenua has the potential to cause stress and harm to tūroro Māori (Māori patients), given the intertwined identities of people and land.[9] Critical transport also impacts whānau ability to support their whānau members, and affects their finances, accommodation and transport.[10] Despite these challenges, it is possible that out-of-area transport may be seen as desirable if people believe the specialist services could improve survival,[11] so long as tūroro and whānau are well-supported. Understanding the needs and experiences of Māori is essential to ensuring policy and practice supports hauora (health and wellbeing) and whānau ora (family wellbeing). Alongside a quantitative analysis of tūroro outcomes,[12] this qualitative study of tūroro Māori and whānau experiences and perceptions of transport away from their community after an acute cardiac event is part of a programme of research to determine best practice in EMS destination policies regarding cardiac care in Aotearoa New Zealand. Understanding the potential effects of transport away from communities can inform future policy and practice changes to achieve equity in experience and in outcome.

## Methods

This is Kaupapa Māori research, underpinned by Kaupapa Māori theory, drawing on Māori research methods and led by Māori researchers. Kaupapa Māori theory supports Māori development and the centring of Māori narratives, as well as providing a framework to critically analyse systems and the root causes of current inequities, including colonialism and racism that lead to poorer health outcomes and inequities.[13] Kaupapa Māori approaches to participant engagement were followed, based on the Hui Process.[14] This involved four key elements: mihi—initial contact, greeting and engagement; whakawhanaungatanga—making a connection between the researchers and the participants; kaupapa—the interviews/whānau hui (focus groups); poroporoaki—concluding with acknowledgement, feedback and check-in with participants. The kōrero (discussion) that occurred at the "kaupapa" stage constitutes data for the analysis detailed in this article. Analysis was guided by Kaupapa Māori research practices described by Curtis.[13] These included ensuring the research will have direct benefits for Māori, keeping the research under Māori control, rejecting victim-blaming and cultural-deficit theories and accepting diverse Māori realities.

### Researcher positionality

As Kaupapa Māori research, this was led by Māori researchers with assistance of non-Māori allies. AB (Ngāti Ranginui, Ngāti Maniapoto, Ngāti Rangi) is a clinical and community hauora Māori and equity advisor for Hato Hone St John. MW (Ngāti Kurī, Ngāpuhi, Tainui) is an emerging Māori researcher. FB (Pākehā) is a speech-language therapist and qualitative health researcher. SP (Te Rarawa) is a registered paramedic and a lecturer and Kaupapa Māori health researcher at the Auckland University of Technology. BD (Pākehā) is a paramedic and a resuscitation/EMS researcher. GH (Pākehā) is a researcher in paramedicine. KB (Whakatōhea, Ngāi Te Rangi) is a speech-language therapist and Kaupapa Māori health researcher.

### Eligibility criteria

Inclusion criteria were: Māori aged 18 years or older, had experienced a cardiac event (for example, a heart attack or cardiac arrest) in the community between April 2018 and May 2024, or whānau of someone who experienced a cardiac event, and could provide insight into the experience or implications of being transported outside of the region where they lived.

### Recruitment

Participants were recruited using flyers distributed via social media, healthcare providers, community groups and email.

### Data collection

Data collection included five semi-structured individual interviews and two whānau hui. Whānau hui and interviews were conducted by AB, with support in the whānau hui from MW and BD. Interviews were conducted using a mix of kanohi ki te kanohi (face-to-face), video conferencing (Zoom, Microsoft Teams) and telephone. Both whānau hui were conducted kanohi ki te kanohi.

In keeping with Kaupapa Māori research, whakawhanaungatanga was central to the recruitment and interview/whānau hui process. This often involved kanohi ki te kanohi visits with shared kai (food), slowly leading to data collection as the relationship was formed. To encourage interview and whānau hui participants to voice experiences in their own words, interviews were semi-structured with open-ended questions.

Participants were asked about their cardiac event and the travel experience between the location of their cardiac event to the given hospital with specialist cardiac services. They were also asked about the impacts this had on their whānau and how they were affected during this process and the negative and positive experiences they had.

## Data analysis

Audio recordings from interviews and whānau hui were transcribed. These were analysed in several ways: first AB and MW engaged in data familiarisation, reviewing audio recordings and transcripts to become familiar with what was discussed and *how* it was discussed (e.g., attending to non-verbal communication). A general inductive approach was used for analysis.[15] Initial codes were manually developed from the transcripts. These were revised and categorised into themes prioritising categories that aligned with the research objectives, using Miro mind mapping software (https://miro.com/mind-map/). Themes were then discussed and reviewed with AB and KMB. Recognising the diversity of tūroro and whānau experiences, we did not pursue data saturation.

## Ethics

Ethics approval was acquired from the Auckland University of Technology Ethics Committee (AUTEC) (22/294).

# Results

Participant details are provided in Tables 1, 2 and 3.

Participants reported a wide range of positive and negative experiences of being uplifted from

**Table 1:** Individual interview participants—tūroro.

| Participant | Gender | Residence | North vs South Island | Time since event |
|---|---|---|---|---|
| A | Female | Rural R2 | North | 2 years |
| B | Female | Urban U1 | South | 3 years |
| C | Male | Rural R1 | North | 1 year |
| D | Female | Urban U2 | North | 1 year |
| E | Female | Urban U2 | North | 1 year |

Rural/urban classification is defined using the Geographic Classification for Health.[3]

**Table 2:** Focus group one participants.

| Participant | Gender | Connection to the tūroro |
|---|---|---|
| 1 | Male | Tūroro |
| 2 | Female | Whānau member (witnessed the event) |
| 3 | Female | Whānau member |
| 4 | Female | Whānau member |
| 5 | Female | Whānau member |
| 6 | Male | Different whānau |

The experiences of the focus group one whānau took place in a rural (R2) area[3] in the North Island, approximately 30 years ago.

**Table 3:** Focus group two participants.

| Participant | Gender | Connection to the tūroro |
|---|---|---|
| 1 | Male | Tūroro |
| 2 | Female | Whānau member (witnessed the event) |
| 3 | Male | Whānau member (witnessed the event) |
| 4 | Male | Whānau member |
| 5 | Female | Whānau member |
| 6 | Male | Whānau member |

The experiences of the focus group two whānau took place in an urban (U2) area[3] in the South Island, 6 years ago.

their homes and transported to a hospital with specialist cardiac services. Despite the stressful situation, many participants spoke highly of the service they received throughout the care pathway and understood that transport to a hospital with specialist cardiac services ensures access to specialised medical care and interventions unavailable at local facilities. However, analysis also revealed the nuances within their experiences. These are reflected within one overarching theme—accessing care in an unfamiliar environment, with two sub-themes—whānau support and mana-enhancing communication (a holistic view ensuring the tūroro and whānau retain their power and decision making with all communication). Although people received the specialist care they required, being transported to an unfamiliar environment placed added stress on tūroro and whānau and meant that mana-enhancing communication was of utmost importance.

## Accessing care in an unknown environment

To receive optimal care, tūroro were prepared to be taken away from their whānau, their familiar environments and the systems they were accustomed to. One tūroro commented: "*We'd want the best for our people, and we'd want the best to coming home, and an awesome environment*." Tūroro and whānau did not always perceive there to be a benefit in being away from home, with one whānau member lamenting that "*Coming home to* [hometown], *with your own community, would have been more beneficial for her. She would have healed faster with her whānau around her, or even if she were at home in her own environment with the care going in*."

Although most people recognised the benefits of being transported out-of-area to a hospital with specialist cardiac services, this process was overwhelming. Tūroro often could not remember their experience with first responders. As their condition stabilised and they became aware of their surroundings, there were many stories of satisfaction with initial treatment in local hospitals and with the care of ambulance personnel. However, after being transported to the hospital with specialist cardiac services, many had feelings of unsettlement and confusion. Because hospitals with specialist cardiac services are often much bigger and run differently to smaller rural hospitals, tūroro did not always know who would look after them or when they would be seen.

One participant spoke:

> *"The medical doctor I had was excellent but get to that* [hospital with specialist cardiac services], *you never get to see the head cardiologist, because in one team there's 10 doctors, but you never get to see the cardiologist himself."*

Another participant commented: "*That's only the second or third hospital visit I've had—the first in* [city]. *I didn't know what goes on in* [city hospital]. *It would have actually been nice to have been told some of these things*."

Unfamiliar systems, coupled with the stress of a major cardiac event, left some participants feeling vulnerable. This resulted in them turning to people and environments with which they had previous experiences, relationships and connections, thereby increasing their levels of comfort. One participant explained: *"Because I was still having problems; I rang* [hospital], *because I used to live there, and I know the cardiologist up there, so I rang him."* People's own networks and resources helped support and sustain them at this challenging time.

## Whānau support

Navigating unknown environments was particularly stressful for whānau members. As one participant put it: *"A hospital close means that you can go and support easier."* Transport to a hospital with specialist cardiac services could place significant travel and financial burden on whānau, particularly given that there is limited space for a support person to travel with the tūroro. Thus, other whānau who wished to be present must organise and fund their own transport and accommodation. Many participants shared this experience, with one stating:

> "[Whānau member] *had to drive up in the middle of the night which wasn't ideal because he didn't have any accommodation, he didn't have any money. He had all the kids, so he had to just jump in the car and drive, and it's a big drive, a big drive from* [town], *especially when you don't really know what's happening too much. He arrived in the early hours of the morning. I think he ended up staying in a backpackers or something, didn't you? He had to come over and get* [tūroro's] *credit card."*

While some hospitals with specialist cardiac services have systems to support families from out of town, many of the participants described difficulties in accessing these services, finding them unaccommodating for larger families, or they were not informed about them until it was too late. As described by these participants:

> *"I did ask about the whānau house. Only my daughter could go there and not my grandchildren. Then my partner came up from* [hometown]. *He had to get accommodation somewhere else. Where my grandchildren were, he couldn't go there because there was no more room."*

> *"They've got a Māori service provider. They actually didn't come and see me until 3 days before I come out … What happened was she told me what their service was. My family could have got accommodation through them, but nobody told us that until 3 days before my leaving."*

## Mana-enhancing communication

When a whānau is under stress, in an unfamiliar environment, mana-enhancing communication is vital. To work with Māori is to respect and integrate their cultural values and beliefs. One value that Māori hold is uplifting mana. Incorporating mana means recognising a tūroro's mental, emotional and spiritual wellbeing rather than just focussing on their disease. It acknowledges who they are, where they've come from and where they are going. To acknowledge somebody's mana is to acknowledge the person entirely. If a person comes into a new environment where their mana is uplifted, it can help them navigate the space more easily. To takahi (stomp) on somebody's mana is to dismiss the person, leading to feelings of mamae (hurt) and shame. In healthcare, it is important for healthcare professionals to use mana-enhancing communication and understand that every tūroro has their own story.

Some participants' experiences left them feeling like their mana was not uplifted and that medical teams were inconsiderate. One participant spoke about the conversations she overheard during her surgery and how she felt it was quite insensitive "*at such a critical period*":

> *"I was fine with it, but I said if you're really struggling with everything and the fact of you're having major surgery and you've just had a heart attack and literally died, and there's this conversation happening, it's quite insensitive."*

When offered the chance to make a formal complaint she declined because she did not want to make a fuss; "*that's not who we are as Māori.*"

Mana-enhancing communication was also noted as critical not just with the tūroro but also whānau. Good, reciprocal communication allowed the tūroro and whānau to feel heard and seen, making their stay easier and more comfortable in the unfamiliar environment. This was shown by one tūroro:

> *"I tell you what—they've got a team down in* [hospital with specialist cardiac

> services] *that tells you everything around your procedure, your surgery, your defibrillator and everything else. They were really thorough. Very thorough. I understood them perfectly."*

## Discussion

In this qualitative Kaupapa Māori study we explored tūroro and whānau experiences and perceptions of transport away from their community after an acute cardiac event. An understanding of these experiences will help inform EMS policy and practice to achieve equity in experience and outcomes for Māori.

When working with Māori, a holistic approach is fundamental to their recovery and wellbeing. Such an approach must account for whānau involvement and whānau wellbeing. It is of concern that whānau were not always aware of the supports available to them while in hospital. This could be remedied by prompt referral to the hospital Māori health team for all cardiac tūroro who are transported from out-of-area. Anyone who did not wish to receive this support could decline the referral on first contact. Having support services available from the start, and effective communication so that tūroro and whānau are able to access them, can help whānau members navigate their stay in unknown environments and decrease stress levels, which in turn will increase tūroro wellbeing.

Māori heart tūroro have reported a lack of trust in the health system and reluctance to go to hospital due to previous and ongoing bad experiences.[16,17] Being thrust into an unfamiliar environment, without sufficient guidance and support from healthcare providers, leaves whānau reliant on their own resources. Such experiences can perpetuate feelings of dissatisfaction and mistrust. In this context, effective reciprocal mana-enhancing communication with tūroro and whānau is essential to improve heart health outcomes and enhance tūroro and whānau experiences.[16–18] As shown by the findings of this study, the importance of good communication is heightened when a whānau is under stress, having been transported to an unfamiliar environment. When healthcare providers take the time to form reciprocal relationships and discuss diagnosis and treatment in an accessible way, it not only improves clinical outcomes by ensuring tūroro adhere to their treatment plans but also enhances the overall tūroro experience by reducing anxiety, empowering tūroro and fostering a collaborative approach to health management.[17,18]

### Clinical implications

Under current EMS policy, decisions on where to transport cardiac tūroro are made based on clinical outcomes rather than a holistic approach to the tūroro and their whānau.[1] The results of this research indicate that tūroro and whānau want the most appropriate clinical care, even if that means being transported out of their area. This supports the current policy directions. However, insights gained from this research also show the importance of mana-enhancing communication. EMS staff would benefit from training in how to support mana-enhancing communication at all times, so that more holistic care can be given to the tūroro and whānau even when the need for clinical care means that transport out-of-area is necessary.

Alongside the qualitative analysis, this programme of work also investigated whether there was a quantitative survival benefit for tūroro following a cardiac arrest for direct transport to a hospital with specific capabilities deemed a cardiac arrest centre.[12] Results indicated that, while not statistically significant, compared to a non-specialist hospital an odds ratio of 0.78, equivalent to a 22% decrease in 30-day mortality, is consistent with the benefits associated with management by a cardiac arrest centre. This potential mortality benefit is in alignment with international literature for tūroro with a cardiac arrest secondary to a cardiac cause having a higher survival benefit if transported directly to a specialist cardiac arrest centre.[19–21] Further research with a larger cohort is required to determine a treatment effect. However, given the potential for benefit and if its implementation could be delivered in a way that empowers tūroro then it would likely enhance survival outcomes if tūroro were directly transported to hospitals with appropriate specialist services. Complementing the quantitative data, the current study adds important information for healthcare providers involved in decisions around transport to hospitals with specialist cardiac services. Namely, to increase the wellbeing of tūroro and whānau in these circumstances, mana-enhancing communication and support for whānau is essential.

### Conclusions

Because cardiac events are sudden and unexpected, it is impossible to prepare for them and the process can be daunting and stressful. Tūroro and whānau transported away from home following a serious cardiac event described the challenges associated with receiving care in an unfamiliar environment. The resulting uncertainty for the tūroro and travel and financial burden for whānau added to what was already a stressful time. Many of the challenges inherent in this situation can be mitigated with mana-enhancing communication.

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#### COMPETING INTERESTS

This research was supported by a 2022 Pūtahi Manawa | HHANZ CoRE Equity Grant Round.
BD is an employee of Hato Hone St John and Auckland University of Technology.
AB is an employee of Hato Hone St John and a participant in the Hato Hone St John Māori Locality Review Committee.
FB is a DSMC member for HRC funded project on stroke rehabilitation and a Chair for the Programme Accreditation Committee, New Zealand Speech-language Therapists' Association.
KB was a Waitangi Tribunal WAI 2736 technical witness in November 2022, participates in the Health Research Council of New Zealand reviewing committee 2024 and is Co-Director of Pūtahi Manawa | Healthy Hearts for Aotearoa New Zealand (CoRE).

#### ACKNOWLEDGEMENTS

The authors acknowledge the tūroro and whānau who generously shared their experiences for this study.

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https://nzmj.org.nz/journal/vol-138-no-1611/accessing-care-in-an-unfamiliar-environment-experiences-of-turoro-maori-and-their-whanau-when-transported-outside-their-local-ar

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# Variation in emergency medical service use for acute coronary syndromes by ethnicity: an Aotearoa New Zealand observational study

Bridget Dicker, Vanessa Selak, Haydn Drake, Graham Howie, Andy Swain, Rochelle Newport, Sandra Hanchard, Shanthi Ameratunga, Corina Grey, Matire Harwood

## ABSTRACT

**AIM:** This study investigated whether emergency medical services (EMS) use varies by ethnicity among patients hospitalised with acute coronary syndrome (ACS) in Aotearoa New Zealand.

**METHODS:** All adults (aged ≥18 years) hospitalised with ACS (2019–2021) were identified. EMS use was determined by linkage between national hospitalisation and EMS data. Associations between ethnicity and EMS use for ACS (ST-elevation myocardial infarction [STEMI]; non-STEMI [NSTEMI]; unstable angina [UA]) were assessed.

**RESULTS:** A total of 19,283 patients with ACS were identified (STEMI 25%, NSTEMI 55%, UA 20%). For STEMI, EMS use was lower in Māori (adjusted odds ratio 0.72, 95% confidence interval [CI] 0.58–0.90), Pacific (0.64, 0.48–0.87), Indian (0.63, 0.43–0.86) and non-Indian Asian (0.52, 0.37–0.74) but not Other patients (0.79, 0.43–1.52), compared with Europeans. Similar findings by ethnicity were found for NSTEMI. Although odds of EMS use were also lower for UA in all ethnic groups compared with Europeans, the magnitude of the reduction was attenuated, and the effect was not statistically significant, apart from for non-Indian Asian patients.

**CONCLUSIONS:** EMS use prior to admission for ACS was less likely for most ethnic groups compared with Europeans. Heart healthcare access enablers identified in previously published research—including good-quality information, reduced cost and health professional cultural safety—may reduce barriers to EMS use by non-Europeans.

Māori (the Indigenous people of Aotearoa New Zealand), Pacific peoples (people predominantly from South Pacific Islands) and South Asian peoples living in Aotearoa New Zealand are disproportionately affected by cardiovascular disease (CVD).[1] Māori, Pacific peoples and Indians (who are the only South Asian group that can currently be identified in routinely collected Aotearoa New Zealand health data) experience the onset of CVD at a younger age,[2,3] and have a significantly higher prevalence of diabetes than Europeans.[4] Compared with their European counterparts, Māori and Pacific peoples also have a much higher prevalence of other risk factors for CVD such as smoking and atrial fibrillation,[5–7] and are more likely to die from CVD.[4,8] Of all ethnic groups in Aotearoa New Zealand, Indians have the highest prevalence of coronary heart disease. Yet, compared with Europeans, Māori and Pacific peoples are the most likely to die from coronary heart disease before reaching hospital.[9] Indeed, coronary heart disease is the most important cause of potentially avoidable deaths for Māori and Pacific peoples, contributing up to 1 year of the approximately 6–7 year reduction in life expectancy for Māori and Pacific peoples compared with other New Zealanders.[10]

Acute coronary syndrome (ACS), comprised of ST-elevation myocardial infarction (STEMI), non-STEMI (NSTEMI) and unstable angina (UA), is a major contributor to the burden of CVD. Highly effective treatments reduce the morbidity and mortality of ACS, but the effectiveness of reperfusion (required for STEMI) is critically time-dependent.[11,12] Prehospital triage and investigations like electrocardiograph by emergency medical services (EMS) to promptly identify and manage such patients has led to significant advances in their management, and is a critical factor in reducing times to definitive reperfusion treatment for patients with STEMI.[13] A study from 2012 found that among patients admitted to the coronary care unit of an Aotearoa New Zealand hospital with ACS, the delay between symptom onset and defibrillator availability was 7 hours longer for patients arriving by self-transport compared with EMS.[14] That study also found

Māori, Pacific and Indian peoples, as well as those from areas of higher deprivation, were less likely to arrive by EMS.[14] Another study found that communities with the highest levels of socio-economic deprviation had the least availablity of public access defibrillatiors, despite also having the highest incidence of out-of-hospital cardiac arrest.[15] In addition to determining early interventions, ACS type is also associated with prognosis.[16]

The Aotearoa New Zealand health system is required under the *Pae Ora (Healthy Futures)* legislation to ensure equitable access to health services.[17] The aim of this study was to use contemporary national data to determine if there are ethnic variations in EMS use by ACS type.

## Methods

### Study design and inclusion and exclusion criteria

A retrospective cross-sectional study of all adult patients (aged 18+ years) hospitalised for an ACS event in Aotearoa New Zealand was undertaken between 1 July 2019 and 30 June 2021. Patients were identified from the national hospitalisation data collection (National Minimum Dataset [NMDS]). This 2-year period was chosen because it was the earliest date where there were reliable electronic EMS data, and, at the time of the analysis, the latest date that hospitalisation data were available. An ACS event was defined as a primary diagnosis (at discharge) of International Classification of Diseases (ICD) 10 codes for STEMI (I21.0–I123, I220, I221, I228, I229), NSTEMI (I214, I222) or UA (I200). For patients with multiple ACS events during the study, only the first was included in the analysis. Patients were excluded if they had duplicate EMS records for the same date.

### Variables

EMS use for each included ACS event was determined by linkage (using an encrypted National Health Index [NHI], a unique patient identifier) to the national EMS registry, the Aotearoa New Zealand Paramedic Care Collection (ANZPaCC). The ANZPaCC contains all routinely collected electronic clinical record data for all patients in Aotearoa New Zealand attended by EMS. We determined for each patient if their ACS event could be matched with an EMS encounter on the day of or the day prior to admission. If a match was made, they were classified as having been transported by EMS. Otherwise, they were classified as having been transported by other means.

Age, sex, ethnicity, socio-economic deprivation and rurality were obtained from the NHI data collection. Ethnicity was prioritised using a slight modification of the Aotearoa New Zealand Health and Disability sector standard[18] in the following order: Māori > Pacific > Indian (including Fijian Indian) > non-Indian Asians (including Chinese) > Middle Eastern, Latin American and African (MELAA) > European > Other. MELAA and Other ethnic groups were combined given small numbers. Indians comprise approximately 90% of the total South Asian group but due to limitations in the ethnicity categorisations currently available in routinely collected Aotearoa New Zealand health data, non-Indian South Asians cannot be disaggregated from the rest of the non-Indian Asian group. Socio-economic deprivation and rurality measures were based on patients' domicile code, which reflected their residential address. Socio-economic deprivation decile or quintile was classified according to the New Zealand Index of Deprivation (NZDep) 2013, based on a range of 2013 Census data from people living in the same small area (of at least 100 people).[19] The Geographic Classification for Health (GCH) was used to classify each patient into one of five levels of (reducing) rurality (two urban categories [U1, U2] and three rural categories [R1, R2, R3]).[20]

### Statistical analysis

Patients were described using categorical variables (summarised as counts and percentages) and continuous variables (summarised as means with standard deviations [SD] and medians with interquartile ranges [IQR]) according to ACS type (STEMI, NSTEMI, UA) and within each ACS type by ethnicity. Differences in continuous variables (using the Kruskal–Wallis rank sum test) and categorical variables (using the Chi-squared test, or Fisher's exact test where any cells had a value <5) were assessed between ACS types and, within each ACS type, by ethnicity (using Episheet). The association between variables (ethnicity as well as age, sex, NZDep and rurality, either individually for univariable or in combination [ethnicity, age, sex, NZDep, rurality] for multivariable analyses) and arrival via EMS was assessed using logistic regression separately for each ACS type (using R Studio). Data are presented as (adjusted) odds ratios (OR or aOR) with 95% confidence intervals (CI). A p-value of <0.05 was considered statistically significant. Analyses were undertaken using Episheet or R Studio.

## Ethics

This study was conducted under a long-term CVD research programme, which undergoes annual ethics approval, most recently approved by the Northern Region B Health and Disability Ethics Committee on 21 October 2022 (2022 EXP 13442). This approval includes a waiver for individual participant consent. Ethical approval was also obtained from the Auckland University of Technology Ethics Committee (21/369) as the study was undertaken as part of the master's thesis of Haydn Drake.

# Results

Between 1 July 2019 and 30 June 2021, 19,283 patients were admitted with an ACS event and included in this analysis (STEMI n=4,827, 25%; NSTEMI n=10,627, 55%; UA n=3,829, 19.9%) (Table 1). Their median age was 69 years (IQR 60–78 years) and nearly two-thirds were male (65.2%, n=12,567). Most were European (75%), followed by Māori (11%), Pacific (5%), Indian (4%), non-Indian Asians (3%) and Other (1%). Most lived in urban areas (U1 51%, U2 23%), and the proportion living in areas with the greatest deprivation quintile was 23%. While there were statistically significant differences in each of these characteristics by ACS type, most differences were relatively minor, apart from those by age (median age STEMI 66 vs NSTEMI 71 and UA 70 years) and sex (women STEMI 31% vs 37% NSTEMI 37% and UA 36%). Each ACS type is also described by ethnicity in Appendix Table 1–3.

There were substantial (as well as statistically significant) differences in EMS use by ACS type, ranging from 75% for STEMI to 61% for NSTEMI and 45% for UA. The association between patient characteristics and EMS use is described for each ACS type in Table 2, both by proportions arriving by EMS (with numerators and denominators provided in Appendix Table 4–6) as well as by logistic regression.

For STEMI, EMS use ranged from 63.7% for non-Indian Asians to 77.9% for Europeans. All ethnic groups assessed were less likely to arrive by EMS for STEMI than Europeans, both for unadjusted as well as for adjusted analyses, although the effect was not statistically significant for Other patients (Figure 1). A similar pattern was evident for NSTEMI, although the reduced odds of EMS use compared with Europeans was not statistically significant in adjusted analyses for Indian or Other patients. For UA, while there were reduced odds of EMS use for all ethnic groups compared with Europeans, the magnitude of the reduction was attenuated, and odds were only statistically significant in adjusted analyses for non-Indian Asian patients.

EMS use also varied according to the other characteristics assessed. Men were consistently less likely than women to arrive via EMS across all ACS types, for unadjusted as well as adjusted analysis. Similarly, EMS was strongly associated with increasing age. The observed association between EMS use and deprivation was inconsistent, with some indication of lower access with increasing deprivation for STEMI and NSTEMI, but the inverse evident for UA. There was some indication of reduced EMS access with increasing rurality, although the pattern was mixed. EMS access was lower for U2 (second most urban) compared with U1 for all ACS types in adjusted analyses. EMS access was similarly lower for R2 and R3 (most rural) compared with U1, although the effect wasn't consistently statistically significant for STEMI and NSTEMI, and no statistically significant effects were observed for UA. In adjusted analyses, EMS access for R1 (mid-level on the five-level rurality scale) was slightly reduced (but not statistically different) to that for U1 for STEMI, and increased (though again not statistically significantly) to that for U1 for NSTEMI and UA.

# Discussion

Between 1 July 2019 and 30 June 2021, 19,283 ACS events were identified (STEMI 25%, NSTEMI 55%, UA 20%). Consistent with the findings of an earlier national study,[16] STEMI patients were younger and less likely to be women than NSTEMI or UA patients (median age 66 vs 71 and 70 years, respectively; women 31% vs 37% and 36%, respectively). EMS use ranged from 45% for UA to 61% for NSTEMI and 75% for STEMI. EMS use for STEMI was similar to that found in an earlier study from Aotearoa New Zealand (73%).[21]

EMS use was highest in Europeans (48–78%) compared with other ethnic groups (Māori 36–66%, Pacific 41–66%, Indian 37–68%, non-Indian Asians 26–64%, Other 32–71%). For STEMI, EMS use was lower in Māori (aOR 0.72, 95% CI 0.58–0.90), Pacific (aOR 0.64, 95% CI 0.48–0.87), Indian (aOR 0.63, 95% CI 0.43–0.86) and non-Indian Asian (aOR 0.52, 95% CI 0.37–0.74) but not Other patients (aOR 0.79, 95% CI 0.43–1.52) compared with Europeans. Similar findings by ethnicity were found for NSTEMI. Although odds of EMS use were also lower for UA in all ethnic groups compared with Europeans, the magnitude of the reduction was attenuated, and the effect was not statistically significant, apart from for non-Indian Asian patients.

Other studies have similarly found lower levels of EMS use for ACS among minority ethnic populations. One study focussed on STEMI found that Māori and Pacific patients were less likely than other ethnic groups to be transported by EMS than to self-transport.[21] A systematic review[22] identified three studies that found Latino,[23] Māori, Pacific and Indian peoples[14] and South Asians[24] were less likely to have been transported to hospital by EMS than non-minoritised populations.

A systematic review of ethnic differences of the care pathway following an out-of-hospital cardiac event found that disparities in access were attributed to a range of factors (comorbidities, insurance status, socio-economic variables, transportation barriers) and that addressing these disparities required targeted context- and population-specific interventions, informed by qualitative research.[22] Responding to this gap, a recent study of Māori patients and families accessing care for an out-of-hospital cardiac event found that EMS initiation was influenced by knowledge of symptoms and a desire to maintain personal dignity, alongside systemic barriers including racism, discrimination and inadequate resourcing.[25] The following factors were found to be critical to optimising healthcare journeys: relationships with health professionals, availability of good-quality information and family support and the use of cultural practices.[25] Similar factors are also relevant for Pacific and Asian (including South Asian) populations, who may also experience other barriers related to language and lack of knowledge of the Aotearoa New Zealand health system (particularly among migrants within Asian communities).[26–28] Key recommendations for achieving equity from that study, which are likely to be relevant to improving EMS access for Māori, as well as other groups with reduced access, are to increase awareness of the concepts and implications of cultural safety among health professionals and to integrate cultural practices into the healthcare journey of patients and their families.[25] Such approaches are likely to be important—alongside addressing other barriers such as lack of good information and cost—to supporting equitable EMS access. Strategies that make non-Europeans as comfortable using the EMS service as Europeans might include diversification of the EMS workforce as well as collaboration with ethnic groups to develop ethnic-appropriate education, communication and outreach. Further research is needed to determine the effectiveness of such strategies in ensuring that the Aotearoa New Zealand health system meets its responsibility for ensuring equitable access to pre-hospital care for ACS patients.

The strengths of this study were that it was based on recent and near complete national hospitalisation and EMS data, and analyses by ethnicity were undertaken separately by ACS type and were adjusted for age, sex, deprivation and rurality. On the other hand, EMS access may have been over-estimated because patients were matched with an EMS encounter on the day of or the day prior to admission. Some of the findings may be spurious because no adjustment was made for multiple statistical testing, and it is possible that COVID-19 and associated national lockdowns may have influenced the results observed given the study period. This study only assessed patients who were admitted to hospital with ACS, and therefore excluded patients who died with ACS prior to hospitalisation. This is an important consideration for future research given that as many as three-quarters of deaths from ACS occur outside the hospital, there is a strong relationship between delay in paramedic care and mortality[14] and Māori and Pacific peoples are significantly more likely than Europeans to have an unwitnessed cardiac arrest[29] and to die from coronary heart disease before reaching hospital.[9]

## Conclusions

EMS use for ACS (particularly STEMI, and similarly for NSTEMI) varies by ethnicity, with most ethnic groups (including Māori and Pacific peoples) less likely to have access to EMS than Europeans. This is despite Māori and Pacific peoples experiencing the greatest burden of CVD, and legislative requirements in Aotearoa New Zealand for equitable access to health services, including EMS. Previously published research from Aotearoa New Zealand on heart healthcare has identified enablers of access, including good-quality information, reduced cost and health professional cultural safety. Strengthening these enablers could increase access to EMS use for ACS by Māori, Pacific peoples and other non-Europeans.

**Table 1:** Patient characteristics by acute coronary syndrome type.

| | STEMI, n (%) | NSTEMI, n (%) | UA, n (%) | Total, n (%) | p-value* |
|---|---|---|---|---|---|
| Total | 4,827 (25.0) | 10,627 (55.1) | 3,829 (19.9) | 19,283 | |
| **Sex** | | | | | |
| Female | 1,470 (30.5) | 3,876 (36.5) | 1,370 (35.8) | 6,716 (34.8) | <0.0001 |
| Male | 3,357 (69.5) | 6,751 (63.5) | 2,459 (64.2) | 12,567 (65.2) | |
| **Age, years** | | | | | |
| Mean (SD) | 66.4 (13.6) | 69.8 (13.1) | 68.9 (11.6) | 68.7 (13.1) | <0.0001 |
| Median (IQR) | 66.0 (57.0–76.5) | 71.0 (61.0–80.0) | 70.0 (61.0–77.0) | 69.0 (60.0–78.0) | |
| **Age groups, years** | | | | | |
| 18–39 | 115 (2.4) | 146 (1.4) | 31 (0.8) | 292 (1.5) | <0.0001 |
| 40–49 | 420 (8.7) | 596 (5.6) | 172 (4.5) | 1,188 (6.2) | |
| 50–59 | 998 (20.7) | 1,661 (15.6) | 636 (16.6) | 3,295 (17.1) | |
| 60–69 | 1,292 (26.8) | 2,633 (24.8) | 1,050 (27.4) | 4,975 (25.8) | |
| 70–79 | 1,086 (22.5) | 2,914 (27.4) | 1,240 (32.4) | 5,240 (27.2) | |
| 80+ | 916 (19) | 2,677 (25.2) | 700 (18.3) | 4,293 (22.3) | |
| **Ethnicity** | | | | | |
| Māori | 566 (11.7) | 1,204 (11.3) | 418 (10.9) | 2,188 (11.3) | 0.0055 |
| Pacific | 268 (5.6) | 560 (5.3) | 149 (3.9) | 977 (5.1) | |
| Indian | 226 (4.7) | 425 (4) | 148 (3.9) | 799 (4.1) | |
| Non-Indian Asian | 168 (3.5) | 352 (3.3) | 143 (3.7) | 663 (3.4) | |
| Other | 56 (1.2) | 134 (1.3) | 57 (1.5) | 247 (1.3) | |
| European | 3,543 (73.4) | 7,952 (74.8) | 2,914 (76.1) | 14,409 (74.7) | |
| **Deprivation quintile, from 1 (least) to 5 (most) deprivation** | | | | | |
| 1 | 824 (17.1) | 1,713 (16.1) | 636 (16.6) | 3,173 (16.5) | 0.0309 |
| 2 | 904 (18.7) | 1,875 (17.6) | 643 (16.8) | 3,422 (17.7) | |
| 3 | 879 (18.2) | 2,069 (19.5) | 807 (21.1) | 3,755 (19.5) | |
| 4 | 1,092 (22.6) | 2,454 (23.1) | 865 (22.6) | 4,411 (22.9) | |
| 5 | 1,102 (22.8) | 2,488 (23.4) | 868 (22.7) | 4,458 (23.1) | |
| Missing | 26 (0.5) | 28 (0.3) | 10 (0.3) | 64 (0.3) | |

**Table 1 (continued):** Patient characteristics by acute coronary syndrome type.

| | STEMI, n (%) | NSTEMI, n (%) | UA, n (%) | Total, n (%) | p-value* |
|---|---|---|---|---|---|
| **Rurality, from Urban 1 (least) to Rural 3 (most) rural** | | | | | |
| Urban 1 | 2,588 (53.6) | 5,405 (50.9) | 1,834 (47.9) | 9,827 (51.0) | <0.0001 |
| Urban 2 | 1,042 (21.6) | 2,406 (22.6) | 892 (23.3) | 4,340 (22.5) | |
| Rural 1 | 625 (12.9) | 1,552 (14.6) | 621 (16.2) | 2,798 (14.5) | |
| Rural 2 | 321 (6.7) | 768 (7.2) | 314 (8.2) | 1,403 (7.3) | |
| Rural 3 | 67 (1.4) | 145 (1.4) | 59 (1.5) | 271 (1.4) | |
| Missing | 184 (3.8) | 351 (3.3) | 109 (2.8) | 644 (3.3) | |
| **Transportation to hospital** | | | | | |
| Ambulance | 3,612 (74.8) | 6,455 (60.7) | 1,714 (44.8) | 11,781 (61.1) | <0.0001 |
| Self | 1,215 (25.2) | 4,172 (39.3) | 2,115 (55.2) | 7,502 (38.9) | |

STEMI = ST-elevation myocardial infarction; NSTEMI = non-STEMI; UA = unstable angina; SD = standard deviation; IQR = interquartile range.
*p-value for difference by acute coronary syndrome type .

**Table 2:** Association between patient characteristics and emergency medical services access by acute coronary syndrome type.

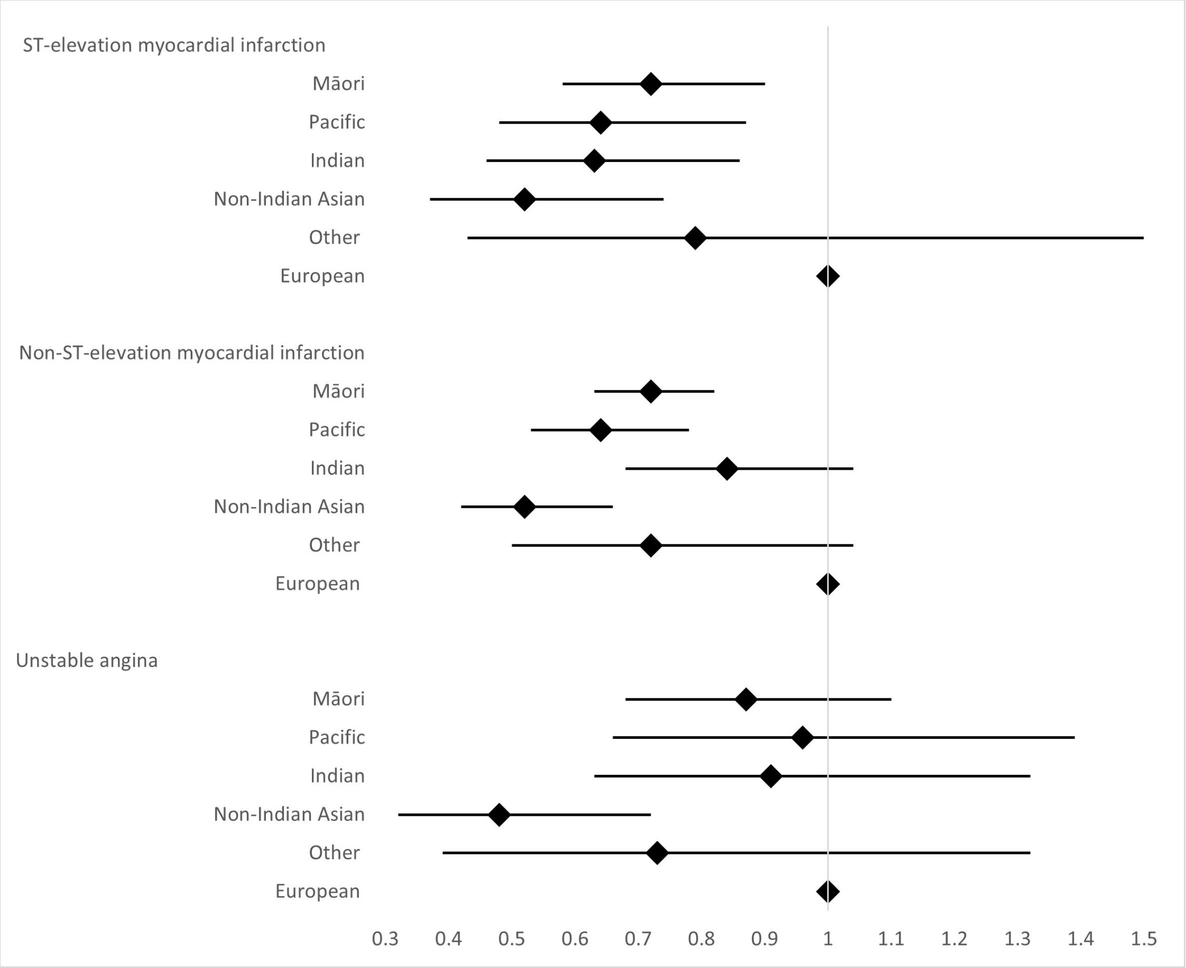
| | **ST-elevation myocardial infarction** | | | **Non-ST-elevation myocardial infarction** | | | **Unstable angina** | | |
|---|---|---|---|---|---|---|---|---|---|
| | **n/N (%) arriving by EMS** | **OR (95% CI)** | | **n/N (%) arriving by EMS** | **OR (95% CI)** | | **n/N (%) arriving by EMS** | **OR (95% CI)** | |
| | | **Unadjusted** | **Adjusted*** | | **Unadjusted** | **Adjusted*** | | **Unadjusted** | **Adjusted*** |
| **Ethnicity** | | | | | | | | | |
| Māori | 375/566 (66) | 0.56 (0.46–0.68) | 0.72 (0.58–0.90) | 586/1,204 (49) | OR 0.51 (0.46–0.58) | OR 0.72 (0.63–0.82) | 150/418 (36) | OR 0.61 (0.49–0.75) | OR 0.87 (0.68–1.10) |
| Pacific | 177/268 (66) | 0.55 (0.42–0.72) | 0.64 (0.48–0.87) | 264/560 (47) | OR 0.48 (0.41–0.57) | OR 0.64 (0.53–0.78) | 61/149 (41) | OR 0.76 (0.54–1.06) | OR 0.96 (0.66–1.39) |
| Indian | 153/226 (68) | 0.59 (0.45–0.80) | 0.63 (0.46–0.86) | 226/425 (53) | OR 0.62 (0.51–0.75) | OR 0.84 (0.68–1.04) | 55/148 (37) | OR 0.65 (0.46–0.90) | OR 0.91 (0.63–1.32) |
| Non-Indian Asian | 107/168 (64) | 0.50 (0.36–0.69) | 0.52 (0.37–0.74) | 154/352 (44) | OR 0.42 (0.34–0.52) | OR 0.52 (0.42–0.66) | 37/143 (26) | OR 0.38 (0.26–0.55) | OR 0.48 (0.32–0.72) |
| Other | 40/56 (71) | 0.71 (0.40–1.31) | 0.79 (0.43–1.52) | 70/134 (52) | OR 0.59 (0.42–0.84) | OR 0.72 (0.50–1.04) | 18/57 (32) | OR 0.50 (0.28–0.87) | OR 0.73 (0.39–1.32) |
| European | 2,760/3,543 (78) | 1.00 | 1.00 | 5,155/7,952 (65) | 1.00 | 1.00 | 1,393/2,914 (48) | 1.00 | 1.00 |
| **Sex** | | | | | | | | | |
| M | 2,442/3,357 (73) | 0.68 (0.59–0.79) | 0.79 (0.67–0.93) | 3,875/6,751 (57) | OR 0.68 (0.62–0.73) | OR 0.79 (0.72–0.86) | 1,016/2,459 (41) | OR 0.68 (0.59–0.77) | OR 0.74 (0.64–0.85) |
| F | 1,170/1,470 (80) | 1.00 | 1.00 | 2,580/3,876 (67) | 1.00 | 1.00 | 698/1,370 (51) | 1.00 | 1.00 |
| **Age, years** | | | | | | | | | |
| Per increase in year | | 1.03 (1.02–1.03) | 1.02 (1.02–1.03) | | OR 1.05 (1.04–1.05) | OR 1.04 (1.04–1.05) | | OR 1.05 (1.05–1.06) | OR 1.05 (1.04–1.06) |
| 18–39 | 72/115 (63) | | | 51/146 (35) | | | 10/31 (32) | | |
| 40–49 | 280/420 (67) | | | 258/596 (43) | | | 52/172 (30) | | |
| 50–59 | 708/998 (71) | | | 761/1,661 (46) | | | 179/636 (28) | | |
| 60–69 | 921/1,292 (71) | | | 1357/2,633 (52) | | | 383/1,050 (37) | | |

**Table 2 (continued):** Association between patient characteristics and emergency medical services access by acute coronary syndrome type.

| | ST-elevation myocardial infarction | | | Non-ST-elevation myocardial infarction | | | Unstable angina | | |
|---|---|---|---|---|---|---|---|---|---|
| | n/N (%) arriving by EMS | OR (95% CI) | | n/N (%) arriving by EMS | OR (95% CI) | | n/N (%) arriving by EMS | OR (95% CI) | |
| | | Unadjusted | Adjusted* | | Unadjusted | Adjusted* | | Unadjusted | Adjusted* |
| 70–79 | 827/1,086 (76) | | | 1845/2,914 (63) | | | 588/1,240 (47) | | |
| 80+ | 804/916 (88) | | | 2183/2,677 (82) | | | 502/700 (72) | | |
| **Deprivation decile from 1 (least) to 10 (most) deprivation** | | | | | | | | | |
| Per increase in decile | | 0.96 (0.93–0.98) | 0.98 (0.96–1.01) | | OR 0.99 (0.97–1.00) | OR 1.02 (1.00–1.03) | | OR 1.02 (1.00–1.04) | OR 1.05 (1.02–1.08) |
| 1–2 | 642/824 (78) | | | 1,033/1,713 (60) | | | 256/636 (40) | | |
| 3–4 | 692/904 (77) | | | 1,141/1,875 (61) | | | 287/643 (45) | | |
| 5–6 | 677/879 (77) | | | 1,305/2,069 (63) | | | 371/807 (46) | | |
| 7–8 | 796/1,092 (73) | | | 1,542/2,454 (63) | | | 418/865 (48) | | |
| 9–10 | 793/1,102 (72) | | | 1,420/2,488 (52) | | | 377/868 (43) | | |
| **Rurality, from Urban 1 (least) to Rural 3 (most) rural** | | | | | | | | | |
| Urban 2 | 692/1,042 (66) | 0.55 (0.47–0.65) | 0.47 (0.40–0.56) | 1,366/2,406 (57) | OR 0.83 (0.75–0.91) | OR 0.70 (0.63–0.78) | 365/892 (41) | OR 0.87 (0.74–1.02) | OR 0.76 (0.64–0.91) |
| Rural 1 | 489/625 (78) | 1.00 (0.81–1.24) | 0.87 (0.70–1.09) | 1,031/1,552 (66) | OR 1.25 (1.11–1.41) | OR 1.10 (0.97–1.25) | 319/621 (51) | OR 1.32 (1.10–1.59) | OR 1.21 (0.99–1.47) |
| Rural 2 | 223/321 (70) | 0.63 (0.49–0.82) | 0.57 (0.44–0.75) | 438/768 (57) | OR 0.84 (0.72–0.98) | OR 0.73 (0.62–0.86) | 134/314 (43) | OR 0.93 (0.73–1.19) | OR 0.86 (0.67–1.12) |
| Rural 3 | 51/67 (76) | 0.89 (0.51–1.62) | 0.92 (0.52–1.69) | 78/145 (54) | OR 0.74 (0.53–1.03) | OR 0.71 (0.50–1.00) | 25/59 (42) | OR 0.92 (0.54–1.55) | OR 0.81 (0.46–1.40) |
| Urban 1 | 2,024/2,588 (78) | 1.00 | 1.00 | 3,313/5,405 (61) | 1.00 | 1.00 | 814/1,834 (44) | 1.00 | 1.00 |

OR = odds ratio; CI = confidence interval.
*Adjusted for all variables listed in table.

**Figure 1:** Association between ethnicity and emergency medical services access by acute coronary syndrome type, adjusted odds ratios (95% confidence intervals).



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**COMPETING INTERESTS**

Vanessa Selak, Shanthi Ameratunga, Matire Harwood and Corina Grey report funding from the Healthier Lives | He Oranga Hauora – National Science Challenge, the Heart Foundation of New Zealand and the Health Research Council of New Zealand (programme and project grants).

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Matire Harwood is Board Member of the Hauora Māori Advisory Committee, Member of the Heart Foundation, Member of the MAS Foundation and Board Member of the MRINZ Board.

Rochelle Newport received a PhD scholarship from Manawataki Fatu Fatu.

Vanessa Selak is Board Member of the EQUIT3 (vaping cessation trial) DSMB, Board Member of the Cess@Tion (smoking cessation trial) DSMB, Board Member of the Auckland Medical Research Foundation and Deputy Chair of the Medical Committee of the Auckland Medical Research Foundation.

Bridget Dicker is an employee of Hato Hone St John and this work was undertaken in “time only” as part of her employment.

Sandra Hanchard received support of Pacific Fellowship from the Heart Foundation and Pūtahi Manawa Healthy Hearts for Aotearoa New Zealand. Sandra Hanchard is a Governance Member of the National Cardiac Clinician Network and a Council Member of the Health New Zealand – Te Whatu Ora Whānau, Consumer and Clinician Digital Council.

**ACKNOWLEDGEMENTS**

This work was undertaken as part of Manawataki Fatu Fatu (Māori and Pacific hearts in unison for Achieving Cardiovascular Care for Equity StudieS [ACCESS]).

The programme is led by Associate Professor Matire Harwood and Dr Corina Grey and includes Professor Shanthi Ameratunga, Associate Professor Vanessa Selak, Professor Bridget Dicker, Dr Karen Brewer, Dr Janine Paynter, Dr Tua Taueetia-Su’a, Dr Sandra Hanchard, Dr Sione Vaka, Rochelle Newport, Julie Winter-Smith, Taria Tane and Jess Lagaluga Hutchings.

We kindly acknowledge and thank Hato Hone St John and Wellington Free Ambulance for their assistance with data access.

This work was undertaken in conjunction with the Vascular Risk Equity in Aotearoa New Zealand (VAREANZ) programme. The programme is led by Professor Rod Jackson, Associate Professor Sue Wells, Professor Sue Crengle and Associate Professor Matire Harwood. The authors would like to thank the VAREANZ team and in particular Associate Professor Katrina Poppe, Dr Claris Chung and Dr Yeunhyang Choi for their assistance with data access, linkage and curation, and Dr Suneela Mehta for her advice regarding analyses for Asian patients.

The authors would like to thank the National Heart Foundation of New Zealand and Healthier Lives | He Oranga Hauora – National Science Challenge of New Zealand, co-funders of the Manawataki Fatu Fatu programme, and in particular Sir Jerry Mateparae (Chair, Healthier Lives), Professor Jim Mann (Director, Healthier Lives) and Associate Professor Gerry Devlin (Medical Director, Heart Foundation).

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https://nzmj.org.nz/journal/vol-138-no-1611/variation-in-emergency-medical-service-use-for-acute-coronary-syndromes-by-ethnicity-an-aotearoa-new-zealand-observational-study

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# Appendix

**Appendix Table 1:** ST-elevation myocardial infarction patient characteristics by ethnicity, n (%).

| | Māori | Pacific | Indian | Non-Indian Asian | Other | European | p-value* |
|---|---|---|---|---|---|---|---|
| Total | 566 (11.7%) | 268 (5.6%) | 226 (4.7%) | 168 (3.5%) | 56 (1.2%) | 3,543 (73.4%) | |
| **Sex** | | | | | | | |
| Female | 190 (33.6%) | 72 (26.9%) | 44 (19.5%) | 31 (18.5%) | 10 (17.9%) | 1,123 (31.7%) | <0.0001 |
| Male | 376 (66.4%) | 196 (73.1%) | 182 (80.5%) | 137 (81.5%) | 46 (82.1%) | 2,420 (68.3%) | |
| **Age, years** | | | | | | | |
| Mean (SD) | 59.3 (11.5) | 58.8 (13.0) | 58.8 (14.4) | 61.2 (15.2) | 65.4 (12.2) | 68.8 (12.9) | <0.0001 |
| Median (IQR) | 59.0 (52.0–67.0) | 58.0 (50.0–67.0) | 59.0 (48.3–69.0) | 61.0 (50.0–72.3) | 65.0 (59.0–74.3) | 69.0 (60.0–79.0) | |
| **Age group, years** | | | | | | | |
| 18–39 | 22 (3.9%) | 16 (6.0%) | 23 (10.2%) | 14 (8.3%) | 2 (3.6%) | 38 (1.1%) | 0.005 |
| 40–49 | 91 (16.1%) | 47 (17.5%) | 40 (17.7%) | 27 (16.1%) | 3 (5.4%) | 212 (6.0%) | |
| 50–59 | 184 (32.5%) | 84 (31.3%) | 52 (23.0%) | 35 (20.8%) | 11 (19.6%) | 632 (17.8%) | |
| 60–69 | 163 (28.8%) | 63 (23.5%) | 56 (24.8%) | 40 (23.8%) | 20 (35.7%) | 950 (26.8%) | |
| 70–79 | 78 (13.8%) | 39 (14.6%) | 36 (15.9%) | 28 (16.7%) | 14 (25.0%) | 891 (25.1%) | |
| 80+ | 28 (4.9%) | 19 (7.1%) | 19 (8.4%) | 24 (14.3%) | 6 (10.7%) | 820 (23.1%) | |
| **Deprivation quintile (NZDep13), from 1 (least) to 5 (most) deprivation** | | | | | | | |
| 1 | 29 (5.1%) | 11 (4.1%) | 36 (15.9%) | 43 (25.6%) | 9 (16.1%) | 696 (19.6%) | <0.0001 |
| 2 | 41 (7.2%) | 22 (8.2%) | 46 (20.4%) | 41 (24.4%) | 12 (21.4%) | 742 (20.9%) | |

**Appendix Table 1 (continued):** ST-elevation myocardial infarction patient characteristics by ethnicity, n (%).

| | Māori | Pacific | Indian | Non-Indian Asian | Other | European | p-value* |
|---|---|---|---|---|---|---|---|
| 3 | 68 (12.0%) | 27 (10.1%) | 42 (18.6%) | 20 (11.9%) | 11 (19.6%) | 711 (20.1%) | |
| 4 | 142 (25.1%) | 53 (19.8%) | 46 (20.4%) | 40 (23.8%) | 14 (25.0%) | 797 (22.5%) | |
| 5 | 286 (50.5%) | 153 (57.1%) | 55 (24.3%) | 22 (13.1%) | 9 (16.1%) | 577 (16.3%) | |
| Missing | 0 (0.0%) | 2 (0.7%) | 1 (0.4%) | 2 (1.2%) | 1 (1.8%) | 20 (0.6%) | |
| **Rurality (Geographic Classification for Health), from Urban 1 (least) to Rural 3 (most) rural** | | | | | | | |
| Urban 1 | 216 (38.2%) | 222 (82.8%) | 198 (87.6%) | 141 (83.9%) | 36 (64.3%) | 1,775 (50.1%) | 0.0005 |
| Urban 2 | 158 (27.9%) | 24 (9.0%) | 12 (5.3%) | 14 (8.3%) | 8 (14.3%) | 826 (23.3%) | |
| Rural 1 | 85 (15.0%) | 4 (1.5%) | 5 (2.2%) | 5 (3.0%) | 6 (10.7%) | 520 (14.7%) | |
| Rural 2 | 64 (11.3%) | 2 (0.7%) | 0 (0.0%) | 1 (0.6%) | 3 (5.4%) | 251 (7.1%) | |
| Rural 3 | 26 (4.6%) | 1 (0.4%) | 0 (0.0%) | 1 (0.6%) | 0 (0.0%) | 39 (1.1%) | |
| Missing | 17 (3.0%) | 15 (5.6%) | 11 (4.9%) | 6 (3.6%) | 3 (5.4%) | 132 (3.7%) | |
| **Transportation to hospital** | | | | | | | |
| Ambulance | 375 (66.3%) | 177 (66.0%) | 153 (67.7%) | 107 (63.7%) | 40 (71.4%) | 2,760 (77.9%) | <0.0001 |
| Self | 191 (33.7%) | 91 (34.0%) | 73 (32.3%) | 61 (36.3%) | 16 (28.6%) | 783 (22.1%) | |

SD = standard deviation; IQR = interquartile range.
*p-value for difference by ethnicity.

**Appendix Table 2:** Non-ST-elevation myocardial infarction patient characteristics by ethnicity, n (%).

| | Māori | Pacific | Indian | Non-Indian Asian | Other | European | p-value* |
|---|---|---|---|---|---|---|---|
| Total | 1,204 (11.3%) | 560 (5.3%) | 425 (4.0%) | 352 (3.3%) | 134 (1.3%) | 7,952 (74.8%) | |
| **Sex** | | | | | | | |
| Female | 547 (45.4%) | 233 (41.6%) | 106 (24.9%) | 102 (29.0%) | 39 (29.1%) | 2,849 (35.8%) | <0.0001 |
| Male | 657 (54.6%) | 327 (58.4%) | 319 (75.1%) | 250 (71.0%) | 95 (70.9%) | 5,103 (64.2%) | |
| **Age, years** | | | | | | | |
| Mean (SD) | 62.3 (12.4) | 61.8 (12.9) | 62.7 (13.8) | 64.3 (14.6) | 66.1 (13.5) | 72.1 (12.3) | <0.0001 |
| Median (IQR) | 63.0 (54.0–71.0) | 61.5 (53.0–71.0) | 63.0 (53.0–73.0) | 65.0 (53.0–76.0) | 64.0 (56.0–76.0) | 73.0 (63.0–81.0) | |
| **Age group, years** | | | | | | | |
| 18–39 | 41 (3.4%) | 21 (3.8%) | 23 (5.4%) | 17 (4.8%) | 1 (0.7%) | 43 (0.5%) | 0.0005 |
| 40–49 | 143 (11.9%) | 77 (13.8%) | 51 (12.0%) | 49 (13.9%) | 10 (7.5%) | 266 (3.3%) | |
| 50–59 | 310 (25.7%) | 147 (26.3%) | 95 (22.4%) | 67 (19.0%) | 33 (24.6%) | 1,009 (12.7%) | |
| 60–69 | 368 (30.6%) | 163 (29.1%) | 108 (25.4%) | 85 (24.1%) | 41 (30.6%) | 1,868 (23.5%) | |
| 70–79 | 237 (19.7%) | 100 (17.9%) | 92 (21.6%) | 69 (19.6%) | 28 (20.9%) | 2,388 (30.0%) | |
| 80+ | 105 (8.7%) | 52 (9.3%) | 56 (13.2%) | 65 (18.5%) | 21 (15.7%) | 2,378 (29.9%) | |
| **Deprivation quintile (NZDep13), from 1 (least) to 5 (most) deprivation** | | | | | | | |
| 1 | 70 (5.8%) | 24 (4.3%) | 49 (11.5%) | 69 (19.6%) | 26 (19.4%) | 1,475 (18.5%) | <0.0001 |
| 2 | 90 (7.5%) | 43 (7.7%) | 76 (17.9%) | 92 (26.1%) | 30 (22.4%) | 1,544 (19.4%) | |
| 3 | 160 (13.3%) | 65 (11.6%) | 64 (15.1%) | 67 (19.0%) | 26 (19.4%) | 1,687 (21.2%) | |

**Appendix Table 2 (continued):** Non-ST-elevation myocardial infarction patient characteristics by ethnicity, n (%).

| | **Māori** | **Pacific** | **Indian** | **Non-Indian Asian** | **Other** | **European** | **p-value*** |
|---|---|---|---|---|---|---|---|
| 4 | 271 (22.5%) | 118 (21.1%) | 86 (20.2%) | 69 (19.6%) | 25 (18.7%) | 1,885 (23.7%) | |
| 5 | 612 (50.8%) | 305 (54.5%) | 149 (35.1%) | 55 (15.6%) | 27 (20.1%) | 1,340 (16.9%) | |
| Missing | 1 (0.1%) | 5 (0.9%) | 1 (0.2%) | 0 (0.0%) | 0 (0.0%) | 21 (0.3%) | |
| **Rurality (Geographical Classification for Health), from Urban 1 (least) to Rural 3 (most) rural** | | | | | | | |
| Urban 1 | 415 (34.5%) | 475 (84.8%) | 373 (87.8%) | 307 (87.2%) | 98 (73.1%) | 3,737 (47.0%) | 0.0005 |
| Urban 2 | 363 (30.1%) | 36 (6.4%) | 21 (4.9%) | 20 (5.7%) | 10 (7.5%) | 1,956 (24.6%) | |
| Rural 1 | 176 (14.6%) | 15 (2.7%) | 12 (2.8%) | 12 (3.4%) | 13 (9.7%) | 1,324 (16.6%) | |
| Rural 2 | 159 (13.2%) | 8 (1.4%) | 2 (0.5%) | 2 (0.6%) | 7 (5.2%) | 590 (7.4%) | |
| Rural 3 | 47 (3.9%) | 0 (0.0%) | 1 (0.2%) | 1 (0.3%) | 0 (0.0%) | 96 (1.2%) | |
| Missing | 44 (3.7%) | 26 (4.6%) | 16 (3.8%) | 10 (2.8%) | 6 (4.5%) | 249 (3.1%) | |
| **Transportation to hospital** | | | | | | | |
| Ambulance | 586 (48.7%) | 264 (47.1%) | 226 (53.2%) | 154 (43.8%) | 70 (52.2%) | 5,155 (64.8%) | <0.0001 |
| Self | 618 (51.3%) | 296 (52.9%) | 199 (46.8%) | 198 (56.3%) | 64 (47.8%) | 2,797 (35.2%) | |

SD = standard deviation; IQR = interquartile range.
*p-value for difference by ethnicity.

**Appendix Table 3:** Unstable angina patient characteristics by ethnicity, n (%).

| | Māori | Pacific | Indian | Non-Indian Asian | Other | European | p-value* |
|---|---|---|---|---|---|---|---|
| Total | 418 (10.9%) | 149 (3.9%) | 148 (3.9%) | 143 (3.7%) | 57 (1.5%) | 2,914 (76.1%) | |
| **Sex** | | | | | | | |
| Female | 196 (46.9%) | 62 (41.6%) | 32 (21.6%) | 52 (36.4%) | 16 (28.1%) | 1,012 (34.7%) | <0.0001 |
| Male | 222 (53.1%) | 87 (58.4%) | 116 (78.4%) | 91 (63.6%) | 41 (71.9%) | 1,902 (65.3%) | |
| **Age, years** | | | | | | | |
| Mean (SD) | 61.4 (10.8) | 61.6 (12.2) | 62.8 (11.6) | 64.7 (11.6) | 63.1 (10.1) | 71.0 (11.0) | <0.0001 |
| Median (IQR) | 61.0 (55.0–68.0) | 60.0 (53.0–72.0) | 64.0 (54.8–72.0) | 65.0 (57.0–72.0) | 63.0 (54.0–72.0) | 72.0 (64.0–79.0) | |
| **Age group, years** | | | | | | | |
| 18–39 | 9 (2.2%) | 4 (2.7%) | 7 (4.7%) | 4 (2.8%) | 0 (0.0%) | 7 (0.2%) | 0.0005 |
| 40–49 | 49 (11.7%) | 18 (12.1%) | 13 (8.8%) | 9 (6.3%) | 4 (7.0%) | 79 (2.7%) | |
| 50–59 | 116 (27.8%) | 49 (32.9%) | 31 (20.9%) | 30 (21.0%) | 19 (33.3%) | 391 (13.4%) | |
| 60–69 | 153 (36.6%) | 38 (25.5%) | 50 (33.8%) | 52 (36.4%) | 17 (29.8%) | 740 (25.4%) | |
| 70–79 | 69 (16.5%) | 27 (18.1%) | 41 (27.7%) | 35 (24.5%) | 14 (24.6%) | 1,054 (36.2%) | |
| 80+ | 22 (5.3%) | 13 (8.7%) | 6 (4.1%) | 13 (9.1%) | 3 (5.3%) | 643 (22.1%) | |
| **Deprivation quintile (NZDep13), from 1 (least) to 5 (most) deprivation** | | | | | | | |
| 1 | 27 (6.5%) | 6 (4.0%) | 15 (10.1%) | 34 (23.8%) | 13 (22.8%) | 541 (18.6%) | <0.0001 |
| 2 | 34 (8.1%) | 10 (6.7%) | 22 (14.9%) | 26 (18.2%) | 11 (19.3%) | 540 (18.5%) | |
| 3 | 57 (13.6%) | 15 (10.1%) | 28 (18.9%) | 35 (24.5%) | 11 (19.3%) | 661 (22.7%) | |

**Appendix Table 3 (continued):** Unstable angina patient characteristics by ethnicity, n (%).

| | Māori | Pacific | Indian | Non-Indian Asian | Other | European | p-value* |
|---|---|---|---|---|---|---|---|
| 4 | 90 (21.5%) | 33 (22.1%) | 27 (18.2%) | 21 (14.7%) | 15 (26.3%) | 679 (23.3%) | |
| 5 | 210 (50.2%) | 83 (55.7%) | 55 (37.2%) | 27 (18.9%) | 6 (10.5%) | 487 (16.7%) | |
| Missing | 0 (0.0%) | 2 (1.3%) | 1 (0.7%) | 0 (0.0%) | 1 (1.8%) | 6 (0.2%) | |
| **Rurality (Geographical Classification for Health), from Urban 1 (least) to Rural 3 (most) rural** | | | | | | | |
| Urban 1 | 132 (31.6%) | 121 (81.2%) | 132 (89.2%) | 122 (85.3%) | 41 (71.9%) | 1,286 (44.1%) | 0.0005 |
| Urban 2 | 135 (32.3%) | 9 (6.0%) | 3 (2.0%) | 13 (9.1%) | 7 (12.3%) | 725 (24.9%) | |
| Rural 1 | 74 (17.7%) | 14 (9.4%) | 5 (3.4%) | 6 (4.2%) | 3 (5.3%) | 519 (17.8%) | |
| Rural 2 | 55 (13.2%) | 1 (0.7%) | 4 (2.7%) | 0 (0.0%) | 2 (3.5%) | 252 (8.6%) | |
| Rural 3 | 12 (2.9%) | 0 (0.0%) | 0 (0.0%) | 0 (0.0%) | 1 (1.8%) | 46 (1.6%) | |
| Missing | 10 (2.4%) | 4 (2.7%) | 4 (2.7%) | 2 (1.4%) | 3 (5.3%) | 86 (3.0%) | |
| **Transportation to hospital** | | | | | | | |
| Ambulance | 150 (35.9%) | 61 (40.9%) | 55 (37.2%) | 37 (25.9%) | 18 (31.6%) | 1,393 (47.8%) | <0.0001 |
| Self | 268 (64.1%) | 88 (59.1%) | 93 (62.8%) | 106 (74.1%) | 39 (68.4%) | 1,521 (52.2%) | |

SD = standard deviation; IQR = interquartile range.
*p-value for difference by ethnicity.

**Appendix Table 4:** ST-elevation myocardial infarction patient characteristics by transport to hospital, n (%).

| | Emergency medical service | Other | Total | p-value* |
|---|---|---|---|---|
| **Sex** | | | | |
| Female | 1,170 (32.4%) | 300 (24.7%) | 1,470 | <0.01 |
| Male | 2,442 (67.6%) | 915 (75.3%) | 3,357 | |
| **Age, years** | | | | |
| 18–39 | 72 (2.0%) | 43 (3.5%) | 115 | <0.01 |
| 40–49 | 280 (7.8%) | 140 (11.5%) | 420 | |
| 50–59 | 708 (19.6%) | 290 (23.9%) | 998 | |
| 60–69 | 921 (25.5%) | 371 (30.5%) | 1,292 | |
| 70–79 | 827 (22.9%) | 259 (21.3%) | 1,086 | |
| 80+ | 804 (22.3%) | 112 (9.2%) | 916 | |
| **NZDep13 quintiles** | | | | |
| 1 | 642 (17.8%) | 182 (15.2%) | 824 | <0.01 |
| 2 | 692 (19.2%) | 212 (17.7%) | 904 | |
| 3 | 677 (18.8%) | 202 (16.8%) | 879 | |
| 4 | 796 (22.1%) | 296 (24.6%) | 1,092 | |
| 5 | 793 (22.0%) | 309 (25.7%) | 1,102 | |
| Missing | 12 | 14 | 26 | |
| **Rurality** | | | | |
| Urban 1 | 2,024 (58.2%) | 564 (48.5%) | 2,588 | <0.01 |
| Urban 2 | 692 (19.9%) | 350 (30.1%) | 1,042 | |
| Rural 1 | 489 (14.1%) | 136 (11.7%) | 625 | |
| Rural 2 | 223 (6.4%) | 98 (8.4%) | 321 | |
| Rural 3 | 51 (1.5%) | 16 (1.4%) | 67 | |
| Missing | 133 | 51 | 184 | |
| **Ethnicity** | | | | |
| European | 2,760 (76.4%) | 783 (64.4%) | 3,543 | <0.01 |
| Non-Indian Asian | 107 (3.0%) | 61 (5.0%) | 168 | |
| Indian | 153 (4.2%) | 73 (6.0%) | 226 | |

**Appendix Table 4 (continued):** ST-elevation myocardial infarction patient characteristics by transport to hospital, n (%).

| | Emergency medical service | Other | Total | p-value* |
|---|---|---|---|---|
| Māori | 375 (10.4%) | 191 (15.7%) | 566 | |
| Pacific | 177 (4.9%) | 91 (7.5%) | 268 | |
| Other | 40 (1.1%) | 16 (1.3%) | 56 | |

*p-value for difference by transport to hospital by patient.

**Appendix Table 5:** Non-ST-elevation myocardial infarction patient characteristics by transport to hospital, n (%).

| | Emergency medical service | Other | Total | p-value* |
|---|---|---|---|---|
| **Sex** | | | | |
| Female | 2,580 (40.0%) | 1,296 (31.1%) | 3,876 | <0.01 |
| Male | 3,875 (60.0%) | 2,876 (68.9%) | 6,751 | |
| **Age, years** | | | | |
| 18–39 | 51 (0.8%) | 95 (2.3%) | 146 | <0.01 |
| 40–49 | 258 (4.0%) | 338 (8.1%) | 596 | |
| 50–59 | 761 (11.8%) | 900 (21.6%) | 1,661 | |
| 60–69 | 1,357 (21.0%) | 1,276 (30.6%) | 2,633 | |
| 70–79 | 1,845 (28.6%) | 1,069 (25.6%) | 2,914 | |
| 80+ | 2,183 (33.8%) | 494 (11.8%) | 2,677 | |
| **NZDep13 quintiles** | | | | |
| 1 | 1,033 (16.0%) | 680 (16.4) | 1,713 | <0.01 |
| 2 | 1,141 (17.7%) | 734 (17.7%) | 1,875 | |
| 3 | 1,305 (20.3%) | 764 (18.4%) | 2,069 | |
| 4 | 1,542 (23.9%) | 912 (21.9%) | 2,454 | |
| 5 | 1,420 (22.0%) | 1,068 (25.7%) | 2,488 | |
| Missing | 14 | 14 | 28 | |
| **Rurality** | | | | |
| Urban 1 | 3,313 (53.2%) | 2,092 (51.7%) | 5,405 | <0.01 |
| Urban 2 | 1,366 (21.9%) | 1,040 (25.7%) | 2,406 | |
| Rural 1 | 1,031 (16.6%) | 521 (12.9%) | 1,552 | |

**Appendix Table 5 (continued):** Non-ST-elevation myocardial infarction patient characteristics by transport to hospital, n (%).

| | Emergency medical service | Other | Total | p-value* |
|---|---|---|---|---|
| Rural 2 | 438 (7.0%) | 330 (8.1%) | 768 | |
| Rural 3 | 78 (1.3%) | 67 (1.7%) | 145 | |
| Missing | 229 | 122 | 351 | |
| **Ethnicity** | | | | |
| European | 5,155 (79.9%) | 2,797 (67.0%) | 7,952 | <0.01 |
| Non-Indian Asian | 154 (2.4%) | 198 (4.7%) | 352 | |
| Indian | 226 (3.5%) | 199 (4.8%) | 425 | |
| Māori | 586 (9.1%) | 618 (14.8%) | 1,204 | |
| Pacific | 264 (4.1%) | 296 (7.1%) | 560 | |
| Other | 70 (1.1%) | 64 (1.5%) | 134 | |

*p-value for difference by transport to hospital by patient characteristic.

**Appendix Table 6:** Unstable angina patient characteristics by transport to hospital, n (%).

| | Emergency medical service | Other | Total | p-value* |
|---|---|---|---|---|
| **Sex** | | | | |
| Female | 698 (40.7%) | 672 (31.8%) | 1,370 | <0.01 |
| Male | 1,016 (59.3%) | 1,443 (68.2%) | 2,459 | |
| **Age, years** | | | | |
| 18–39 | 10 (0.6%) | 21 (1.0%) | 31 | <0.01 |
| 40–49 | 52 (3.0%) | 120 (5.7%) | 172 | |
| 50–59 | 179 (10.4%) | 457 (21.6%) | 636 | |
| 60–69 | 383 (22.3%) | 667 (31.5%) | 1,050 | |
| 70–79 | 588 (34.3%) | 652 (30.8%) | 1,240 | |
| 80+ | 502 (29.3%) | 198 (9.4%) | 700 | |
| **NZDep13 quintiles** | | | | |
| 1 | 256 (15.0%) | 380 (18.0%) | 636 | <0.01 |
| 2 | 287 (16.8%) | 356 (16.9%) | 643 | |
| 3 | 371 (21.7%) | 436 (20.7%) | 807 | |
| 4 | 418 (24.5%) | 447 (21.2%) | 865 | |

**Appendix Table 6 (continued):** Unstable angina patient characteristics by transport to hospital, n (%).

| | Emergency medical service | Other | Total | p-value* |
|---|---|---|---|---|
| 5 | 377 (22.1%) | 491 (23.3%) | 868 | |
| Missing | 5 | 5 | 10 | |
| **Rurality** | | | | |
| Urban 1 | 814 (49.1%) | 1,020 (49.4%) | 1,834 | <0.01 |
| Urban 2 | 365 (22.0%) | 527 (25.5%) | 892 | |
| Rural 1 | 319 (19.3%) | 302 (14.6%) | 621 | |
| Rural 2 | 134 (8.1%) | 180 (8.7%) | 314 | |
| Rural 3 | 25 (1.5%) | 34 (1.6%) | 59 | |
| Missing | 57 | 52 | 109 | |
| **Ethnicity** | | | | |
| European | 1,393 (81.3%) | 1,521 (71.9%) | 2,914 | <0.01 |
| Non-Indian Asian | 37 (2.2%) | 106 (5.0%) | 143 | |
| Indian | 55 (3.2%) | 93 (4.4%) | 148 | |
| Māori | 150 (8.8%) | 268 (12.7%) | 418 | |
| Pacific | 61 (3.6%) | 88 (4.2%) | 149 | |
| Other | 18 (1.1%) | 39 (1.8%) | 57 | |

*p-value for difference by transport to hospital by patient characteristic.

# Distribution of prehospital times of major trauma cases attended by emergency medical services in Aotearoa New Zealand

Bridget Dicker, Luisa Montoya, Gabrielle Davie, Rebbecca Lilley, Bridget Kool

## ABSTRACT

**AIMS:** Co-ordinated trauma systems ensure timely transport to the appropriate hospital for patients following acute trauma. The Aotearoa New Zealand National Trauma Network reports median transport times to definitive care annually but omits reporting specific prehospital time intervals. This study focusses on prehospital times for major trauma patients attended by emergency medical services (EMS) in Aotearoa New Zealand.

**METHODS:** An analysis of routinely collected data from a retrospectively designed prospective cohort study was undertaken. Individuals of any age who suffered major trauma (Injury Severity Score [ISS] greater than 12 or died) between 2016 and 2018 and were attended by an EMS provider were included. Descriptive analyses were performed.

**RESULTS:** A total of 3,334 patients met the eligibility criteria, of which 105 (3.1%) died prehospital and 121 (3.6%) died within 24 hours following hospital admission. Response time was significantly faster for patients who died prehospital (median 11.5 minutes cf 14.5 minutes for those that survived to the hospital; p=0.0002). Among hospitalised patients, the median total prehospital time was 80.6 minutes (interquartile range [IQR]: 55.2–114.0). Patients who died within 24 hours following admission had significantly faster response and transport times (p=0.0005 and 0.009 respectively).

**CONCLUSION:** This study is the first to map out the distribution of prehospital times for major trauma patients in Aotearoa New Zealand. It establishes a crucial baseline for the timeliness of EMS care and shines a light on the significant sex and ethnic disparities among those affected by major trauma.

Injuries are one of the main causes of disability and death worldwide and remain an important public health issue.[1] Major trauma is commonly defined as any physical injury that has the potential to cause death or long-term disability.[2,3] Although an agreed internationally standardised definition of major trauma does not currently exist, it is commonly defined in terms of injury severity through anatomical scores such as the Injury Severity Score (ISS).[4] For example, an ISS of greater than 12 is considered major trauma.[2,5]

Trauma is considered a time-sensitive condition.[6] Total prehospital time (TPT) is defined as the time spent from the emergency call to arrival at hospital.[7] A TPT of 60 minutes or less is known as the "golden hour"; this concept encourages rapid transportation of trauma patients, premised on the hypothesis that trauma patients receiving definitive care within this time have improved outcomes.[8] Although this term is well-known among emergency medical services (EMS) and trauma systems, and commonly used in trauma research, evidence supporting the relevance of the golden hour for survival is limited.[8,9] For example, there is conflicting evidence for the impact of prehospital time on mortality.[10–12] Moreover, specific prehospital intervals, such as response time or scene time, may differentially impact mortality.[12,13]

In Aotearoa New Zealand, major trauma significantly contributes to morbidity and mortality; there are approximately 2,000 injury deaths and 2,500 hospitalisations for major trauma each year.[14–17] Response times, from call receipt to scene arrival, are dictated by telephone triage. The most critical categories, "purple" (suspected cardiac or respiratory arrest) and "red" (immediately life-threatening), prompt immediate response with lights and sirens. "Orange" is for serious but not immediately life-threatening incidents, dispatched at normal speed.[18] Annual reports from Hato Hone St John indicate that response time targets are generally met for the most critical incidents.[19]

EMS target measures for response times and times to definitive care are readily reportable; however, there is a sparsity of published literature describing specific prehospital time intervals for patients with major trauma in Aotearoa New Zealand. Therefore, the aim of this study was to determine the distribution of prehospital times for major trauma patients. The findings will provide data to inform the delivery of EMS care in Aotearoa New Zealand.

## Methods

### Eligibility criteria

This retrospectively designed prospective cohort study analysed information from individuals of any age who suffered major trauma in Aotearoa New Zealand during the period 1 December 2016 to 30 November 2018 and were attended by one of Aotearoa New Zealand's two EMS providers.[20] The New Zealand Trauma Registry (NZTR) definition of major trauma was used, which is an *"ISS greater than 12 (based on AIS 2005 Update 2008) or death following trauma that is principally due to the injuries sustained."*[21,22] Deaths due to hangings, drownings and poisonings were excluded.[21,22] Patients who self-presented to the hospital or arrived at the hospital more than 24 hours after receiving EMS care were excluded. For cases with more than one presentation to hospital due to major trauma within the study period, the most recent presentation was selected. Patients who survived to hospital were also excluded if they met three additional NZTR exclusion criteria: 1) isolated neck of femur fracture, 2) delayed admissions (more than 7 days after injury), or 3) elderly patients with pre-existing diseases that precipitate injury or death, or those who died as a result of superficial injuries. These additional criteria were not able to be applied to those who died prehospital as the data for these exclusions were not available for the prehospital deaths.

### Data derivation

The primary sources of information were Aotearoa New Zealand's EMS providers' electronic and paper patient report forms (PRF) and the NZTR. Additional information from Te Tāhū Hauora – New Zealand Health Quality & Safety Commission (HQSC), and the Ministry of Health's National Minimum Dataset of hospital discharges (NMDS) and National Health Index (NHI; Aotearoa New Zealand's unique health identifier) database was used to supplement and/or validate the data obtained.[20] The National Coronial Information System (NCIS) was used to calculate ISS for cases who died prior to arrival at hospital and were therefore not captured in the NZTR.

Response times were calculated from PRF data with the time started from the point in time that the telecommunications provider transferred the 111-emergency call to EMS providers and it was picked up by the call handlers. Prehospital time components included (from Figure 1):

1. *Activation time*: the difference between the time the request for assistance phone call was picked up and the earliest time an ambulance was enroute.
2. *Travel to scene time*: the difference between the earliest time an ambulance was enroute and the earliest time an ambulance arrived on scene.
3. *Response time*: the difference between the time the request for assistance phone call was picked up and the earliest time an ambulance arrived at scene (this is the sum of activation time and travel to scene time).
4. *On-scene time*: the difference between the earliest time an ambulance arrived at the scene and the time the transporting ambulance left the scene.
5. *Transport time*: the difference between the time the transporting ambulance left the scene and the time the transporting ambulance arrived at the hospital.
6. *Total prehospital time* (TPT): the sum of all EMS time intervals (response, on-scene and transport).

Other variables of interest included age, sex, ethnicity, mechanism of injury, dominant injury type, ISS and dispatch triage priority. This study allocated a single ethnicity per individual based on a prioritisation hierarchy according to the Ministry of Health – Manatū Hauora as described in the *HISO 10001:2017 Ethnicity Data Protocols*.[23] In addition, area-level socio-economic deprivation and rurality were assigned using the geographical injury location as recorded by EMS. The New Zealand Index of Deprivation (NZDep) 2018 is an ordinal scale where 1 represents the 10% of small areas with the lowest socio-economic deprivation and 10 represents the 10% of small areas with the highest socio-economic deprivation.[24] Rurality was allocated using the binary version of the Geographic Classification for Health (GCH).[25]

## Statistical analysis

A descriptive analysis was conducted. The distribution of the characteristics of major trauma cases attended by an EMS provider is presented by prehospital mortality status using frequencies and percentages, with median and interquartile range (IQR) used for skewed continuous variables.

A comparison of times between those who died prehospital and those who survived to the first hospital was restricted to activation time and travel to scene time (i.e., response time). An additional outcome of interest was evaluated for patients who survived to 24 hours following (first) hospital admission. For each group defined by this outcome, time components are presented using medians and IQRs.

The Mann–Whitney test was used to compare the distributions of prehospital times.

A descriptive analysis to identify the reasons for prolonged on-scene time in the prehospital care of major trauma patients was also conducted. A time higher than the mean on-scene time for patients in this study that survived to hospital was considered as a delay. Stata SE version 17 was used for the analysis.[26]

## Ethics

Ethics approval for the study was obtained from the Health and Disability Ethics Committee (Ref 18NTB142). Research approvals were obtained from the NZTR, Hato Hone St John, Wellington Free Ambulance (WFA) and the NCIS and New Zealand Chief Coroner (Ref NZ013) to access their data for the period of interest.

# Results

A total of 3,334 patients met the eligibility criteria, of which 105 (3.1%) died prehospital and 3,229 (96.8%) survived to the first hospital (Table 1).

The majority of major trauma patients attended by EMS during the period reviewed were male (69.5%; n=2,318/3,334), and 21.6% (n=717/3,334) were Māori (Aotearoa New Zealand's Indigenous population). The median age was 48 years (IQR: 27–65), with 69.3% (n=2,310/3,334) of patients aged between 15 and 64 years. Most incidents occurred in urban areas and areas of moderate socio-economic deprivation (66%, n=2,209/3,323 and 44%, n=1,456/3,304, respectively). A dispatch triage status of red or purple, indicating cardiac or respiratory arrest, immediately life-threatening or time-critical incidents, was assigned to 45.9% of patients.

The most common mechanism of injury was transport incidents (60.9%; n=2,030/3,291), followed by falls (26.1%; n=859/3,291) (Table 1). The median ISS was 17 (IQR: 14–25); 45.7% of patients had "severe" ISS scores (16–24) and 27.7% were scored as "very severe" (ISS ≥25).

Most of the patients who died prehospital were male (73.3%: n=77/105) and younger than those who survived (median age: 44 cf 48 years). Patients who died prehospital had a significantly higher ISS than those who survived to the first hospital, with 86.7% (n=91/105) of patients who died prehospital experiencing severe trauma (ISS ≥25) compared with those who survived to the first hospital (25.7%) (Table 1).

Comparison of times between those that did and did not survive to the first hospital was restricted to response time (activation time and travel to scene time), as on-scene time and transport times are systematically different for those that were attended by EMS but died prehospital (Table 2). The median response time was shorter among patients who died prehospital compared with those who survived (11.5 vs 14.5 minutes; p=0.0002). Activation time was significantly shorter for those who died prehospital (median 2.9 minutes vs 3.7 minutes; p<0.0001); on average, activation time comprised 33% of patients' response time.

One-third (33%; n=35/105) of patients who died prehospital experienced a response time between 5 to 10 minutes, compared with 25% (n=802/3,227) of patients who survived to hospital. A smaller proportion of patients who died prehospital, 32% (n=34/105), had a response time of greater than 15 minutes compared with 48% (n=1,549/3,227) of patients who survived to hospital.

Total prehospital time (TPT) could not be calculated for four hospitalised patients due to missing data. Of the remaining 3,225 hospitalised patients, analysis of the distribution of prehospital time revealed a median TPT of 80.6 minutes (IQR: 55.2–114.0). Patients who survived to 24 hours following admission had, on average, longer TPTs than those who did not (median 81.1 cf 65.6 minutes; p=0.003) (Table 3).

For hospitalised patients, the median response time (12.4 cf 14.6 minutes; p=0.0005) and transport time (17.0 cf 20.2 minutes; p=0.009) were significantly shorter for patients who died within 24 hours of hospitalisation compared with those who survived. Response time contributed, on average, 22% of the patient's TPT. Approximately one-third of patients (30.2%; n=974/3,225) had a TPT (from EMS phone pick up) within 60 minutes ("golden hour").[8]

The median on-scene time was 30.6 minutes (IQR: 19.7–49.4); this represented, on average, 42.8% of TPT. There was no evidence of a statistically significant difference between on-scene time for patients who died within 24 hours following injury (Table 3).

On-scene delays (greater than 38.7 minutes on scene time) were present in one-third of cases that survived to hospital (35.1%; n=1,171/3,334). However, the reasons for this were only documented for 368 of these cases (31.4%; n=368/1,171). Difficult patient extrication (31.0%; n=126/368), patient's condition (24.3%; n=99/368), trapped/encased patients (19.9%; n=81/368) and multiple patients involved in the event (12.0%; n=49/368) were the most common reasons for on-scene delays.

## Discussion

This descriptive analysis of a cohort study of major trauma patients in Aotearoa New Zealand confirms that major trauma in Aotearoa New Zealand most commonly occurs among males and in patients aged between 15 and 64 years; the most common mechanisms of injury are motor vehicle crashes (MVCs) and falls, while penetrating injuries are uncommon. Similar results were reported in an Australian study by Harris et al.,[27] who found that more than 70% of patients experiencing major trauma were males, with 63% of cases being due to MVCs. Patients of Indigenous Māori ethnicity are over-represented in the total cohort (22%), and of those patients who died (29%), this is markedly higher than the proportion of Māori within the Aotearoa New Zealand population, at 17%.[28] This finding is consistent with previously reported data from the Aotearoa New Zealand National Trauma Network (the Network).[29] The Network indicates that Māori experience higher rates of major trauma compared with other ethnic groups across all ages, except for those aged greater than 80 years.[29]

The median response time was quicker by around 3 minutes for patients who died prehospital, with a higher proportion of patients who survived to the hospital having response times greater than 15 minutes. Patients who died prehospital in the present study had a higher ISS, with a great proportion dispatched as time-critical triage red or purple, explaining the shorter median response time obtained for this group in this study.[17] Both groups of patients who died prehospital and those who survived to hospital had a median response time similar to that reported in other similar trauma systems such as New South Wales, Australia (15 minutes)[10] and Norway (11 minutes urban, 14 minutes suburban, 21 minutes remote).[30] Additionally, neither of these recent observational studies indicated any impact of response time on patient mortality.[10,30] Future research that has sufficient numbers to explore the relationships between triage status, prehospital time and survival would be valuable. Of the 121 that died in 24 hours following hospital admission, 24% (n=29) died within the first hour and 26% (n=31) died within 1 and 6 hours. In this study, 12% of patients who survived to hospital but died within 24 hours were triaged purple (the highest), 55% red and 33% orange or lower; for those that survived to 24 hours following admission this was 2% purple, 43% red and 55% orange or lower.

For patients who survived to hospital, on-scene time (median 31 minutes) was the biggest contributor to TPT in the present study (43%). Similar results were obtained from New South Wales, Australia where a median on-scene time of 28 minutes was reported.[10] Interestingly, in a Norwegian study, the median time on-scene time (although not significant) was longer for incidents occurring in remote locations (22 minutes) than in urban or suburban locations (16 minutes).[30] The Australian study did not demonstrate any relationship between on-scene time and mortality;[10] however, the Norwegian study found that prolonged on-scene time was associated with higher odds of mortality.[30] The most common reasons for on-scene delays in the present study were difficult extrication, patient's condition and patients who were trapped/encased in MVCs. These factors are primarily derived from a drop-down list within the Aotearoa New Zealand EMS electronic patient record, and there are likely to be additional factors not captured that may contribute to increased scene time. A Canadian study that explored paramedic perspectives of why on-scene times may exceed 10 minutes identified that scene characteristics, the collaboration of allied services (police and fire), mode of transport (e.g., waiting for helicopter EMS) and the crew's skills may impact the duration of time on-scene.[31]

In our cohort, transport time to the first hospital was the second biggest contributor to TPT with a median transport time of 20 minutes. This is similar to that reported in the Norwegian (14 minutes urban, 23 minutes suburban, 50 minutes remote)[30] and Australian studies (24 minutes).[10] Interestingly, both of these studies found that longer transport times may be associated with reduced mortality, which was also in alignment with an earlier observational study from the United States of America (USA).[10,30,32]

The median TPT for patients surviving to the first hospital with EMS-attended major trauma in Aotearoa New Zealand was 81 minutes, exceeding the "golden hour"[8] by 21 minutes. Australian estimates of median TPT also exceed the "golden hour"; however, only by 12 minutes.[10] Our study found that TPT and EMS time intervals in patients who survived to hospital are longer in those patients who survived more than 24 hours compared with those who died within 24 hours following injury. It may be that in developed trauma systems, longer prehospital times are not associated with increasing mortality because the highest acuity and most unstable patients have the shortest prehospital time intervals, and the lowest acuity/more stable patients have the longest. Studies to address the confounding in injury severity and type of injury are of future interest to address this.

## Strengths and limitations

A key strength of this research is that it is the first study to use national data to describe the prehospital time intervals for patients with major trauma using a standard definition of major trauma. However, the EMS time-related data were not externally validated and, therefore, potentially subject to bias. We observed cases in our database with incomplete and/or improbable times (e.g., departure time preceded arrival time). These times were verified and, where possible, corrected.

Although we do have time to death following hospital admission, we were limited in terms of possible analysis given; in this cohort, there were only 121 deaths in hospital in the 24 hours following admission. Therefore, our study focussed on 24-hour mortality for hospitalised patients. If there were higher numbers of patients, additional analysis of the shorter time periods may have identified bleeding patients who could have survived with shorter prehospital times.

Those who died prehospital were unable to be assessed for additional NZTR exclusion criteria as described in the methods, as these data are only collected in-hospital. This may have impacted the characteristics described for the prehospital deaths. However, it is notable that the median age for those who died prehospital was 44, the majority of these were in road traffic incidents and more than 85% of prehospital deaths had an ISS ≥25, so it is likely that very few, if any, of these would have met these additional exclusions had they been able to be assessed.

This study did not characterise time to definitive care, only time to the first hospital. Time to definitive care includes the time interval for patients transferred between hospitals and is routinely reported elsewhere.[14] This study was confined to characterising prehospital time intervals, and it provides a valuable baseline for EMS; however, future analysis could investigate the relationship between such intervals and mortality. This study uses data corresponding to EMS care delivered in Aotearoa New Zealand between 2016 and 2018. There is the potential for different outcomes with more recent data, and this may not reflect current practice.

## Conclusion

This study provides a comprehensive overview of the demographics, injury profiles and prehospital time distribution for major trauma patients in Aotearoa New Zealand. It establishes a vital benchmark for the efficiency of EMS care and highlights significant disparities in sex and ethnicity among trauma victims. These insights are crucial for shaping future trauma care strategies and ensuring equitable treatment for all patients.

**Figure 1:** Emergency medical services prehospital time intervals.

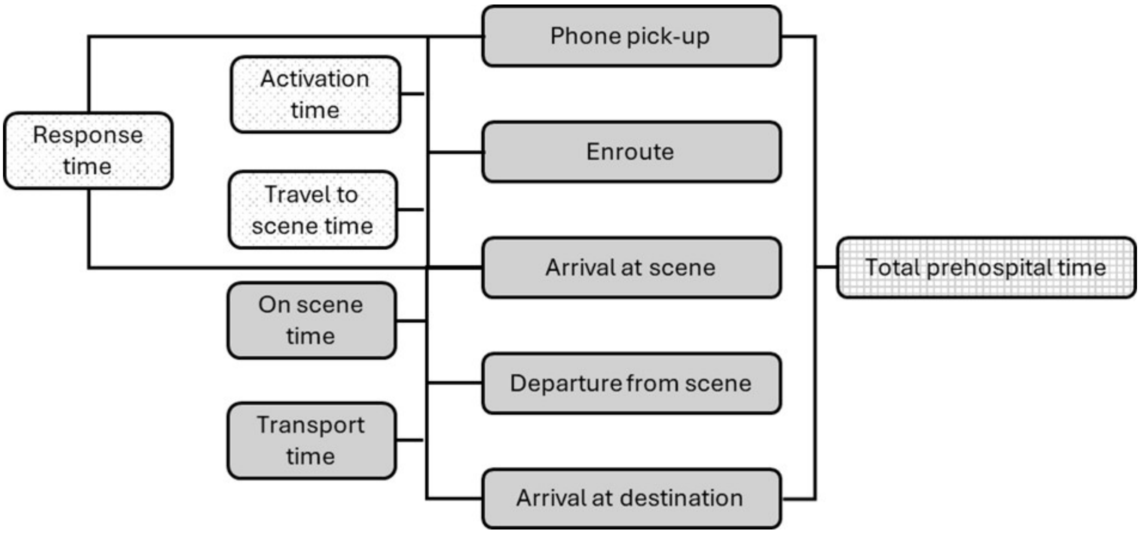

**Table 1:** Demographic and injury characteristics of emergency medical services-attended major trauma patients in Aotearoa New Zealand by prehospital mortality status, 2016–2018.

| **Characteristics*** | **Died prehospital** | **Survived to first hospital** | **Total** | **p-value**** |
|---|---|---|---|---|
| | **n=105** | **n=3,229** | **n=3,334** | |
| | **n (%)** | **n (%)** | **n (%)** | |
| **Sex** | | | | |
| Female | 28 (26.7) | 988 (30.6) | 1,016 (30.5) | 0.4 |
| Male | 77 (73.3) | 2,241 (69.4) | 2,318 (69.5) | |
| **Median age in years (IQR)** | 44 (25–60) | 48 (27–65) | 48 (27–65) | <0.001 |
| **Ethnicity (prioritised)** | | | | |
| Māori | 30 (30.6) | 687 (21.3) | 717 (21.6) | 0.03 |
| Non-Māori | 68 (69.4) | 2,542 (78.7) | 2,610 (78.4) | |
| **Geographic Classification for Health of incident** | | | | |
| Urban | 66 (62.9) | 2,143 (66.6) | 2,209 (66.5) | 0.4 |
| Rural | 39 (37.1) | 1,075 (33.4) | 1,114 (33.5) | |
| **NZDep2018 of incident** | | | | |
| 1–3 (low deprivation) | 24 (22.9) | 813 (25.4) | 837 (25.3) | 0.7 |
| 4–7 | 50 (47.6) | 1,406 (44.0) | 1,456 (44.1) | |
| 8–10 (high deprivation) | 31 (29.5) | 980 (30.6) | 1,011 (30.6) | |

**Table 1 (continued):** Demographic and injury characteristics of emergency medical services-attended major trauma patients in Aotearoa New Zealand by prehospital mortality status, 2016–2018.

| | | | | |
|---|---|---|---|---|
| **Triage priority** | | | | |
| Purple/red (high) | 56 (53.3) | 1,472 (45.7) | 1,528 (45.9) | 0.1 |
| Other | 49 (46.7) | 1,751 (54.3) | 1,800 (54.1) | |
| **Mechanism of injury** | | | | |
| Transport | 71 (76.3) | 1,959 (61.3) | 2,030 (61.7) | 0.001 |
| Fall | 8 (8.6) | 851 (26.6) | 859 (26.1) | |
| Other specified | 14 (15.1) | 388 (12.1) | 402 (12.2) | |
| **Injury intent** | | | | |
| Intentional | 9 (8.6) | 281 (8.7) | 290 (8.7) | 1.0 |
| Unintentional | 96 (91.4) | 2,933 (91.3) | 3,029 (91.3) | |
| **Median Injury Severity Score (IQR)** | 57 (34–75) | 17 (14–25) | 17 (14–25) | <0.001 |
| **Injury Severity Score (ISS) groups** | | | | |
| Minor/moderate (ISS 1–15) | 5 (4.8) | 881 (27.3) | 886 (26.6) | <0.001 |
| Severe (ISS 16–24) | 9 (8.6) | 1,513 (46.9) | 1,522 (45.7) | |
| Very severe (ISS ≥25) | 91 (86.7) | 830 (25.7) | 921 (27.7) | |

*Small amounts of missingness were present for ethnicity (n=7), rurality (n=11), deprivation (n=30), triage priority (n=6), mechanism (n=43), injury intent (n=15) and ISS (n=5). The geographical injury location was used to assign the New Zealand Index of Deprivation (NZDep) 2018 (1=lowest deprivation, 10=highest) and rurality (binary version of the Geographic Classification for Health [GCH]).

**$\chi 2$ test was used for categorical variables; Mann–Whitney U-test for continuous variables. Those with responses “not recorded” or “unknown” were not included in the $\chi 2$ test.

IQR = interquartile range; NZDep = New Zealand Index of Deprivation; ISS = Injury Severity Score.

**Table 2:** Distribution of response time (activation time and travel to scene time) by prehospital mortality for emergency medical services-attended major trauma patients in Aotearoa New Zealand, 2016–2018.

| Time components (minutes) | Died prehospital (n=105) Median (IQR) | Survived to first hospital (n=3,227*) Median (IQR) | Total (n=3,332*) Median (IQR) | Mann–Whitney p-values | Contribution % (95% CI) |
|---|---|---|---|---|---|
| Response time | 11.5 (8.0–17.1) | 14.5 (9.4–23.8) | 14.4 (9.4–23.6) | 0.0002 | |
| Activation time | 2.9 (1.7–4.4) | 3.7 (2.6–5.7) | 3.7 (2.6–5.7) | <0.0001 | 32.6 (31.9, 33.3) |
| Travel to scene time | 8.0 (5.4–13.8) | 9.8 (5.7–16.8) | 9.8 (5.6–16.7) | 0.06 | 67.4 (66.7,68.1) |

*Those for whom response time could not be calculated were removed from analysis (n=2).
IQR = interquartile range; CI = confidence interval.

**Table 3:** Distribution of total prehospital time and prehospital time components by 24-hour mortality after hospitalisation for emergency medical services-attended major trauma patients in Aotearoa New Zealand that survived to hospital, 2016–2018.

| Time components (minutes) | Died within 24 hours following injury (n=121) Median (IQR) | Survived to 24 hours following injury (n=3,104*) Median (IQR) | Total (n=3,225*) Median (IQR) | Mann–Whitney p-values | Contribution % (95% CI) |
|---|---|---|---|---|---|
| Total prehospital time | 65.6 (46.1–108.7) | 81.1 (55.6–114.4) | 80.6 (55.2–114.0) | 0.003 | |
| Response time | 12.4 (8.4–17.3) | 14.6 (9.5–23.9) | 14.5 (9.4–23.8) | 0.0005 | 22.0 (21.6, 22.4) |
| On-scene time | 28.4 (17.7–47.5) | 30.7 (19.8–49.5) | 30.6 (19.7–49.4) | 0.2 | 42.8 (42.2, 43.5) |
| Transport time | 17.0 (7.8–29.9) | 20.2 (11.4–33.5) | 20.1 (11.3–33.4) | 0.009 | 28.2 (27.7, 28.7) |

*Those for whom response time or on-scene time could not be calculated were removed from analysis (n=4).
IQR = interquartile range; CI = confidence interval.

**COMPETING INTERESTS**

GD acknowledges a Health Research Council payment made to their institution. GD is on the Data Governance Group for the New Zealand Major Trauma Registry.
LM acknowledges a Health Research Council payment made to their institution.
RL acknowledges a Health Research Council payment made to their institution.
BD is an employee of Hato Hone St John, and this work was undertaken in “time only” as part of her employment.
BK is an employee of The University of Auckland, and this work was undertaken as part of her employment.

**ACKNOWLEDGMENTS**

The authors would like to thank Associate Professor Andy Swain and Wellington Free Ambulance for their contributions to the data for this analysis. We acknowledge the NCIS and New Zealand Chief Coroner (Ref NZ013) for access to their data for the period of interest.

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https://nzmj.org.nz/journal/vol-138-no-1611/distribution-of-prehospital-times-of-major-trauma-cases-attended-by-emergency-medical-services-in-aotearoa-new-zealand

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# Injecting-related injuries experienced by people who inject drugs in New Zealand: impact, healthcare access and stigma

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## ABSTRACT

**AIM:** People who inject drugs (PWID) are at risk of injecting-related injuries and diseases (IRIDs), but little is known about these in Aotearoa. We aimed to characterise the impact of IRIDs and explore barriers to accessing healthcare for PWID, using mixed methods.

**METHODS:** A convenience sample was recruited at two South Island needle exchanges. Participants who were clients completed a survey (n=57) about drug use and experience of IRIDs, participated in a qualitative interview (n=7) about their experiences of IRIDs and healthcare access, or both. Staff (n=3) participated in a qualitative interview about supporting clients with IRIDs.

**RESULTS:** A total of 91.3% of clients reported having any IRIDs and 40.4% reported more than 10 IRIDs. A total of 63.1% reported never seeking medical attention for an IRID. Twenty-five clients (44%) had experienced at least one severe IRID. A greater proportion of clients sought medical attention if they had experienced a severe IRID; however, 32% of clients who had experienced a severe IRID had never sought medical attention. Prevalent interview themes included stigma, discrimination, lack of social support and reliance on peer support.

**CONCLUSIONS:** IRIDs are a significant health risk in the Aotearoa injecting community and issues of stigma, discrimination and cost are significant barriers to healthcare.

The most recent data from the Ministry of Health – Manatū Hauora (2007/2008) reported that 1.3% of people aged 16–64 had ever injected drugs in Aotearoa New Zealand (hereafter Aotearoa) for recreational purposes, with 0.3% reporting injecting in the previous 12 months.[1] With 2024's population, these figures equate to approximately 44,600 and 10,300 people respectively. Injecting drug use is a highly stigmatised behaviour[2] and most people who inject drugs (PWID) in Aotearoa will be injecting drugs that are illegal. The most commonly injected drug in Aotearoa is reported to be methamphetamine.[3] Injecting drug use is associated with multiple negative health outcomes, and results in 2.35 deaths per 100 person-years from all-cause mortality, primarily from HIV infection and drug overdose.[4] Specifically among those who inject methamphetamine, overdose and cardiovascular disorders are a significant cause of death.[5] PWID are potentially exposed to a large range of vascular injury, soft tissue injury and infection exposure as a result of injecting-related injuries and diseases (IRIDs).[6,7] Some IRIDs can be life-threatening, which is particularly pertinent, given that PWID are a vulnerable population facing barriers to accessing both preventive and secondary healthcare.[8,9]

Abscesses and cellulitis are two of the most prevalent complications of injecting drug use, with lifetime prevalence estimated between 6 and 69% based on systematic review.[7] A previous study by Tsao et al. reported that 55.4% of hospital visits with injecting drug-related complications were diagnosed as abscesses or cellulitis.[10] IRIDs can be prevented, or their risk reduced. For example, abscesses and cellulitis can be prevented with correct equipment and aseptic technique with alcohol sterilisation,[11] and risk may be reduced by avoiding high-risk sites such as the groin.[12] IRIDs can have severe negative impacts on the health and wellbeing of PWID, as well as being a source of healthcare costs.[13] Qualitative work in Scotland has also exposed the high morbidity that IRIDs can have on PWID, as well as the complicating factors of stigma and discrimination leading to untimely and inadequate healthcare provision.[14] While international research has reported on the high prevalence and frequency of such outcomes,[7] data in Aotearoa are sparse. Unpublished technical data in Aotearoa suggest a similarly high prevalence of IRIDs;[15,16] however, no formal investigation of IRID prevalence or impacts has occurred. While methamphetamine is most commonly injected in Aotearoa, the lack of heroin and other illicitly manufactured injectables means diverted pharmaceuticals are also more common than elsewhere,[3] which may make extrapolations from other countries less relevant, and thus highlights the need for local data.

The use of a peer-based approach within needle exchanges has been advantageous in earning the trust of PWID, attributed to the shared understanding of lived and living experience of injecting between staff and clientele, as well as the ability to support clients, avoid stigma and maintain anonymity.[17,18] PWID may avoid other healthcare services for fear of discrimination or consequences of being discovered as a PWID,[19] and for many, the needle exchange is trusted and may facilitate connections to other services;[20] though, stigma may still create a barrier to accessing the needle exchange, particularly for women.[21] Therefore, PWID are likely to be under-represented in healthcare statistics and population-level surveys, and reaching PWID who utilise the needle exchange may give insight into the needs of this population.

This exploratory research will provide preliminary data on IRIDs in Aotearoa, which can contribute to future estimation of national prevalence and frequency, as well as economic impact on the public health system. We currently have a large deficiency of knowledge on this topic in Aotearoa, with limited data on the burden or impact of IRIDs, or how mainstream healthcare systems such as hospitals and general practitioners may treat these injuries. This research will aim to provide clarity for healthcare providers and also ensure PWID are provided with the best possible evidence-based care pathways to enable healthcare access, while breaking down barriers to care. We employed mixed methods to answer our exploratory research questions: 1) what are the characteristics and experiences of IRIDs in a sample of PWID, 2) how do PWID access healthcare in response to IRIDs, and 3) are there any barriers to healthcare access, including stigma?

## Methods

Drug Injecting Services in Canterbury (DISC) Trust is a peer-run organisation providing care, sterile injecting equipment and harm reduction advice to the PWID community in the South Island of Aotearoa as part of the New Zealand Needle Exchange Programme (NZNEP). The services provided by the NZNEP are anonymous and, as such, data are not collected at the level of individual clients (i.e., the services do not have a robust means of knowing how many clients they have). This project was co-designed with DISC Trust staff, considering client preferences for data collection. The study was framed within a pragmatic research paradigm, which embraces an experiential view of knowledge where people's experiences inform their understanding of the world in which they exist, using methods that best suited the research questions.[22]

### Ethics

Ethical approval was granted by the University of Otago Human Ethics Committee (Ref 23/112). Information about the survey and the interview was provided to clients, and written informed consent was obtained prior to beginning each survey or interview. Where a participant had challenges reading written material, the student researcher (SP) assisted by reading the information and consent sheet. No identifying information was collected, to ensure participants felt safe to disclose their experiences. Survey participants received a $20 supermarket voucher, and interview participants a $40 supermarket voucher.

### Participants and recruitment

The primary participants were clients of DISC Trust who attended the two sites: the Rodger Wright Centre in Ōtautahi Christchurch and Dunedin Intravenous Organisation (DIVO) in Ōtepoti Dunedin between 31 October 2023 and 10 February 2024. These are the two largest needle exchange sites (by service provision) in the South Island. Both the Rodger Wright Centre and DIVO have some access to healthcare professionals onsite, via a part-time nurse practitioner and part-time (1 day per week) GP, respectively, which is not consistent across all NZNEP sites. Additionally, three staff members from the two sites participated in the qualitative phase. All study participants were at least 18 years old and were able to speak English.

The study was advertised with a flyer at the two sites. Client/participant recruitment was purposive and occurred primarily in conjunction with DISC Trust staff, who suggested clients who may have been willing to participate and assisted with introducing the clients to the student researcher (SP). Recruitment was also opportunistic, with SP spending time at the sites and asking clients if they were willing to participate, after clients had collected their equipment.

### Survey methods

The survey was designed in consultation with DISC Trust staff and covered a range of issues relevant to determining the incidence and severity of IRIDs within DISC Trust clients. The questionnaire also aimed to elicit information regarding risk factors for IRIDs, as well as protective factors. Additionally, the questionnaire aimed to gather IRID treatment data to determine whether PWID sought professional healthcare or advice and identify any barriers to care. All data were self-reported (e.g., hepatitis C serostatus was not confirmed via testing) and based upon symptomatic experience rather than formal diagnoses. The survey was completed with the researcher (SP) present to assist with question clarification or for participants with reading challenges. Clarification and explanation were provided for medical terminology, and understanding was confirmed with the client before the response was written down. Where an "other" box was provided, there was also a free-text field for clients to elaborate on the issue.

De-identified data were collated in Microsoft Excel for cleaning. Data were verified by one researcher (RC) who was not involved in data entry validating 10% of the sample. The verifier found one transcription error, and a further 20% of the sample was then validated with no further errors identified. Data were then imported to Stata (version 16.1 for Windows)[23] for analysis. All analyses were descriptive and did not account for potential confounds or include multivariate analyses. Ninety-five percent confidence intervals are reported for type of IRID, using a binomial exact test.

### Interview methods

Semi-structured interviews were conducted to develop an understanding of PWIDs' experiences of IRIDs and associated healthcare experiences. Interviews with staff focussed on understanding their response to IRIDs. Consent was sought to record the interviews, for ease for transcription, and transcripts were then analysed thematically using NVivo software.[24] Interviews were transcribed verbatim by SP. Transcripts were then reviewed, and key quotes were coded in NVivo software highlighting salient features relevant to questions relating to the impact of IRIDs, how PWID access healthcare, PWID experiences of healthcare and barriers to this healthcare. The resulting analysis generated codes that were closely aligned with participant experiences or had close meaning, with these grouped to produce initial themes. Themes were then reviewed and combined as appropriate. Themes were then defined and named. Where a theme had a unique experience that fewer participants had reported, but still related to a larger theme, a sub-theme was described. This resulted in findings of themes, sub-themes and relevant supporting quotes.[25]

### Mixed methods

Mixed methods were selected as the most appropriate method to address the exploratory nature of our research questions, given the significant knowledge gaps about IRIDs that exist in Aotearoa. We aimed to provide preliminary data that would fill some knowledge gaps while also highlighting future research priorities. We used a convergent parallel design to identify areas of convergence between quantitative (survey) and qualitative (interview) results, with the aim of identifying shared outcomes and findings across the two discrete datasets. Mixed methods have been extensively used in public health research, as they offer methodological innovation for complex topics, e.g., through comparison, validation and triangulation of multiple datasets.[26] Not only does this methodology account for biomedical factors related to IRIDs at the individual level, but it also enables an understanding of the social and structural facets in health outcomes for this key population. This approach grounds the findings in both sets of rigorous data to offer a holistic understanding of IRIDs among the sample that may not have been possible using a single method.

## Results

### Major qualitative themes

Key themes, identified through the thematic analysis of interviews, included discrimination and stigma, concern of repercussion from seeking healthcare, lack of social supports or financial stability and a reliance on support from other injecting peers. Quotes are presented alongside the relevant survey results to illustrate the convergent findings. There were no obvious points of divergence between the survey and interview data.

### Interview participants' characteristics

There were 10 participants, eight of whom were recruited from the Rodger Wright Centre (80%)

and two from DIVO (20%). Seven interviewees (70%) identified as male and three interviewees (30%) as female. Six interviewees (60%) were clients of NZNEP, one interviewee (10%) was both staff and client of NZNEP and three interviewees (30%) were staff of NZNEP. Of the four staff, three worked as peer workers and one worked as a nurse practitioner. Of the seven client interviewees, the median age was 43 and mean age was 47. Staff age was not recorded.

## Survey participant characteristics

The survey data included 57 participants (all clients). The majority were men (63.16%) and of NZ European ethnicity (71.93%). Māori made up 22.47% of the sample. The average age of participants was 47 years, with a median length of injecting being 20 years (range 1–46 years). Forty participants (70%) were recruited from Christchurch and 17 (30%) were recruited from Dunedin.

Forty-seven percent of the sample were injecting at least daily; 7% reported injecting more than 3-times per day, 19% 2–3 times per day and 21% once per day.

The drug most recently injected was predominantly methamphetamine (24.56%) or methadone (22.81%). Other drugs injected included methylphenidate, morphine, steroids, heroin, cocaine, codeine, ketamine, oxycodone and fentanyl. Five participants (8.77%) most recently injected two drugs simultaneously last time they injected. In all of these cases, the combination was a type of opioid and a stimulant class drug.

## Potential risk factors for IRIDs

Seventy percent of the sample had always used a new needle and syringe in the last month, with 17 people (30%) reporting that they had not. Of those 17, all reported that they had reused their own needle, and nobody reported reusing a needle that somebody else had used.

We categorised injecting in either the neck or groin as high risk; 11 people (19%) had injected into a high-risk site in the last month.

## Protective factors against IRIDs

We asked clients about their use of eight protective factors that they "usually used", which were pre-specified by the project team (listed below in Table 1). These are behaviours or practices that are associated with reduced risk of IRIDs (see Appendix 1).

The median number of protective factors that clients identified using was six of the possible eight asked about in the survey.

Considering the proportion reporting the types of protective factors being "usually used", the most common were self-administration, swabbing the injection site and using a sterile needle and syringe (Table 1).

In interviews, clients described their experience of IRIDs and the ways in which they took action to try and prevent IRIDs.

> *"And I believe what really saved my life the most is the water filters. I used them from the day they came out. Three times I didn't use them. Three times I got dirties." – P2*

**Table 1:** Proportion of clients who usually used each of the protective factors.

| Protective factor | Number (%)<br>Total n=57 |
|---|---|
| Self-administering the injection | 50 (88%) |
| Use of a sterile needle and syringe every time | 49 (86%) |
| Swabbing the site with alcohol beforehand | 49 (86%) |
| Washing hands beforehand | 46 (81%) |
| Use of a filter | 39 (68%) |
| Mixing with sterile water | 36 (63%) |
| Tourniquet use | 35 (61%) |
| Use of a wheel filter | 22 (39%) |

## Types and frequency of IRIDs

We surveyed clients about their experience of nine different types of IRIDs. The median number of IRID types that clients had experienced was three (noting that they may have experienced the same type of IRID multiple times). Over 40% of clients had experienced an IRID (of any type) more than 10 times.

The most common types of IRIDs were prominent scarring or bruising and collapsed veins (Table 2). The most common "other" type of IRID reported was nerve or artery strike, which was reported as free-text in the questionnaire.

We further classified IRIDs by severity and considered abscess, septicaemia, thrombosis and endocarditis as "severe", due to their potential to be life-threatening, and where delays to medical care have the potential to alter patient outcomes. Sensitivity testing with different definitions of IRID severity were trialled (see Appendix 2). Twenty-five clients (44%) had experienced at least one severe IRID. These 25 clients had also experienced at least one type of non-severe IRID, i.e., no clients had experienced a severe IRID without having also experienced non-severe IRIDs. Client experiences of severe IRIDs were also described in the interviews.

> *"I had an abscess in my groin … I woke up and I had bruises all from my knees down and then I thought that was weird and then the next day I woke up with them all blistered when I went to hospital. I had used my saliva to wipe old blood off my groin that had caused it, and I ended up in intensive care." – P5*

> *"The situation became severe where I needed to ring an ambulance* [in reference to abscess]*." – P1*

> *"I had about 10 minutes and a spider web or something must've been in it, I don't know but whatever the hell was in it, um, let's just say I thought I was on death's door* [in context of 16 days of extreme lethargy and fever, self-managed]*." – P2*

> *"I had an abscess in my neck. I shot into the neck and that and it was a f****** pus-y thing." – P3*

## Seeking of medical attention for IRIDs

The majority of clients surveyed (n=36, 63%) had never sought medical attention for any IRID.

**Table 2:** Types of injecting-related injury (IRID) experienced in lifetime.

| Types of IRID | Number (%)<br>Total n=57 | 95% confidence interval |
|---|---|---|
| **Severe** | | |
| Abscess | 18 (32%) | 22–45% |
| Septicaemia (blood infection) | 13 (23%) | 13–36% |
| Thrombosis (DVT) | 6 (11%) | 4–22% |
| Endocarditis | 2 (4%) | 0.4–12% |
| **Non-severe** | | |
| Prominent scarring or bruising * | 46 (81%) | 69–90% |
| Vein difficulties/collapsed veins | 34 (60%) | 46–72% |
| Swelling of hands or feet ** | 20 (35%) | 23–49% |
| Infection lasting more than 1 week * | 13 (23%) | 13–36% |
| Other | 30 (53%) | 39–66% |

* NB = in the survey form it was specified that these occurred at an injection site.
** NB = in the survey form it was specified that this should have occurred following injecting.

**Table 3:** Seeking medical attention by experience of severe injecting-related injury (IRID).

| Medical attention | No severe IRID experience<br>n=32 | Had experienced a severe IRID<br>n=25 | Total<br>n=57 |
|---|---|---|---|
| Never sought | 28 (88%) | 8 (32%) | 36 (63%) |
| Sought for some | 4 (13%) | 14 (56%) | 18 (32%) |
| Sought for all | 0 | 3 (12%) | 3 (5%) |

Only three clients reported having always sought medical attention.

When considering differences between those who had or had not experienced a severe IRID, there was a greater proportion of clients seeking medical attention if they had experienced a severe IRID (Table 3). However, eight of the 25 clients who had experienced a severe IRID (32%) had never sought medical attention.

When medical attention had been sought, the most common places to seek help were from the emergency department (n=13, 23%) or needle exchange (n=9, 16%). Seven (12%) clients reported seeking care from a general practice, five (9%) from a 24-hour clinic and one (2%) from a pharmacy.

Clients often talked about their desire to use needle exchange services to gather advice about health concerns prior to seeking higher care.

> *"I'd ring* [nurse practitioner at Rodger Wright Centre] [if there were further health problems from injecting]*." – P5*

> *"… My best friend,* [name removed], *she is not using now. She been there, done everything. She's a wee bit older than me and she is the first one I went to about this* [abscess]. *She was the one who drew the line around it and, and she sort of forced me to come in here* [Rodger Wright Centre]*." – P8*

Clients talked about their reluctance to seek medical care in the interviews, and how bad things would have to be before they sought medical care.

> *"Yeah, I, I would probably only go to hospital now if I knew I was dying." – P5*

> *"Yeah, I mean, yeah, it's got to come to probably losing a limb potentially or more worse implications before I am going to go* [to hospital]*." – P8*

> *"I think she did wait a while* [to seek healthcare for a large abscess]. *I can't remember if she used a DIVO doctor at the time or kind of had her own GP, but I think it did get pretty bad before she actually kind of went to a GP." – P9 (staff)*

A reluctance to seek medical attention due to potential repercussions was also reflected in the interview quotes.

> *"So yeah, absolutely would do everything in my power to avoid seeking healthcare because I believe that the methadone clinic would, 'Ohh well, hello, hello. What's going on here? We've been injecting our methadone here. Have we? Well, we got to take your takeaways off you!' which for me would have massive impact on my ability to, you know, do my job without interruption." – P4*

> *"I do not want this on my notes because I'll lose my dose* [methadone] *and then I'll lose my job and I'll lose my house and, you know the implications are huge." – P8*

> *"You know, avoid hospital, you avoid doctors, you avoid all of this because the Kaupapa, because of the whole programme. It's illegal." – P1*

## Barriers to accessing healthcare

The most common barriers to accessing healthcare that were reported in the survey were shame and previous negative experiences with

**Table 4:** Barriers to accessing healthcare.

| **Barriers to healthcare access** | **Number (%)**<br>**Total n=57** |
|---|---|
| Shame/embarrassment | 24 (42%) |
| Negative experiences from healthcare | 24 (42%) |
| Cost | 17 (30%) |
| Transport | 15 (26%) |
| Waiting times | 14 (25%) |
| Other | 14 (25%) |
| Worry about getting arrested | 12 (21%) |
| Opening hours | 12 (21%) |

healthcare, with cost also being reported as a barrier by almost one-third of survey participants (Table 4).

Barriers to accessing healthcare were strongly reflected in the interview findings, where participants described their previous experiences of seeking medical care, and the discrimination they had experienced.

> *"And I think as soon as they* [healthcare workers] *hear methadone, bang, you're a junkie. You're useless. You're, we can't trust you. Um, and you're doing it to yourself." – P8*

> *"I had big holes in my groins, when the nurses were looking at, at it, like when they first seen it, one goes, ew, like that and it's like, ohh god makes you feel even more ew … the lady that was from the disease clinic or whatever, she wanted me to go to the ombudsman and lay a complaint but it was just too much hassle for me and 'cos I'd already felt ashamed and that and you know, and they make me feel even more ashamed so, yeah, that puts me off hospitals." – P5*

> *"I ended up discharging myself from there because a doctor came in and it was the first time I'd met him and he goes, 'I come to work every day to help people and then I've got to risk getting hep C from someone like you'." – P5*

> *"Many friends, well associates … they won't go back* [to seek medical attention]*."*
> *("They won't ever go back?" – Interviewer)*
> *"No, the way they were treated, especially if they land in hospital or things like that, you know treat, treated pretty brutally if you're actively using." – P2*

> *"I would say, you know, she would give the impression, the first impression of so underweight, bad teeth, hyperactive, probably seemed like a junkie. She meets the stereotype, and she was eventually refused care by the dentist and she's like 'it's all paid for blah, blah, blah' and they're like 'We've refused the care on the basis that she had self-disclosed that she had hep C' and she came back here* [DIVO] *extremely upset." – P10 (staff)*

Clients also described how costs had impacted their ability to receive appropriate medical care or adequate standard of living.

> *"And, so, they've only got a certain amount of money so, yes, it's all, all very well offering them accommodation. But then by the time they pay for that, pay for electricity, pay for a few groceries, they've got nothing left. They'd rather live on the street and have more options to them." – P6 (staff)*

**Table 5:** Sources of knowledge about injecting-related injury (IRID).

| Sources of knowledge | Number (%) Total n=57 |
|---|---|
| Peers | 44 (77%) |
| Needle exchange staff | 34 (60%) |
| Needle exchange resources | 29 (51%) |
| Medical professionals | 21 (37%) |
| Other | 24 (42%) |

> *"I shoplift a bit because I've got no money but, you know, I have to shoplift for food." – P3*

> *"Always* [having difficulties with costs]. *The other thing too is Canterbury, New Zealand is probably one of the most expensive places in the world to have a drug, opiate habit … To pay for the same or similar drugs even somewhere as close as Sydney, Melbourne, Perth, Australia, you're looking at what you'd pay 100 dollars for here, you could pay 25 dollars in Australia." – P1*

Others also described a reliance on social support systems such as Work and Income New Zealand (WINZ) to access care.

> *"I had cirrhosis of the liver by 46. I had genotype 3B* [hepatitis B, contracted through IV drug use]*, which is a real mongrel one as you may know. B is the hardest one to treat* [pre-pangenotypic]. *I was very lucky because I got the drugs into the country through the clinic here* [Rodger Wright Centre]. *They got me a grant, you know. There was a window open with WINZ. I thank every taxpayer for it." – P2*

> *"So,* [GP at DIVO site] *was working with her over that and he had arranged for WINZ to pay for her to have her teeth done. This is not the only time I've heard of this kind of thing happening with clients who get WINZ payments for dental issues." – P10 (staff)*

### Sources of knowledge on IRIDs

Survey responses demonstrate that clients are gaining their knowledge on IRID prevention primarily from peers and needle exchange staff. The "other" sources reported in the survey included websites, YouTube and learning through experience over time (Table 5). This reliance on peer support was reflected in the interviews.

> "[I]*t has to be a real concerted effort of self-preservation … learning … getting connected with the different organisations like the hep C clinic, the Rodger Wright* [Centre], *peers, we're so fortunate in Christchurch, in Canterbury here that all the people that work here … they're all peers and they're all of the older generation and they all know, we all know one another. Information sharing is just one of those things that takes place, and it's really valued." – P1*

## Discussion

IRIDs are a substantial source of health harm for PWID and represent both harm to individuals and associated healthcare costs. Knowledge of how PWID experience IRIDs in Aotearoa is vital to informing preventive and harm reduction efforts. To the best of our knowledge, this study represents the first characterisation of IRIDs in an Aotearoa sample of PWID.

We found that PWID are using a diverse range of protective methods, and are educating themselves about IRID prevention, but nevertheless are experiencing a high number and wide range of IRIDs, many of which have the potential to cause serious harm and/or be life threatening. We found that the rates of IRIDs in the South Island are broadly consistent with those from international data relating to PWID. An international systematic review of injecting-related injury and diseases among PWID found the lifetime prevalence of abscesses ranged from 6.2% to 68.6%, consistent with our finding of 32%.[7] Our results were also consistent with international findings in relation to thrombosis and endocarditis. Thrombosis's lifetime prevalence was estimated at 3–27% (compared with our 11%) and endocarditis lifetime prevalence was estimated as 0.5–11.8% (compared with our 4%).[7] One contrasting difference between the international estimates and our findings was the notably higher rate of lifetime sepsis in our study. Larney et al. (2017) reviewed six studies that analysed the lifetime prevalence of sepsis and found the prevalence to be 2.0% (1.7–2.3%) in an Australian sample and 9.8% (3.3–21.4%) in a United States of America (USA) sample, both of which are significantly lower than the 23% (13–37%) we found in our Aotearoa sample. This suggests that PWID in Aotearoa are at greater risk of developing sepsis compared with PWID in other countries[7] and are at greater risk of sepsis than the general population.[27] The reason for this is unknown and may be an artefact of a low power study. However, a possible hypothesis for this may be that PWID in Aotearoa may have delayed recognition and treatment of otherwise less-serious infections, which may lead to development into a more serious bacteraemia. This may indicate a need for further research into the ability of PWID and peers to recognise a bacterial infection that requires treatment so that this progression does not occur. An alternate hypothesis is that the higher prevalence of methamphetamine injecting may increase sepsis risk, possibly due to contamination within the local drug supply. Regardless, this requires additional research to validate the finding and explore potential mechanisms.

Our data also indicated that PWID in Aotearoa reported high levels of knowledge and harm reduction awareness, as shown by finding that the median number of harm reduction (protective) factors used was six out of a possible eight. We also acknowledge that this survey was conducted at a time where the NZNEP was undergoing severe supply issues and struggling to source wheel filters and sterile water overseen by Te Whatu Ora – Health New Zealand. This is reflected in our data as wheel filters were the lowest utilised protective measure at just 39%. This emphasises the responsibility our public health system has to maintain its obligations to vital harm reduction services working with vulnerable communities. While acknowledging both the skew of the sample being taken from a harm reduction site and the potential for recall bias, it is reassuring that clients report using harm reduction measures. However, the high prevalence of injury despite these harm reduction measures indicates the significance of access to healthcare remains, and the importance of reducing the barriers this population experiences to seeking care.

Almost all participants reported an unwillingness to seek healthcare and described multiple barriers to healthcare access, particularly stigma and discrimination. This is of particular concern for the almost half of our sample who had experienced at least one severe IRID, which could be acutely life-threatening, and for whom delays to medical care therefore could have significant implications for patient outcome. This stigma experience is well documented in international research as drug use has been labelled as a "social evil".[9,28] Qualitative research from the West Coast of Aotearoa's South Island found stigma to be a significant barrier to distributing care through healthcare services.[18] Likewise, qualitative work from the USA described very similar themes of stigma and discrimination to those our interviews revealed, finding that 59.4% of participants in one study felt fear of stigmatisation or discrimination.[29] These authors also identified that this fear of stigmatisation led to avoidance of healthcare providers.

There is also a considerable degree of socio-economic deprivation within the PWID community, thereby exacerbating barriers to accessing healthcare. We found that cost and transport concerns acted as a barrier for 30% and 26% of our survey sample, respectively. This was reflected in interviews, with some participants lacking access to motor vehicles and financial stability. It is well documented that PWID tend to have lower incomes and have greater exposure to incarceration, poverty and violence than the general population.[30–32] It is also important to note that our study found that Māori were over-represented compared with the general population, and this is reflected in needle exchange data more generally in Aotearoa.[3] Being Māori per se is not a risk factor for drug use or drug-related harm, but is likely to compound harms through processes of colonisation, marginalisation and racism.[33] Though there are limited empirical data available on social and structural determinants of health among PWID in Aotearoa, it is reasonable to hypothesise that many within this community will be structurally marginalised and experiencing multiple morbidities. This highlights the need to take a public health approach to reducing harm in this community.

These data demonstrate the importance of health practitioners being aware of the risks of IRIDs in PWID and the barriers to PWID seeking care. Stigma is a well-documented barrier to health-seeking behaviour and thus clinicians are well-placed to halt stigmatisation of taboo topics or acknowledge and mitigate the harmful effects of stigmatisation where identified.[34,35] In the context of IRIDs, the most common barrier to adequate care we identified was stigma and past negative experiences with health professionals. Evidence shows that educational interventions are effective in reducing stigma and fostering positive attitudes in healthcare students.[36] Therefore, one avenue to approach de-stigmatisation is for students in healthcare to be educated about injecting drug use and harm reduction services in the community. Based on our survey and interview findings, many PWID feel stigmatised, discriminated and shamed, which means that they are less likely to seek healthcare. Consideration should be given to how healthcare services can be better oriented to provide care for PWID, which could include models that better integrate already trusted services, like the needle exchange.

The study's small size and recruitment of a convenience sample only from the South Island are limitations. However, sample demographics (both survey and interview) are broadly consistent with NZNEP data, suggesting that they were representative of PWID in Aotearoa.[3] Similarly, we acknowledge the limitations of self-reported data and associated recall bias, and the risk that some clients may not have understood the medical nomenclature and thus under-reported their experience of IRIDs in the survey. We quantified IRIDs based on symptomatic experience, not on formal diagnosis, given that medical attention may not have been sought and, therefore, there was no diagnosis. However, these concerns are balanced by a key strength of the study, where mixed methods were used to add richness to the quantitative data and to support the survey findings. This methodology leveraged trusted relationships (including introductions from peer workers) to build rapport with clients and gain key insights directly from participants, amplifying the voices and perspectives of a population group that is stigmatised and "hidden". Our study design also did not look at healthcare access for each incidence of IRID that clients experienced; we asked about their overall healthcare access behaviour in response to IRIDs. This means we cannot separate out whether clients accessed healthcare for some types of IRID and not others, or if clients sought different types of healthcare for different types of IRID. This study, albeit small, has the potential to be upscaled and conducted nationally, thereby enabling national prevalence of IRIDs to be determined. It may also be possible to elucidate clients' responses to different IRID types with a longer and more complex survey design. Future research focussed on client outcomes (including admission and treatment) following severe IRIDs would be of particular benefit.

In conclusion, IRIDs present a significant health risk to a vulnerable population of PWID in Aotearoa who have a range of other compounding negative health predictors. We found that PWID appear to be using a wide range of harm-reducing measures, but, regardless, appear to experience a range of injecting injuries at rates comparable to international data, and in some cases exceeding these. The NZNEP, including DISC Trust, has provided PWID with a safe environment where they are able to access judgement-free harm-reduction equipment and information since 1988, and is highly trusted by PWID. At the present time, however, the NZNEP's limited resourcing means that the health burden posed by clients' untreated injuries exceeds the programme's capacity in many regions. Clients are seeking support from peer staff on IRID prevention and treatment, which reinforces the need for training to support staff in this role, and to recognise when clients may need to seek healthcare. This study highlights the importance of expanding harm reduction in Aotearoa and further destigmatisation of healthcare to ensure access to vulnerable and marginalised communities.

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**COMPETING INTERESTS**

This project was undertaken as a summer studentship by SP, funded from a Health Research Council grant awarded to RC (21/638). The funder had no role in the conduct of the research or the decision to publish the findings. Associated research costs were funded from discretionary research funding by RC. Author GN has dual roles at the University and with the New Zealand needle exchange programme but has no competing interest to declare. All authors declare that they have no financial or competing interests.

RC holds a role as Director on the Australasian Professional Society for Alcohol and other Drugs, as the NZ representative.

**ACKNOWLEDGEMENTS**

We acknowledge with gratitude Philippa Jones, Jason George, Belinda Read, Serena Weatherall and the peer staff at the participating needle exchanges for their support in facilitating this research.

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https://nzmj.org.nz/journal/vol-138-no-1611/injecting-related-injuries-experienced-by-people-who-inject-drugs-in-new-zealand-impact-healthcare-access-and-stigma

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# Appendices

## Appendix 1: Explanation of "protective factors"

This information is provided as additional context and background on how these behaviours are protective against IRIDs for people who inject drugs. It is important to note that these protective factors are not considered as either/or, and it would be considered best practice to use all of these factors when injecting.

For an interested reader, we also refer to the following online harm reduction resources that have been developed for and by people who inject drugs:

https://www.nznep.org.nz/media/pdfs/585.pdf

https://nznep.org.nz/_assets/img/Resources/Filtering-Booklet-NZNEP.pdf

https://harmreduction.org/issues/safer-drug-use/injection-safety-manual/safer-injection-basics/

**Self-administering the injection**—this enables the person injecting drugs to have control over the injecting practices, including infection management.

**Use of a sterile needle and syringe**—this prevents transmission of bloodborne viruses and reduces infection risk. The needle exchange advises clients not to share injecting equipment between people, but to also not reuse equipment. This is because if a needle tip becomes damaged through reuse, it can cause damage to the vein.

**Swabbing the site with alcohol beforehand**—this is to prevent any microbes on the skin from being pushed into the injection site and, thus, causing infection.

**Washing hands beforehand**—as the equipment being used should be sterile, this practice maintains hygiene and is intended to reduce infection risk.

**Use of a filter**—filtering is intended to remove impurities from drugs prior to injecting. This includes bacteria that can cause infection, as well as binding agents or impurities like talcum powder that can damage veins. Using a filter is always recommended, but different types of filters are recommended for different types of drugs. The NZNEP provides resources to clients to support them to use the most appropriate filter.

**Mixing with sterile water**—some drugs need to be mixed with water in order to be injected. It is always recommended that sterile water be used for mixing, to reduce the risk of microbes that could cause infection being introduced.

**Tourniquet use**—using a tourniquet helps plump up the vein so that it is more likely that the injection will go into a vein on the first try and reduce "vein missing". This is recommended in order to minimise damage to veins that may occur through repeated injecting, and thus lead to people then progressing to higher-risk injecting sites (like the groin).

**Use of a wheel filter**—wheel filters are a low micron filter that remove bacteria in order to prevent infection. Some drugs require pre-filtering to remove larger contaminants before use of a wheel filter.

## Appendix 2: Definitions of IRID severity

Severe IRIDs were defined as those with the potential to be life-threatening and where any delay to medical care has the potential to alter patient outcomes.

We acknowledge that not all IRIDs may warrant medical attention; therefore, we attempted a three-level classification of IRIDs to then enable cross-tabulation with seeking medical attention.

We maintained the current "severe" categorisation and then split "non-severe" into mild (scarring/bruising, vein difficulties, other) and moderate (swelling, infection more than a week). This would have enabled us to consider whether medical care was sought in a way that could have excluded the "mild" group. However, when classified this way, the numbers were:

Severe = 25 clients
Moderate = 5 clients
Mild = 27 clients

The group of 5 ("moderate") was too small to meaningfully analyse seeking medical care, and our results were very similar to our original Table 3 for the "mild" group.

When replicating Table 3 with this three-level classification of severity, the results were:

| **Medical attention** | **Only mild IRID experience (n=27)** | **Had experienced a moderate IRID (n=5)** | **Had experienced a severe IRID n=25** | **Total n=57** |
|---|---|---|---|---|
| Never sought | 23 (85%) | 5 (100%) | 8 (32%) | 36 (63%) |
| Sought for some | 4 (15%) | 0 | 14 (56%) | 18 (32%) |
| Sought for all | 0 | 0 | 3 (12%) | 3 (5%) |

# Māori healthcare professionals' perceptions of psychedelic-assisted therapy: a qualitative study

Carly Hanna, Eva Morunga, Alesha Wells, Lisa M Reynolds

## ABSTRACT

**AIM:** Psychedelic-assisted therapies are gaining interest as an innovative treatment for problems with mental health and addictions, and there are several clinical trials in this area currently being conducted in Aotearoa New Zealand. However, many stakeholder groups hold concerns about cultural acceptability and safety. While psychedelic substances have a long history overseas in various Indigenous populations for spiritual and ritualistic purposes, their traditional use with Māori in Aotearoa New Zealand is unclear. Given our Te Tiriti o Waitangi obligations and the significant health inequities for Māori, any new treatments should be developed considering Te Ao Māori (Māori worldview) perspectives. This study aimed to explore Māori healthcare professionals' current awareness, attitudes and perspectives on psychedelics and psychedelic-assisted therapy.

**METHODS:** To explore these aims, 13 Māori healthcare professionals were recruited to participate in semi-structured qualitative interviews investigating psychedelic awareness, knowledge and attitudes using Māori health models Te Whare Tapa Whā and Te Wheke as a framework for data collection and analysis.

**RESULTS:** Four key themes were identified, including 1) greater awareness leads to greater openness towards psychedelic-assisted therapy (PAT), 2) more research and education about PAT is needed, 3) PAT has the potential to align with Te Ao Māori, and 4) equitable access is critical for Māori.

**CONCLUSION:** Our sample of Māori healthcare professionals generally supported research investigating psychedelic therapies in Aotearoa New Zealand. Improving awareness of this novel treatment is likely to influence its acceptability as a treatment option and will inform the cultural safety of its use with Māori.

Psychedelic-assisted therapy (PAT) is a treatment that involves the administration of psychedelic substances alongside psychological therapies to produce therapeutic benefit.[1] Common psychedelic substances include lysergic acid diethylamide (LSD), psilocybin, N,N-Dimethyltryptamine (DMT), mescaline and 3,4-Methylenedioxymethamphetamine (MDMA). Emerging evidence suggests that PAT can be used to treat a wide range of health conditions, including depression, anxiety, addictions and substance use, post-traumatic stress disorder and end-of-life distress.[2–4] Given that Māori in Aotearoa New Zealand (henceforth Aotearoa) face significant health inequities across such conditions,[5] it is essential the needs and perspectives of Māori are central to the development of new interventions in these areas.

While psychedelics are relatively novel in Western medicine, their therapeutic use is not new to many Indigenous populations with a long-standing history in traditional healing practices in countries such as South America and Mexico.[6,7] Such substances have historically been used in ritualistic and religious contexts, as a bridge between the physical and spiritual world.[6] However, they have also been used medicinally, including to heal common ailments such as colds and pains.[6] It is currently unclear whether psychedelic substances were used in Aotearoa pre-colonisation due to the systematic suppression of traditional healing approaches since colonisation.[8]

Given that the contemporary approach to PAT was developed in a Westernised framework and little is known about its cultural safety, there is a need to explore this intervention in the context of Māori health. All new treatments in Aotearoa should be developed in accordance with the legislative obligations particular to Aotearoa, including Te Tiriti o Waitangi[9] and the *Pae Ora (Healthy Futures) Act*,[9] which ensure treatments meet the needs and aspirations of Māori. Māori health models are holistic and more collectively focussed compared with Western health models, which often prioritise a biomedical focus.[10]

Māori models of health, including Te Whare Tapa Whā[11] and Te Wheke,[12] symbolise principles in Te Ao Māori (Māori worldview) that contribute to health and wellbeing. Briefly, Te Whare Tapa Whā is based on four pillars of wellbeing, i.e., taha wairua (spiritual), taha whānau (family/social), taha hinengaro (mental/emotional) and taha tinana (physical),[11] and Te Wheke extends these domains to include concepts such as mauri (life essence), mana ake (unique identity of individuals and family), whatumanawa (open and healthy expression of emotion) and hā a koro ma, a kui ma (breath of life from forbearers). Culturally unsafe practices can arise when these aspects of health are not addressed in interventions, ultimately causing harm to the communities they intended to serve.

There are several clinical trials currently investigating PAT in Aotearoa[13–15] and, as such, it is a timely priority to include a Māori voice in the development of such interventions. This requires understanding the views of Māori healthcare professionals, given that they are key stakeholders in the development and delivery of such interventions and would become referrers and/or providers of PAT should it become available. Healthcare professionals have unique insights into the benefits and barriers of introducing a novel treatment modality, and patients rely on their health providers for education about treatment options.[16] The existing literature often presents an optimistic view towards PAT for the treatment of mental health conditions, with awareness often predicting greater openness towards the modality.[17–19] However, health professionals continue to endorse the need for further scientific research both internationally[20] and in Aotearoa.[21,22] While there has been some work exploring perceptions of PAT, there is currently little known about the specific perspectives of Māori healthcare professionals.

Thus, there is a need for Kaupapa Māori rangahau (Māori-led research) to explore the perceptions of PAT and its applicability for taha tinana, taha hinengaro, taha whānau and taha wairua. The current study aimed to investigate Māori healthcare professionals' awareness, attitudes and perceptions regarding the potential use of PAT in Aotearoa. Such an understanding should inform the development of PAT interventions to ensure they are culturally safe for Māori and to maximise their potential to address health inequities.

## Methods

This study was guided by Kaupapa Māori (Māori approach/ideology) in that it was conducted by Māori, with Māori and for Māori and prioritised tikanga Māori (Māori customs and traditions), Te Ao Māori and tino rangatiratanga (self-determination).[23] The research team were primarily Māori, and all participants were of Māori descent. Kaupapa Māori rangahau guided all study components from the project development and consultation, recruitment, data collection and data analysis, as well as dissemination of study results. The current report presents qualitative analyses of a larger mixed-methods study.

### Participants

The target populations for this study were Māori healthcare professionals and Māori university students studying to become healthcare professionals. The scope of healthcare professionals included Rongoā Māori (Māori medicine) practitioners, doctors, nurses, psychologists/counsellors and allied health professionals, and healthcare students included students currently studying any healthcare course with a clinical component (e.g., nursing, medicine, psychology). To be eligible, participants had to be over the age of 18, of Māori descent, fluent in English and must work or study clinically in healthcare with patients. Ethics approval was granted by the Auckland Health and Research Ethics Committee (reference AH25736).

Convenience sampling methods were used for recruitment, including snowballing techniques. Flyers were posted at The University of Auckland medical campus and with Māori health providers, Māori nurses council, Hospice kaimahi Māori, Aotearoa Psychedelic Māori Advisory Rōpū, Iwi United Engaged newsletter, health practitioner societies and/or registry boards and social network postings. Following locality approval, participants were also recruited through Te Toka Tumai and Counties Manukau mailing lists.

### Procedure

Following completion of an initial survey (not further discussed here), participants were asked whether they would be willing to take part in a qualitative interview. If they expressed interest, participants were contacted by the primary researcher (CH) by phone or email to schedule a hui (meeting). Interviews took place either by phone, Zoom or in person. When conducted on the phone or in person, interviews were audio recorded via dictaphone, and Zoom interviews were recorded via the Zoom recording tool. In line with Indigenous data sovereignty, recordings were stored on a local server, not on internationally stored cloud services. The Microsoft Word dictation tool was used to facilitate transcription. The primary researcher also manually transcribed all te reo Māori kupu (words) to ensure correct transcription. Following transcription, recordings were deleted. Interviews were de-identified by assigning participants with a study number.

The hui began with whakawhanaungatanga (establishing relationships), which involved the researcher introducing themselves, their affiliation with Te Ao Māori and explaining the study. Space was provided for the participants to introduce themselves, and hui opened and closed with karakia (prayer). A semi-structured interview guide asked about psychedelic awareness, knowledge and attitudes. The Māori health models Te Whare Tapa Whā[11] and Te Wheke[12] were used as a framework for data collection and analysis. These models were chosen based on their holistic and spiritual approach to hauora (wellbeing). Participants were offered a $40 gift voucher as compensation for their time and had the option to receive a copy of their transcript to review. Participants were given the opportunity to make changes to their transcript and withdraw their data within 14 days of receiving their transcript.

## Data analysis

Reflexive thematic analysis was used to generate themes from the qualitative data.[24] This involved the primary researcher (CH) initially familiarising themselves with the transcripts. Intelligent verbatim was used for transcription so that any redundant words and sounds were removed. The researcher used a reflexive journal throughout the transcribing and analysing process that facilitated reflections on positionality, how whakawhanaungatanga impacted the interview and in the development of themes. Mind maps were used to collate themes and link quotes together. Themes were discussed in an iterative process with all researchers (CH, EM, AW, LR) and collaboratively refined. Given the exploratory nature of the study, an inductive (bottom-up) approach was used for thematic analysis where the coding of the data was based on a semantic (explicit meaning) and latent (underlying ideas) approach.

# Results

## Participants

A total of 13 Māori healthcare professionals and students in their clinical years participated in the qualitative interviews (Table 1). Most interviews were held over Zoom (n=7), two were conducted over the phone and four were kanohi ki te kanohi (face-to-face). Interviews ranged between 45 and 60 minutes depending on the flow of the kōrero (conversation) and participants' other commitments.

**Table 1:** Demographic characteristics of interview participants (N=13).

| | ***n* (%)** |
|---|---|
| **Gender:** | |
| Female | 9 (69) |
| Male | 4 (31) |
| **Profession:** | |
| Nurse | 4 (31) |
| Doctor | 2 (15) |
| Medical student | 1 (8) |
| Counsellor/social worker | 2 (16) |
| Rongoā practitioner | 1 (8) |
| Other | 3 (23) |

Most participants identified as female (n=9) and a range of professions were represented.

## Findings

Four themes were identified; two had a specific focus on PAT with Māori, and two more generally pertained to PAT as a field. The briefer and more general themes are discussed below first.

### *Theme 1: greater awareness leads to greater openness towards PAT*

Awareness varied across participants, with some aware of psychedelic use for whai ora (person/s seeking wellness) and others demonstrating a lack of awareness by asking what counted as a "psychedelic substance" (see Table 2 for quotes). Greater awareness appeared to be associated with greater openness towards PAT. Those who had greater awareness of the psychedelic literature held knowledge across various aspects of psychedelic usage, including of studies investigating how different psychedelic substances can be used for various health conditions, how mystical experiences can arise from larger doses of psychedelics and the importance of set and setting. Many participants also noted there was stigma associated with psychedelics that might limit openness from patients and practitioners towards PAT. Those that had less awareness of PAT tended to draw on knowledge of recreational use of psychedelics or attributed psychedelics to the "hippie era" and felt more comfortable with the provision of microdoses versus higher doses, associating the former with greater control and caution.

### *Theme 2: more research and education about PAT is needed*

Participants consistently spoke about the need for more research to investigate the risks and benefits of PAT, including concerns about safety issues such as drug-induced psychosis and how PAT might interact with other treatments like rongoā (see Table 3). Most participants were open to referring patients to clinical trials; however, some noted they needed more information about the therapy's safety and efficacy before feeling comfortable to do so. Participants also called for continued education of healthcare professionals as psychedelic research progresses, including the need for more information and resources.

**Table 2:** Quotes representing theme "greater awareness leads to greater openness towards PAT".

| Sub-theme | Quote/s |
|---|---|
| Awareness of psychedelics and PAT is varied | "I don't know a lot about it. It's definitely something that I want to look more into for myself and for our whānau [family]. I attended a hui ... and we had a few speakers from all around the world and some of their kōrero was around using psychedelics and supporting whānau with addiction and mental health … it is something that we should be open to." – #4, mental health and addictions practitioner |
| Stigma impedes openness | "But firstly, I was like why would you use it for therapy? But that's just because it is that stigma of recreational use and I guess seeing it out there is different to having it in a controlled environment." – #10, clinical nurse specialist<br>"There's obviously a lot of stigma around these medications and a lot of them are linked to the illicit production of said substances … there's obviously associations with illegal producers and suppliers, such as gangs and things like that … personally, I think these substances have caused a lot of harm amongst our whānau, especially spiritual and mental health … I have seen a lot of patients in the hospital with very severe mental health issues. A lot of schizophrenia from the use of psychedelics … I think we just have to tread very carefully, especially given the effects that these have had on us." – #7, doctor<br>"I think it just comes down to that psychedelics are drugs and drugs are bad ... And I think that might just be a generational thing at the moment." – #4, mental health and addictions practitioner |

**Table 3:** Quotes representing theme "more research and education about PAT is needed".

| Sub-theme | More research and education about PAT is needed |
|---|---|
| More research is needed around contraindications around safety | "I'd feel fine myself as long as the trials had all been done and it was all positive or mainly positive outcomes, expecting, though there will be some that it just does not work for, for whatever reason. Could it mix with the medications they're already on?" – #1, healthcare assistant<br>"The only problem with our rongoā and today with PHARMAC's and medication is that they don't really want to mix natural with these. There's a contraindication that they are afraid that it will react. And at the same time, they won't allow us to just stop their meds and let us use the natural first ... So, there's always been a bit of a battle between Western science and our tradition … But we'll see what our people want." – #13, rongoā practitioner |
| Healthcare professionals have limited confidence in referring patients to clinical trials | "I think I would probably have to know a lot about what was happening in the trial. Like what support people were getting beforehand and the screening they were getting beforehand and how much support they were getting afterwards. All those kinds of things." – #8, doctor<br>"I'd be slow to accept it or advocate for it unless there was like solid evidence showing otherwise, but I guess you can't do that without trialling it." – #3, medical student, 2nd year<br>"If the large majority of experts in the field came to a conclusion and that was the recommendations then by all means I'd be happy to give it a try. If there was sort of a division, even like 50/50, I think I'd be more averse to holding off until further research is done." – #7, doctor |
| Healthcare professionals need more education | "I think if people had the right information or the right education or more education about things, they would be able to make their own decisions, but I feel like some people just jump on the waka [canoe] and go the other way." – #4, mental health and addictions practitioner<br>"I think if the health professionals are educated enough about this sort of therapy, and we are able to share that with our whānau and our communities, I definitely think that's going to change the perceptions of our community." – #4, mental health and addictions practitioner |

### *Theme 3: PAT has potential to align with Te Ao Māori*

As shown in Figure 2 and Table 4, participants perceived PAT to be a holistic approach that has potential to align with Te Ao Māori. Firstly, due to its holistic nature, PAT was perceived to target various domains of wellbeing relevant to Māori health frameworks. Participants expressed how Māori are inherently spiritual, and that PAT appeared to embrace a spiritual approach. In contrast, others feared that taking a "substance" to induce a spiritual experience would not be a "true" experience. Participants also thought PAT may have the potential to improve family relationships (such as fostering connection at end of life, increasing energy), but that it may also put strain on whānau if they did not approve of the treatment. Participants felt that PAT may help people to open up more in therapy, supporting whatumanawa, rather than masking symptoms as is often the way in Western medicine. Some felt that it may be a tool to connect patients with their culture and "authentic" selves. However, others felt it may act as an interim measure in lieu of real connection.

Some participants expressed that PAT has the potential to connect people with their whenua (land) and tupuna (ancestors) through a physical and spiritual connection to Papatūānuku (Earth Mother). The notion that some psychedelics come from the earth and could enable a spiritual journey as opposed to being a "drug" was expressed in

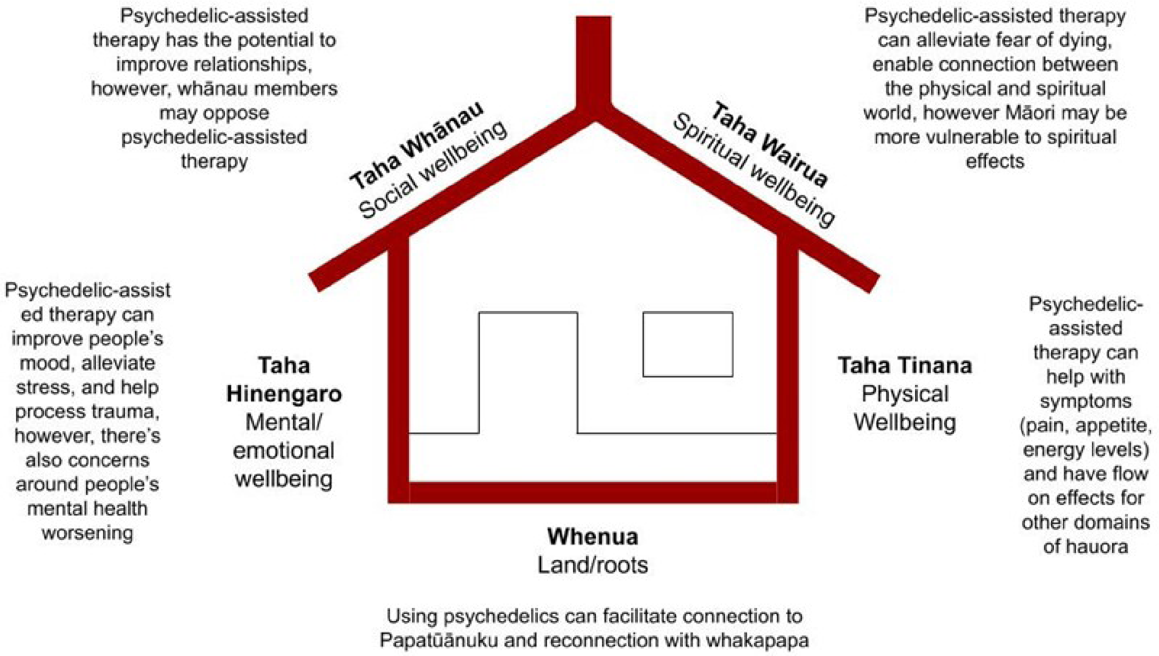
**Table 4:** Quotes representing theme "PAT has potential to align with Te Ao Māori".

| Sub-theme | PAT has potential to align with Te Ao Māori |
|---|---|
| Potential to align with a Māori health framework | *On taha wairua*: "We're very spiritual, very intuitive human beings and that's what makes us quite sensitive … more susceptible for the substances." – #11, counsellor/social worker<br>*On taha hinengaro*: "That [PAT] would give them some comfort in a hinengaro side of things. It's sort of almost like a form of meditation, whereas the person can really relax and go into that stillness in the mind, sort of thing." – #1, healthcare assistant<br>*On taha tinana*: "It might even help with pain, physical pain, by relaxing the mind. I believe it's all connected." – #1, healthcare assistant; and "If psychedelics are used in a way to help symptoms, once symptoms are alleviated then stresses are alleviated at the same time…" – #9, clinical nurse specialist<br>*On taha whānau*: "[PAT] could help improve whānau relationships potentially, especially if family dynamics are strained." – #9, clinical nurse specialist; and "It's important for whānau to be supportive and involved … but if they don't approve of the way that they're getting help, then that could be a thing." – #3, medical student, 2nd year<br>*On whenua*: "A lot of them [psychedelic substances] come from the earth so they've got that connection to Papatūānuku, which already gives them, in my opinion, a certain level of validity as an entity of healing, although you could argue that Māori didn't really use them very much … there's many cultures that have used them for healing over in their cultural lines. There's obviously something in them that connects people to some deeper senses of understanding." – #8, doctor; and "They [friend] were talking about connecting with the whenua, connecting with Papatūānuku, but while they're in that hallucinogenic state." – #5, nurse |
| Awareness of psychedelic use in Indigenous cultures | "I think there's definitely a place for psychedelic drugs given I think that's been established anyway in terms of people's culture … various Indigenous peoples have used psychedelic drugs for shamanic purposes or interfacing with the spirit realm, to get messages of some sort." – #2, equity and cultural advisor<br>"I have heard of Indigenous people using it to connect to the spiritual world." – #9, clinical nurse specialist<br>"I'm not actually aware if we [Māori] had anything like that. I mean Fijians had kava, but I don't actually know if Māori had any sort of substance or mind altering…" – #11, counsellor/social worker<br>"I think if you've got that [evidence of psychedelic use in rongoā], then that's your green light to that traditional pathway, using different fauna and flora, if it's natural, then they would have used it." – #12, counsellor/social worker<br>"We do have a native psychedelic mushroom here, I've heard mixed reports about whether our tupuna used to consume them, some people say that the tohunga maybe did it for some very specific purposes. But besides that, the history that I've heard is that Māori prior to colonisation were essentially like a non-substance using culture, except for obviously your rongoā and plants and whatnot which can have their own effects, but we didn't have any psychedelic compounds that were widely used by like the everyday person." – #8, doctor<br>"See the thing with mushrooms, our people also used, at different times, different types of sap and different types of bark roots to actually get the hallucinogenic effects. It wasn't always just down to mushrooms … so it was really, not hugely known about whatsoever. Mainly for a chief, if he was wounded or dying, they would probably, not so much the mushrooms, but they would go out and find the tawhara or the pukatea and would pretty much put them on that." – #13, rongoā practitioner; and "A lot of tohunga (expert/traditional healer), were the only ones that knew about that. They were more so used by tohunga for the spiritual connection … The knowledge has been lost." – #13, rongoā practitioner |

**Table 4 (continued):** Quotes representing theme "PAT has potential to align with Te Ao Māori".

| | |
|---|---|
| Preference for more "natural" psychedelic substances and rongoā | "If I had any issues that I needed to address and that was on offer, I'd probably be scared to touch it [PAT] because I've never explored those avenues and I'll be like why are you trying to give me recreational drugs to help cure something when the Western medicine already doesn't work?" – #10, clinical nurse specialist<br>"For Māori, I think they'd still be for the more natural forms of the hallucinogenics. The rites of passage in our Indigenous cultures, where smoking the pipe or eating the mescaline or drinking it is actually part of a part of a traditional custom. Just with the normalisation of the rongoā and mirimiri (massage), the use of energy work, for Māori, I think some traditional tools need to be brought to the front as an option." – #12, counsellor/social worker<br>"I strongly feel like it should remain with Indigenous people, because that is quite a spiritual therapy and should remain so." – #11, counsellor/social worker |

**Figure 1:** Benefits and concerns for PAT within Te Whare Tapa Whā.



different ways. Some participants thought that Māori patients may be more accepting of natural, as opposed to synthetic, substances. Others reported that natural psychedelics should remain a taonga (treasure) to Indigenous people and not be utilised for Western practices, particularly as Western practices may be ill-equipped to deal with the spiritual nature of such an intervention. Participants who perceived PAT to be more holistic expressed greater openness, particularly when they held knowledge of the history of traditional psychedelic use in Indigenous populations. Many participants were more aware of traditional use among other Indigenous cultures as opposed to Te Ao Māori or rongoā. Where PAT was perceived to be associated with Western medicine, participants felt that patients may not trust the treatment and would instead prefer accessing rongoā or other familiar treatments.

### *Theme 4: equitable access is critical for Māori*

Overall, there was a perception that PAT has the potential to reduce health inequities if delivered in alignment with Te Ao Māori and in a culturally safe way (Table 5). Participants felt that PAT offers a hopeful alternative for whai ora, especially where current treatments are insufficient. Participants stated that transparency and informed consent were priorities in line with the health literacy of the community. However, participants also noted concerns for PAT given systemic barriers to hauora will remain, including access and cost of treatment. Some participants likened foreseeing the implementation of PAT to medicinal cannabis, where access currently perpetuates inequities (see further below). Given that PAT can incorporate spirituality, there was also an expressed need to have appropriate support guiding participants through a psychedelic experience. This support included having Māori kaimahi (worker), kaumatua (Māori elder), rongoā practitioner or tohunga who are experienced in the wairua realm supporting whai ora. Ensuring appropriate support and cultural safety will prevent the exacerbation of current health inequities.

## Discussion

The aim of this study was to explore Māori healthcare professionals' awareness and perceptions of psychedelics and PAT. Four key themes were identified: 1) greater awareness

**Table 5:** Quotes representing theme "equitable access is critical for Māori".

| Sub-theme | Equitable access is critical for Māori |
|---|---|
| PAT offers opportunity for health equity | "I want Māori people to catch up to Pākehā people." – #1, healthcare assistant<br>"Because if it's a matter of public health. If you look after the people whose health is the worse, then naturally that raises the gradient, so everyone benefits anyway." – #2, equity and cultural advisor<br>"I'm all for it, especially if it's proven to work, it's proven to heal, and it's proven that people can get on with their lives and that's what we're here for, is to help change people's lives for the better." – #12, counsellor/social worker |
| Barriers to PAT | "I would personally think of the stigma coming with recreational drugs and the use in like a medical environment and what that might mean for the patient and the whānau." – #9, clinical nurse specialist<br>"I see the process that people are currently going through to get prescribed medicinal cannabis and … I'm worried that this is the way that psychedelic therapy is going to end up … the expense that it costs people to do that." – #4, mental health and addictions practitioner<br>"I just hope it's something that's not like all this pūtea (money) and time put into it and then it's something that isn't accessible for us. So, I definitely hope the research that comes out shows how we can remove those barriers for our whānau who actually need it." – #4, mental health and addictions practitioner |
| Cultural support for Māori | "I think if you were considering it to Māori, and … maybe having like kaumatua or some type of kaimahi support or something along with them or available to them, especially if you're looking at connecting to the spiritual world … how can they keep themselves safe when they're going through some stuff that they quite don't understand themselves, whether it's from a medical perspective or spiritual." – #9, clinical nurse specialist<br>"You might need people who are Māori to help facilitate. Or you might need people who have had personal experience with drugs because then you understand the lived reality … Sometimes women understand women better than a man will understand the women. And maybe Māori people will understand each other a little bit better because we've all got shared experiences of being discriminated against. Or maybe someone who's been an addict will know how a current addict feels. That's all I'm saying is using people who can somehow allow their experience." – #2, equity and cultural advisor |

leads to greater openness towards PAT, 2) more research and education about PAT is needed, 3) PAT has potential to align with Te Ao Māori, and 4) equitable access is critical for Māori. These themes reflect that while PAT may offer opportunities for health equity, there are barriers to consider about how to ensure cultural support for Māori.

## Clinical and research implications

Low awareness of PAT and psychedelics more generally in the current study suggests that evidence for psychedelic therapies is not being effectively disseminated from researchers to key stakeholders, and this is consistent with previous findings.[17–19] The tendency to rely on heuristics or informal knowledge sources (i.e., recreational use) where formal knowledge is lacking has similarly been reported elsewhere.[22] For those with low awareness, the prospect of "microdosing" appears to sit more comfortably than higher doses. Microdosing refers to the practice of repeated consumption of a psychedelic at doses lower than the threshold to cause substantial alterations in consciousness.[25] Benefits of microdosing are commonly reported in observational research, though rigorous experimental evidence is still underway.[14,15,26–28] Despite this, anecdotal reports and media attention combined with the growing body of evidence for macrodose interventions may have contributed to reduced risk perception of LSD and other psychedelic substances, leading to an uptick in naturalistic use with therapeutic intention.[29] Though psychedelics have a good safety profile, some naturalistic users may be unaware of potential risks, including psychiatric or physical risk factors and variability in drug purity and dosage.[30] Increasing awareness and education around PAT may work to address these risks, as well as any stigma associated with psychedelics, ultimately increasing acceptability of it as a treatment option and reducing harm.

Our sample perceived that PAT has the potential to align well with Te Ao Māori; however, if not implemented in a culturally safe manner, it could further exacerbate health inequities. For example, participants highlighted several potential barriers, including costs and access to treatment, policy, racism and stigma. Many of our participants hoped that PAT would not follow the path of medicinal cannabis, where current legislation and practices limit access for those in need and perpetuate stigma.[31–33] These shortcomings include reported difficulty in accessing prescription cannabis, high costs of cannabis products and appointments, lack of education among healthcare providers and the lack of clarity and fairness in roadside drug testing laws and workplace drug testing policies. Cost, access and low knowledge are common concerns regarding PAT.[19] Despite the potential benefits of PAT, work is required to mitigate or remove such social, political and legal barriers.[34] Critical appraisal of international models of legalisation or access would help to move forward decision-making in an evidence-based and equity-based manner.

To design interventions that work for Māori, there must be strong representation of Māori at every stage of development.[35,36] This includes Māori representation in research participants, and also in researchers, clinicians and trial staff. Workforce considerations include ensuring Māori kaimahi involvement and access to relevant training or accreditation.[37,38] Future interventions and trials should have clear informed consent protocols, including full transparency about the risks and benefits of PAT to tangata whai ora, in line with their health literacy (meeting people where they are at), and to involve cultural/whānau support.

It is also important to consider mana ake and that PAT may not be appropriate for all. Furthermore, the type of psychotherapy being delivered alongside psychedelics in current clinical trials generally follows a Western approach, which may not be appropriate for Indigenous populations.[39,40] There are examples of psychotherapy approaches specifically for Māori that are worthy of consideration in the development of this new treatment modality.[41–44] Ensuring ongoing and genuine consultation with Māori will assist in improving PAT's acceptability and cultural safety.

## Future research

Further exploration of the perspectives of tohunga and rongoā practitioners would provide a better understanding of psychedelics' potential therapeutic use in Te Ao Māori and rongoā. To ensure that PAT is developed equitably, it is essential to co-design interventions with tangata whenua (people of the land). The psychedelic literature would benefit from Kaupapa Māori clinical trials, including marae-based trials. For example, Rangiwaho Marae in Gisborne have obtained the first license in Aotearoa to cultivate native psychedelic mushrooms for the treatment of those affected by addictions.[45] Marae-based trials would not only encourage Indigenous cultivation practices but could also explore the effects and perceptions of PAT in a culturally safe manner.

### Strengths and limitations

This is the first study to explore the perspectives of Māori healthcare professionals towards psychedelics and PAT in Aotearoa.[17,18] The use of Kaupapa Māori methodology has allowed Māori practices and values to be at the forefront of this work. Extensive consultation with Māori stakeholders was also a strong focus of this kaupapa, including the research team being primarily Māori and liaising with the Aotearoa Psychedelic Māori Advisory Rōpū throughout the development and implementation of this rangahau (research). This design has potential to inform the cultural safety of PAT for tangata whenua in the hope of addressing the health inequities that Māori currently face across most health conditions.

Given that greater awareness was associated with greater openness towards PAT, perceptions may evolve as more clinical trials and dissemination of findings emerge. It is important to note that the results from the current study reflect the attitudes, awareness and perceptions of psychedelics and PAT over a particular time period (April to December 2023). Along with the growing interest and development of PAT in the research and media, the awareness and perceptions of PAT will almost certainly change over time. As is typical in qualitative research, data were collected from a small convenience sample, thereby limiting the potential generalisability of these findings.

## Conclusion

This study contributes an Indigenous perspective to the existing PAT literature. This emerging treatment has potential benefits across domains of Te Whare Tapa Whā and Te Wheke, though further consideration of contraindications and safety, stigma and systemic barriers to health equity is required to ensure future interventions work to reduce inequity rather than exacerbate it. Future research would benefit from ongoing consultation and co-design with Māori to aid the development of culturally appropriate and safe PAT. Importantly, this study gave the opportunity for Māori healthcare professionals to share their perspectives and shape the development of future PAT interventions.

**COMPETING INTERESTS**
The University of Auckland provided study materials and funding to complete this work.
LR is a recipient of HRC Emerging Researcher First Grant and MindBio Therapeutics NZ Ltd Grant. She has been paid by Atai Life Sciences for work as a therapist on clinical trials investigating dimethyltryptamine (DMT) and 3,4-Methylenedioxymethamphetamine (MDMA) during 2022–2024. She was a member of the NZ Psychologists Board Scopes Advisory Group.

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**URL**
https://nzmj.org.nz/journal/vol-138-no-1611/maori-healthcare-professionals-perceptions-of-psychedelic-assisted-therapy-a-qualitative-study

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## Appendix: glossary of te reo Māori used in text

- **Hā a koro ma, a kui ma:** breath of life from forbearers.
- **Hauora:** wellbeing.
- **Hui:** meeting.
- **Kanohi ki te kanohi:** face-to-face.
- **Karakia:** prayer.
- **Kaumatua:** Māori elder.
- **Kaupapa:** Māori approach/ideology.
- **Kaupapa Māori rangahau:** Māori-led research.
- **Kōrero:** conversation.
- **Mana ake:** unique identity of individuals and family.
- **Māori kaimahi:** worker.
- **Mauri:** life essence.
- **Mirimiri:** massage.
- **Pūtea:** money.
- **Papatūānuku:** earth mother.
- **Rangahau:** research.
- **Rongoā Māori:** Māori medicine.
- **Taha hinengaro:** mental/emotional.
- **Taha tinana:** physical.
- **Taha wairua:** spiritual.
- **Taha whānau:** family/social.
- **Tangata whai ora:** person/s seeking wellness.
- **Tangata whenua:** people of the land.
- **Taonga:** treasure.
- **Te Ao Māori:** Māori world view.
- **Te reo Māori kupu:** te reo Māori words.
- **Tikanga Māori:** Māori customs and traditions.
- **Tino rangatiratanga:** self-determination.
- **Tupuna:** ancestors.
- **Tohunga:** expert/traditional healer.
- **Waka:** canoe.
- **Whakawhanaungatanga:** establishing relationships.
- **Whānau:** family.
- **Whatumanawa:** open and healthy expression of emotion.
- **Whenua:** land.

# The readability of online laryngectomy patient information: how do Australia and New Zealand compare?

Howard Webb, Jason Toppi

## ABSTRACT

**AIM:** The decision for a patient to undergo a laryngectomy is an extremely important one. The aim of our research was to review the readability of international laryngectomy patient information and compare this with Australian and New Zealand resources.

**METHODS:** Online searches were undertaken using the terms “laryngectomy”, “laryngectomy patient information”, “voice box removal” and “voice box removal patient information”. Twenty-nine articles were included for review. The primary outcomes measures were the Flesch–Kincaid Grade Level, the Flesch Reading Ease Score, the Gunning Fog Index, the Coleman–Liau Index, the SMOG Index, the Automated Readability Index and the Linsear Write Formula.

**RESULTS:** Overall, we found that laryngectomy patient information from Australian and New Zealand sources was more difficult for patients to understand compared with international sources. The average Flesch–Kincaid Grade Level (equivalent to the United States grade level of education) for Australian and New Zealand websites was 10.41, compared with 9.09 for international websites. For reference, guidelines suggest that articles aimed at the public should have a grade level of 8. Similarly, the average Flesch Reading Ease Score was 55.8 and 58.23 for Australian/New Zealand and international resources respectively—which correlate to “fairly hard” to read, rather than the “easy” or “very easy” categories that are recommended for the general population.

**CONCLUSION:** For the resources analysed, Australian and New Zealand laryngectomy patient information was less readable than information distributed by international organisations, and is at a high risk of being too complicated for patients to read and understand. Consideration should be given to distributing patient information accessible to patients with lower literacy levels.

The functions of the larynx are producing speech, airway patency and protecting the lungs from aspiration. Carcinoma of the larynx is one of the most common head and neck cancers, and was estimated to affect 592 Australians in 2013.[1] Because of its important functions, laryngectomy is associated with a significant impact on quality of life and psychosocial wellbeing.[2] The surgery will negatively impact speech, swallow function and body image; thus, patient education is an extremely important part of pre-operative counselling and informed consent.[3] An important part of the education process, not only for patients but also for friends and relatives who might not be able to be a part of in-person education, is website materials.

Patient education prior to surgery is a requirement of pre-operative decision making, which can come from many sources, including face-to-face education, written handout material and internet-based resources. Over 50% of patients search for resources online prior to making the decision to proceed with an elective surgery.[4]

Numerous websites from Australia, New Zealand and worldwide give varying degrees of information surrounding laryngectomy, including on surgery, recovery and long-term outlook.

## Aim

The aim of our research is to analyse the readability of Australian– and New Zealand–produced patient education materials that are freely available online. Additionally, we aimed to compare these to internationally produced materials.

## Methods

### Article selection

Searches were undertaken in Melbourne, Australia in November 2023. The search engine “Google Chrome” was used, and location services were turned off. The internet browser cookies, cache and history were cleared, and an incognito window was used.

Searches were performed using the terms “laryngectomy”, “laryngectomy patient information”, “voice box removal” and “voice box removal patient information”.

The first 50 search results from Australian/New Zealand and international websites (excluding advertisements or sponsored results) for each term were screened for applicability and duplicates excluded.

Inclusion criteria:

- English language
- Written material
- Material aimed at patients

Exclusion criteria:

- Non-English websites
- Video or diagram materials
- Materials aimed at healthcare providers

Twenty-six websites were included for analysis from the above search structure.

A further search was conducted to include only websites published in Australia/New Zealand. The above search terms (“laryngectomy”, “laryngectomy patient information”, “voice box removal” and “voice box removal patient information”) were again used, and the first 50 search results were reviewed. The inclusion and exclusion criteria were not changed. Of the 50 websites, eight were deemed appropriate for inclusion. Of these eight websites, five were included in the previous 26 websites. Thus, a total of 29 websites (eight from Australia/New Zealand and 21 from overseas) were included in the analysis. See the Appendix for further information.

## Readability analysis

The primary outcomes measures were the Flesch–Kincaid Grade Level, the Flesch Reading Ease Score, the Gunning Fog Index, the Coleman–Liau Index, the SMOG (Simple Measure of Gobbledygook) Index, the Automated Readability Index and the Linsear Write Formula.

The body of each text (not including author information, references, titles and advertisements) was copied into the automatic score generators and a score derived.

### *Flesch–Kincaid Grade Level, Gunning Fog Index, Coleman–Liau Index, SMOG Index, Automated Readability Index and Linsear Write Formula*

These measures are tools used to estimate how accessible a body of text is to a person with a certain level of school education.[5] They use characteristics of the text, such as the number of words in a sentence, the length of words used, the number of syllables in words, average letters per 100 words and average number of sentences per 100 words to estimate the difficulty of reading the text and comprehending the message of the text.[5,6]

These scores are based on years of education completed, where a score of 6 represents an article that someone with 6 years of education (i.e., the 6th Grade, between 11 and 12 years old) can understand and a score of 7 represents an article that someone educated for 7 years (i.e., the 7th Grade, between 12 and 13 years old) can understand.[7,8] A score of above 12 indicates that the passage of text requires more than a high school education to be able to read and comprehend the text.

### *Flesch Reading Ease Score*

The Flesch Reading Ease Score is a reliable and valid tool that determines the readability of a body of text by giving it a score out of 100.[9,10] The higher the number, the easier the text is to read.[9] Scores above 60 indicate that the text is easy to follow, and deemed by some to be the appropriate level for written patient information.[7] In research by Wang et al. the Flesch Reading Ease Score and Flesch–Kincaid formulas were the most commonly used formulas in medical research.[11]

## Statistical analysis

Independent Samples *t*-Test was used to calculate p-values. Inter-rater variability did not need to be analysed as the aforementioned measures are computer generated.

## Ethics

Given the nature of the review, no hospital ethics approval was required.

# Results

Overall, 29 articles were analysed using the above scores. The mean Gunning Fog Index for all sites was 11.93 (95% confidence interval [CI] 11.32–12.53) and the mean Flesch–Kincaid Grade Level was 9.45 (95% CI 8.85–10.06), correlating to reading levels of Grade 11 and 9 respectively.

The mean Gunning Fog Index for Australian/New Zealand materials was 12.79 (95% CI 12.14–13.44), compared with 11.6 (95% CI 10.93–12.27) for international materials (Table 1).

The mean Flesch Reading Ease Score for all articles was 57.57 (95% CI 54.29–60.86), with a mean of 55.8 (95% CI 52.45–59.15) for Australian/New Zealand materials and 58.25 (95% CI 54.51–61.98) for international materials (Table 2).

The average readability of the Australian/New Zealand materials analysed was at or above a 9th Grade level for all grade markers of readability used. Seven of the eight Australian/New Zealand articles analysed had a Gunning Fox Index above

**Table 1:** Average readability scores for Australian/New Zealand and non-Australian/New Zealand materials.

| | Gunning Fog Index | Flesch–Kincaid Grade Level | Coleman–Liau Index | SMOG Index | Automated Readability Index | Linsear Write Formula |
|---|---|---|---|---|---|---|
| **Mean of Australian/ New Zealand materials** | 12.79 +/− 0.94 | 10.41 +/− 0.85 | 9.63 +/− 0.99 | 9.33 +/− 0.66 | 10.49 +/− 1.06 | 12.54 +/− 0.85 |
| **Mean of international materials** | 11.6 +/− 1.57 | 9.09 +/− 1.54 | 10.29 +/− 1.41 | 8.66 +/− 1.33 | 9.01 +/− 1.69 | 9.58 +/− 2.16 |
| **p-value** | 0.11 | 0.07 | 0.38 | 0.27 | 0.06 | <0.001 |

**Table 2:** Average Flesch Reading Ease Score for Australian/New Zealand and non-Australian/New Zealand materials.

| | Flesch Reading Ease Score |
|---|---|
| Mean of Australian/New Zealand materials | 55.8 |
| Mean of international materials | 58.23 |
| p-value | 0.37 |

**Table 3:** Percentage of Australian/New Zealand patient materials in each category.

| Percentage of Australian materials | | | |
|---|---|---|---|
| | Less than Grade 6 | Grades 6 to 10 | More than Grade 10 |
| Gunning Fog Index | 0 | 12.5 | 87.5 |
| Flesch–Kincaid Grade Level | 0 | 25 | 75 |
| Coleman–Liau Index | 0 | 37.5 | 62.5 |
| SMOG Index | 0 | 62.5 | 37.5 |
| Automated Readability Index | 0 | 25 | 75 |
| Linsear Write Formula | 0 | 0 | 100 |

10, and none had a score that indicated they would be accessible to someone with a level of schooling equivalent to the 6th Grade (see Table 3). The average grade level readability score of internationally produced materials was lower than the Australian/New Zealand average for all markers except the Coleman–Liau Index, indicating that non-Australian/New Zealand materials tended to be more accessible to readers.

Of the Australian/New Zealand materials analysed using the Gunning Fog Index and the Flesch–Kincaid Grade Level, 87.5% and 75%, respectively, required a 10th Grade education or higher to read and understand the text.

## Discussion

Readability is defined by Dale and Chale as "*The sum total (including all the interactions) of all those elements within a given piece of printed material that affect the success a group of readers has with it. The success is the extent to which they understand it, read it at an optimal speed and find it interesting*."[12] A readability formula is a mathematical formula that gives a number rating to indicate the reading difficulty of a text.[13]

This study indicates that written patient information on the internet is at a high risk of not being fully understood by patients considering laryngectomy. Overall, based on the seven markers of readability used, Australian and New Zealand written information on laryngectomy found on the internet was more complex and difficult to read than international materials; however, the result was only statistically significant for one marker of readability (Linsear Write Formula). Two other markers, the Flesch–Kincaid Grade Level and the Automated Readability Index, approached significant difference (p=0.07 and p=0.06 respectively). Most materials found were not tailored to the level of education and reading level recommended by national health organisations and are at risk of not being fully understood by patients considering laryngectomy.

During our study, we employed a thorough search strategy and believe that the included resources make up the vast majority that patients in Australia or New Zealand would retrieve during their search for written patient information. We used a large number of readability calculators that analyse different aspects of the written text and addressed a major gap in Australian/New Zealand literature surrounding the readability of laryngectomy resources.

Our study does have some limitations. Readability formulas assess the linguistic characteristics of a written text, but do not take in to account other aspects that influence understanding, such as diagrams, charts and videos. Furthermore, they do not take into account a patient's health literacy level, and level of understanding of laryngectomy prior to accessing written materials. Additionally, although government bodies recommend a certain level of readability for written health information materials, the average reading levels of laryngectomy patients is not known, and thus we cannot state with total certainty that patients cannot understand a certain body of text—we assume they have similar reading levels to the rest of the population. Another weakness is that the total number of Australian– or New Zealand–made patient information materials is limited, and only eight articles that were deemed appropriate for inclusion were retrieved. Thus, although all markers of readability showed that Australian– and New Zealand–produced materials tended to be more difficult to read, only one marker was able to show this to be a statistically significant difference.

These findings are in keeping with other studies within the literature investigating online patient information tools for procedures within otolaryngology. Wu et al. investigated online resources for functional endoscopic sinus surgery and found average ease of reading scores were at a minimum university education reading level.[14] Similarly, a North American study by Wong et al., also investigating patient education resources in laryngectomy, found that the reading capacity of an average American adult was less than the average reading difficulty of the resources investigated.[6] Our study adds to the findings of Wong et al. about internet-based laryngectomy resources, and also identifies that Australian and New Zealand resources on laryngectomy are potentially more difficult to read and understand than other resources available.

So that patients can fully comprehend the written information given to them, it is important to direct written patient information at a level that is accessible to most people. The American Medical Association recommends that patient information sheets should be written at or below a 6th Grade level to ensure written information can be understood by most patients.[6,15] In Australia, it is estimated that 13% of people read at or below a primary school level, 44% read at or below a Year 10 level, and only 15% read above a high school level.[16] South Australia Health recommends that health information materials be written at an 8th Grade level or lower.[17]

These issues are further compounded by the fact that the average laryngectomy patient may have poor baseline education levels, with one study of patients undergoing laryngectomy demonstrating 37% had failed to graduate from high school.[18]

Based on the estimated reading levels of the Australian population that state 57% of the population reads at or below a Year 10 level, using the Flesch–Kincaid Grade Level, the Gunning Fog Index, the Coleman–Liau Index, the Automated Readability Index and the Linsear Write Formula, only 43% of the Australian population can potentially read and comprehend the Australian/New Zealand patient information materials on laryngectomy.

Additionally, the average Flesch Reading Ease Score for Australian/New Zealand articles was 55.8, which correlates to "fairly hard" to read, rather than the "easy" or "very easy" categories that are usually recommended for texts aimed at the general population. Similarly, the average Flesch Reading Ease Score for internationally produced materials was 58.23.

Based on our research, Australian/New Zealand and internationally produced online resources on laryngectomy are at risk of not being understood by a large number of patients considering laryngectomy. This gap in the readability of articles and population literacy levels could potentially hinder patient comprehension and engagement, and result in problems regarding informed consent and patient satisfaction, which can subsequently worsen patient outcomes. Because written online patient information is an important means for patients to gain information on laryngectomy, these patients might benefit from the creation of written information that is easier to read and comprehend.

This paper only analyses written patient information on the internet, and as such further research into how accessible other internet resources, such as videos and pictures, are to patients with laryngeal cancer considering laryngectomy would be useful.

## Conclusion

The decision to undergo laryngectomy is a life-altering decision for a patient to make, and it is important that information on the subject is available at a level that is accessible to the majority of the public. Overall, laryngectomy patient information found on the internet is at a high risk of not being fully understood by members of the public. Notably, overall, patient information on Australian/New Zealand websites tends to be less readable than information on international websites. Thus, some thought should go into creating patient information that is less complex and more likely to be understood by more of the population.

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**COMPETING INTERESTS**

The authors have no conflicts of interest to declare.

**ETHICAL STATEMENT**

The authors are accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

**DATA AVAILABILITY STATEMENT**

The data that support this study will be shared upon reasonable request to the corresponding author.

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https://nzmj.org.nz/journal/vol-138-no-1611/the-readability-of-online-laryngectomy-patient-information-how-do-australia-and-new-zealand-compare

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# Appendix

## Access links for the analysed patient information documents

All resources cited approximately 17 November 2023.

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6. Mount Sinai. Laryngectomy. Available from: https://www.mountsinai.org/health-library/surgery/laryngectomy
7. Rogel Cancer Center, University of Michigan Health. What Patients Should Know in Decision Making. Available from: https://www.rogelcancercenter.org/head-and-neck-cancer/voicebox/what-patients-should-know
8. Memorial Sloan Kettering Cancer Center. About Your Total Laryngectomy. Available from: https://www.mskcc.org/cancer-care/patient-education/total-laryngectomy-01
9. Macmillan Cancer Support. Laryngectomy. Available from: https://www.macmillan.org.uk/cancer-information-and-support/treatments-and-drugs/laryngectomy
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17. Iowa Health Care. Laryngectomy Home Care Booklet - Update November 2024. Available from: https://medicine.uiowa.edu/iowaprotocols/laryngectomy-home-care-booklet
18. Alberta Government, MyHealth.Alberta. Laryngectomy: What to Expect at Home. Available from: https://myhealth.alberta.ca/Health/aftercareinformation/pages/conditions.aspx?hwid=zc2636
19. Robert H. Oliver, M.D. Partial Laryngectomy. Available from: http://www.drrobertoliver.com/what-we-do/procedures/partial-laryngectomy
20. UMMC HealthCare. Laryngectomy: What to Expect. Available from: https://www.umc.edu/Healthcare/ENT/Patient-Handouts/Adult/Head_Neck/Laryngectomy.xml
21. American Cancer Society. Surgery for Laryngeal and Hypopharyngeal Cancers. Available from: https://www.cancer.org/cancer/laryngeal-and-hypopharyngeal-cancer/treating/surgery.html
22. UI Health. Head & Neck Cancer: Laryngectomy. Available from: https://hospital.uillinois.edu/primary-and-specialty-care/otolaryngology/head-and-neck-cancer-surgery/surgical-treatments/laryngectomy
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25. University of Rochester Medical Center. Learning to Speak Again After Laryngeal Surgery. Available from: https://www.urmc.rochester.edu/encyclopedia/content.aspx?ContentTypeID=34&ContentID=22953-1
26. EVMS Medical Group. Available from: https://www.evms.edu/patient_care/specialties/ent_surgeons/services/head__neck/patient_education/description_of_a_laryngectomy_removal_of_the_larynx/
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28. Yale Medicine. Laryngeal Surgery. Available from: https://www.yalemedicine.org/conditions/laryngeal-surgery
29. Cleveland Clinic. How To Get Your Voice Back After Laryngeal Cancer Surgery. Available from: https://health.clevelandclinic.org/3-options-to-help-regain-your-voice-after-throat-cancer-surgery

# Refining predictive risk models for stroke in atrial fibrillation: a scoping review and meta-analysis for Aotearoa New Zealand, Māori and Pacific peoples

Karim M Mahawish, Harvey White, Valery Feigin, Rita Krishnamurthi

## ABSTRACT

**AIM:** The predictive risk model $CHA_2DS_2$ VASc helps clinicians assess the risk of stroke in patients with atrial fibrillation (AF). Originally developed and validated in predominantly European populations, it may not accurately reflect the stroke risk for diverse ethnic groups; in Aotearoa New Zealand, Māori and Pacific peoples with AF are at higher stroke risk. As part of global efforts to address health inequities, there is growing interest in adapting predictive models to suit local- and ethnic-specific risks better. Our objectives were to determine: 1) if stroke risk from AF varies by ethnic background/race, 2) stroke rates in non-anticoagulated AF cohorts, and 3) model performance of $CHA_2DS_2$ VASc across different geographical regions. Finally, we provide an overview of methodological considerations for risk model development.

**METHODS:** We searched English language peer-reviewed studies reporting stroke rates in unselected cohorts with AF, published between 1995 and 2024. For stroke risk, we included cohorts with over 5,000 non-anticoagulated patients. The sources of evidence were PubMed, Scopus and EMBASE.

**RESULTS:** Twenty-seven studies were eligible for inclusion. We found significantly elevated stroke risk in African Americans and Hispanics with AF compared with whites (odds ratio [OR] 1.44 [95% confidence interval (CI) 1.25–1.66] and OR 1.11 [95% CI 1.05–1.18] respectively). In Māori and Pacific peoples with AF, the risk of stroke was higher than in New Zealand Europeans, but this difference was not significant (OR 1.28 [95% CI 0.89–1.82], p=0.18 and OR 1.29 [95% CI 0.93–1.52], p=0.17 respectively). Stroke risk (0.6/100–6.8/100 person-years) and $CHA_2DS_2$ VASc performance (c-statistics 0.55–0.8) varied substantially between studies.

**CONCLUSION:** We support the local refinement of risk prediction models in line with cardiology society recommendations.

Reducing health inequities in Aotearoa New Zealand is a healthcare priority, and a number of strategies have been employed to facilitate this—one example being Health New Zealand – Te Whatu Ora's *Assessment and Management of Cardiovascular Risk*, which recommends screening of cardiovascular risk 10 years earlier in Māori than in non-Māori.[1] Such recommendations signal the differing risk profile as determined by age, ethnic and socio-demographic factors, comorbidities, etc. In Aotearoa New Zealand, ethnicity is a significant marker of health needs as highlighted in a recent editorial.[2] As a result, there is growing interest in developing new risk scores and adapting existing risk stratification tools for the Aotearoa New Zealand context. For example, there is currently a research programme underway called the Vascular Risk Equity in Aotearoa New Zealand (VAREANZ), which uses large-scale cohorts in primary and secondary care settings as a basis for developing vascular risk prediction equations and quality improvement initiatives.[3] In this manuscript we will describe the reasons and a strategy for developing/refining risk models using our area of interest as an example—stroke prevention in atrial fibrillation (AF).

The $CHA_2DS_2$ VASc score (Congestive heart failure/left ventricular dysfunction [1 point], Hypertension [1 point], Age ≥75 [2 points], Diabetes [1 point], previous Stroke/transient ischaemic attack [TIA]/thromboembolism [2 points]—Vascular disease such as ischaemic heart disease [1 point], Age 65–74 [1 point], and female sex [1 point]) is the most common risk score used to predict the risk of thromboembolism in patients with AF.[4] The annual risk of ischaemic stroke in untreated patients is estimated to be 0.2%, 0.6% and 2.2% for those with a $CHA_2DS_2$ VASc of 0, 1 and 2 respectively.[5] Other risk stratification scores exist, such as the Global Anticoagulant Registry in the FIELD—Atrial Fibrillation (GARFIELD-AF) or those that include biomarkers such as Anticoagulation and Risk Factors in Atrial Fibrillation (ATRIA).[6,7] These scores have marginally improved performance in risk prediction; however, this is offset by increased complexity or need for biomarkers. The American Heart Association and European Society of Cardiology recommend the use of $CHA_2DS_2$ VASc. The consensus view is that ischaemic stroke risk assessment in AF should balance simplicity and practicality against calibration to improve usability in clinical practice.[8,9]

Based on 2023 Aotearoa New Zealand Census ethnic data, almost 18% (887,493) report their ethnicity as Māori, the Indigenous people of New Zealand.[10] A further 8.9% (442,632) identify as Pacific peoples. The higher incidence of traditional vascular risk factors (e.g., hypertension, diabetes and obesity) and non-traditional factors (e.g. rheumatic heart disease) may contribute to the higher age-adjusted rates of AF in Māori and Pacific peoples.[11] Further, Māori and Pacific peoples are less likely to access healthcare services and may experience disparities in the quality of care they receive.[12] Therefore, comorbidities such as heart failure, diabetes and hypertension may be undetected for a longer time or be suboptimally managed. These factors likely contribute significantly to Māori and Pacific peoples experiencing stroke on average 14 years younger than NZ Europeans (61.5 years vs 75.4 years, $p<0.001$) based on data from the fifth Auckland Regional Community Stroke Study, 2020–2021 (unpublished data). Further, the prevalence of AF was similar across ethnic groups in this cohort (NZ Europeans: 23.4%, Māori: 24.1%, Pacific peoples: 19.3%), suggesting that the attributable risk of stroke associated with AF varies between ethnic groups.

Many commonly used risk assessment scores available, including $CHA_2DS_2$ VASc, have been developed and validated in predominantly European cohorts, accounting for the variation in discriminative performance in other settings.[4,13] Given the differences in risk factor prevalence and potential ethnic differences in their impact, it is important to develop ethnic-specific algorithms. However, little is known about the accuracy of stroke risk prediction in Māori and Pacific populations.

In this scoping review, we aim to determine:

1. If stroke risk from AF varies by ethnicity within populations.
2. If the rates of stroke secondary to AF vary by time and geographical locations according to $CHA_2DS_2$ VASc score.
3. The performance of $CHA_2DS_2$ VASc across geographical locations.

We will also provide an overview of methodological errors in predictive risk models and optimisation strategies.

## Methods

PubMed, Scopus and EMBASE were searched using a mix of the following terms as Medical Subject Heading or its equivalent: atrial fibrillation, ethnicity, race, indigenous, outcomes, stroke, risk prediction, $CHA_2DS_2$ VASc, model performance, discrimination, c-statistics, anticoagulation. The search strategy focussed on published peer-reviewed English language publications and “grey” literature (including conference abstracts) from December 1995 to November 2024. Titles were screened and, if appropriate, the abstract then main text were reviewed for relevance sequentially. For objective 1, studies were included if the sampled population had AF, were representative of the baseline population (i.e., we excluded studies of sub-group populations, e.g. diabetes, chronic kidney disease, stroke cohorts, post-surgery, etc.) and reported stroke rates stratified by ethnicity. For eligible studies, we conducted a meta-analysis of aggregate data using a random-effects model, anticipating significant heterogeneity between studies. Parameters were estimated using restricted maximum likelihood.[14] For objective 2, cohort studies were included across a range of periods and geographical locations if $CHA_2DS_2$ VASc was used for stroke risk assessment, the sampling technique was unselected, the size exceeded 5,000 patients and stroke rates were stratified by anticoagulation status. For objective 3, we included cohort studies across geographical regions that reported c-statistics as a performance measure. Studies reporting comparison of cohorts from different countries were not permitted due to the risk of misclassification of variables. When no other option was available, data extraction involved approximations based on the visual data from graphs. Summary tables were created. Statistical analysis was performed using STATA BE17.

Finally, a summary of papers describing methodological errors, statistical analysis and model evaluation is provided. Data were recorded independently. Records retrieved were catalogued in Zotero. Duplicates were removed by automation supplemented by manual checking.

This manuscript was written in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses extension for Scoping Reviews (PRISMA-ScR) checklist.[15]

## Results

In our scoping review, most records (1,083/1,162, 93%) were excluded following a brief review of the titles/abstracts due to ineligibility, duplicate manuscripts or only age-adjusted stroke rates reported, which prohibited calculation of absolute rates. Of the remaining 79 manuscripts, a further 52 were removed following review for reasons documented in Figure 1. We found few studies assessing stroke risk in AF in multi-ethnic populations. Included cohort studies were rated medium- to high-quality on the Newcastle Ottawa Scale for assessing quality of non-randomised studies in meta-analysis.[16] Methodological biases included a high proportion of imputed ethnicity (e.g., up to 70% in one study),[17] prevalence rates of stroke/TIA used to determine stroke risk as opposed to follow-up stroke incidence rates (a better marker of causality) and results presented graphically only. Further, some studies reported time-to-event outcomes, whereas we reported binary outcomes, which may have led to imprecision in the data reported.

### Objective 1

Our scoping review included relevant manuscripts from the United States, New Zealand and Australia. In the United States, observational data demonstrated an increased risk of stroke in individuals of African American race with AF.[18] In an attempt to address this, a retrospective cohort study of approximately half a million patients with AF was used to derive a modified AF risk assessment, $\text{CHA}_2\text{DS}_2$-VASc-R, which allocated an additional point for African American race.[19] This improved the predictive ability of the score and the fit of the model. Similarly, a large observational study of young low-risk AF patients in Taiwan found an elevated stroke rate compared with an age-matched cohort without AF.[20] Subsequently, a retrospective cohort study demonstrated improved ischaemic stroke risk prediction in this population with AF using a modified $\text{CHA}_2\text{DS}_2$ VASc, which assigned one point for age (50–74 years).[21] In this study, a theorised cut-off score of one in males or two in females would yield a net clinical benefit with anticoagulation, with a potential 30% relative risk reduction of ischaemic stroke in patients. Similar findings of elevated stroke risk have been reported in observational studies of Māori, Pacific peoples, Australian Aboriginals and Hispanics with AF compared with other local ethnicities (Table 1).[11,17,18,22–33] We performed a meta-analysis using a random-effects model due to high heterogeneity between studies; however, this strategy had limited effect and significant heterogeneity remained (Table 1).

Our meta-analysis found no significant difference in stroke risk due to AF in Māori and Pacific peoples. This may be the result of methodological errors/limitations, and higher-quality prospective

**Figure 1:** The sources of evidence selected in this review.

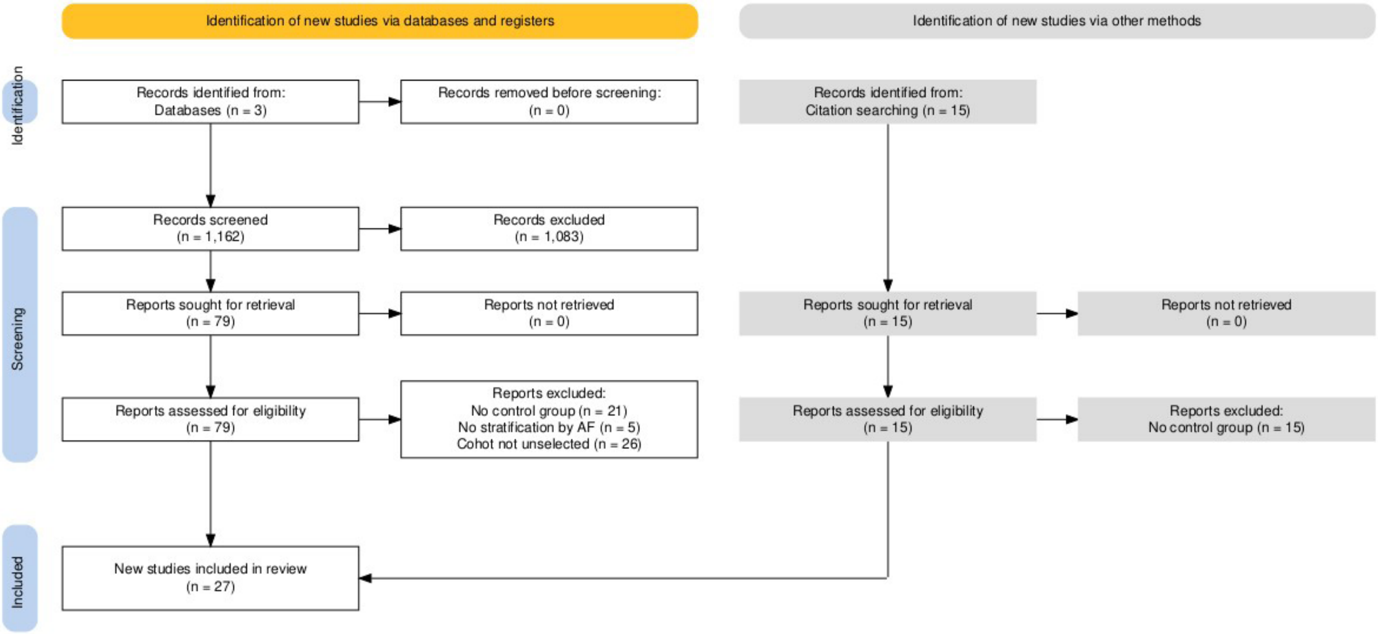
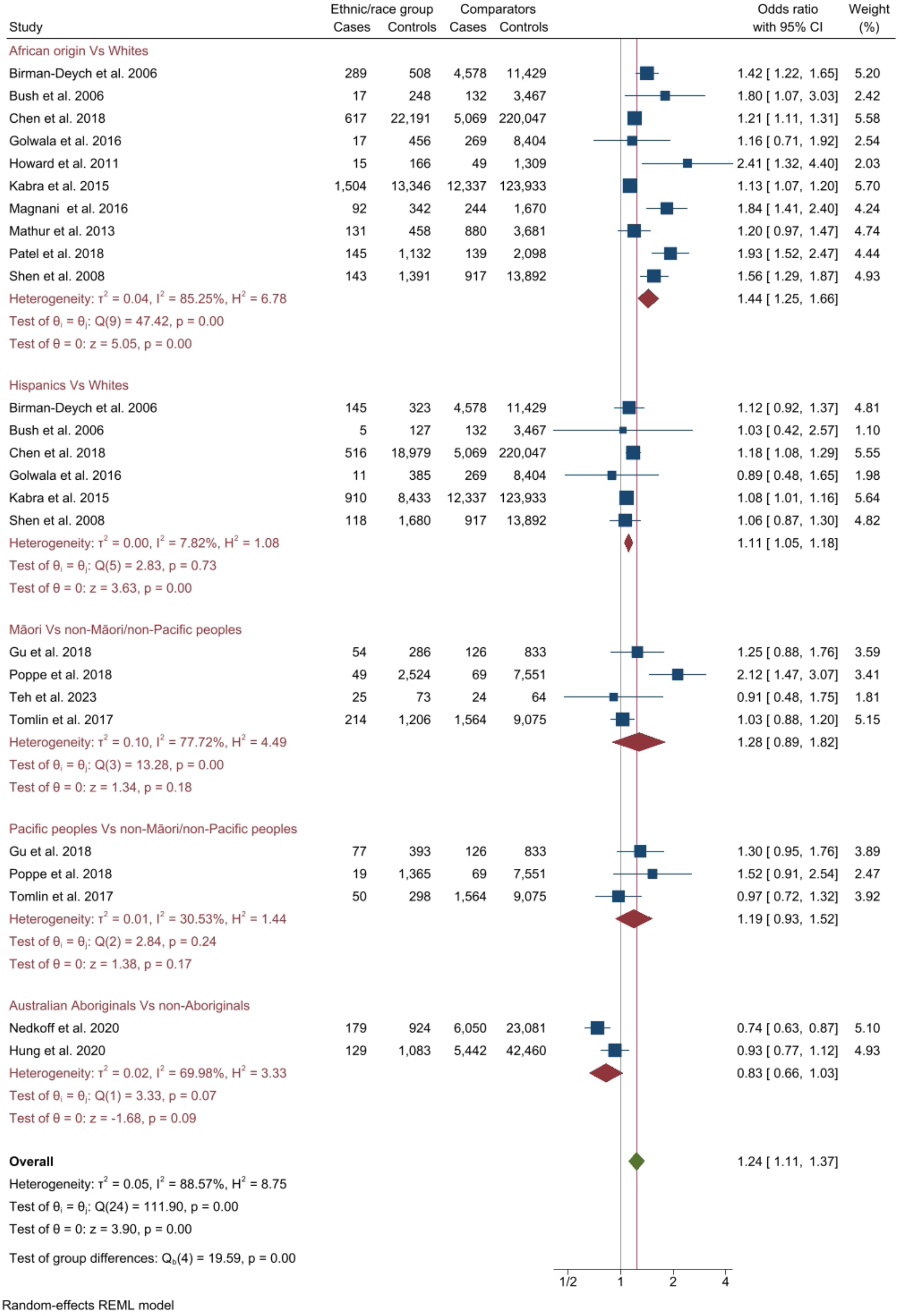


**Table 1:** Meta-analysis of studies on atrial fibrillation and stroke/transient ischaemic attack rates in populations with Indigenous and minority backgrounds.



| Study | Ethnic/race group Cases | Ethnic/race group Controls | Comparators Cases | Comparators Controls | Odds ratio with 95% CI | Weight (%) |
|---|---|---|---|---|---|---|
| African origin Vs Whites | | | | | | |
| Birman-Deych et al. 2006 | 289 | 508 | 4,578 | 11,429 | 1.42 [ 1.22, 1.65] | 5.20 |
| Bush et al. 2006 | 17 | 248 | 132 | 3,467 | 1.80 [ 1.07, 3.03] | 2.42 |
| Chen et al. 2018 | 617 | 22,191 | 5,069 | 220,047 | 1.21 [ 1.11, 1.31] | 5.58 |
| Golwala et al. 2016 | 17 | 456 | 269 | 8,404 | 1.16 [ 0.71, 1.92] | 2.54 |
| Howard et al. 2011 | 15 | 166 | 49 | 1,309 | 2.41 [ 1.32, 4.40] | 2.03 |
| Kabra et al. 2015 | 1,504 | 13,346 | 12,337 | 123,933 | 1.13 [ 1.07, 1.20] | 5.70 |
| Magnani et al. 2016 | 92 | 342 | 244 | 1,670 | 1.84 [ 1.41, 2.40] | 4.24 |
| Mathur et al. 2013 | 131 | 458 | 880 | 3,681 | 1.20 [ 0.97, 1.47] | 4.74 |
| Patel et al. 2018 | 145 | 1,132 | 139 | 2,098 | 1.93 [ 1.52, 2.47] | 4.44 |
| Shen et al. 2008 | 143 | 1,391 | 917 | 13,892 | 1.56 [ 1.29, 1.87] | 4.93 |
| Heterogeneity: $\tau^2 = 0.04$, $I^2 = 85.25\%$, $H^2 = 6.78$ | | | | | 1.44 [ 1.25, 1.66] | |
| Test of $\theta_i = \theta_j$: Q(9) = 47.42, p = 0.00 | | | | | | |
| Test of $\theta = 0$: z = 5.05, p = 0.00 | | | | | | |
| Hispanics Vs Whites | | | | | | |
| Birman-Deych et al. 2006 | 145 | 323 | 4,578 | 11,429 | 1.12 [ 0.92, 1.37] | 4.81 |
| Bush et al. 2006 | 5 | 127 | 132 | 3,467 | 1.03 [ 0.42, 2.57] | 1.10 |
| Chen et al. 2018 | 516 | 18,979 | 5,069 | 220,047 | 1.18 [ 1.08, 1.29] | 5.55 |
| Golwala et al. 2016 | 11 | 385 | 269 | 8,404 | 0.89 [ 0.48, 1.65] | 1.98 |
| Kabra et al. 2015 | 910 | 8,433 | 12,337 | 123,933 | 1.08 [ 1.01, 1.16] | 5.64 |
| Shen et al. 2008 | 118 | 1,680 | 917 | 13,892 | 1.06 [ 0.87, 1.30] | 4.82 |
| Heterogeneity: $\tau^2 = 0.00$, $I^2 = 7.82\%$, $H^2 = 1.08$ | | | | | 1.11 [ 1.05, 1.18] | |
| Test of $\theta_i = \theta_j$: Q(5) = 2.83, p = 0.73 | | | | | | |
| Test of $\theta = 0$: z = 3.63, p = 0.00 | | | | | | |
| Māori Vs non-Māori/non-Pacific peoples | | | | | | |
| Gu et al. 2018 | 54 | 286 | 126 | 833 | 1.25 [ 0.88, 1.76] | 3.59 |
| Poppe et al. 2018 | 49 | 2,524 | 69 | 7,551 | 2.12 [ 1.47, 3.07] | 3.41 |
| Teh et al. 2023 | 25 | 73 | 24 | 64 | 0.91 [ 0.48, 1.75] | 1.81 |
| Tomlin et al. 2017 | 214 | 1,206 | 1,564 | 9,075 | 1.03 [ 0.88, 1.20] | 5.15 |
| Heterogeneity: $\tau^2 = 0.10$, $I^2 = 77.72\%$, $H^2 = 4.49$ | | | | | 1.28 [ 0.89, 1.82] | |
| Test of $\theta_i = \theta_j$: Q(3) = 13.28, p = 0.00 | | | | | | |
| Test of $\theta = 0$: z = 1.34, p = 0.18 | | | | | | |
| Pacific peoples Vs non-Māori/non-Pacific peoples | | | | | | |
| Gu et al. 2018 | 77 | 393 | 126 | 833 | 1.30 [ 0.95, 1.76] | 3.89 |
| Poppe et al. 2018 | 19 | 1,365 | 69 | 7,551 | 1.52 [ 0.91, 2.54] | 2.47 |
| Tomlin et al. 2017 | 50 | 298 | 1,564 | 9,075 | 0.97 [ 0.72, 1.32] | 3.92 |
| Heterogeneity: $\tau^2 = 0.01$, $I^2 = 30.53\%$, $H^2 = 1.44$ | | | | | 1.19 [ 0.93, 1.52] | |
| Test of $\theta_i = \theta_j$: Q(2) = 2.84, p = 0.24 | | | | | | |
| Test of $\theta = 0$: z = 1.38, p = 0.17 | | | | | | |
| Australian Aboriginals Vs non-Aboriginals | | | | | | |
| Nedkoff et al. 2020 | 179 | 924 | 6,050 | 23,081 | 0.74 [ 0.63, 0.87] | 5.10 |
| Hung et al. 2020 | 129 | 1,083 | 5,442 | 42,460 | 0.93 [ 0.77, 1.12] | 4.93 |
| Heterogeneity: $\tau^2 = 0.02$, $I^2 = 69.98\%$, $H^2 = 3.33$ | | | | | 0.83 [ 0.66, 1.03] | |
| Test of $\theta_i = \theta_j$: Q(1) = 3.33, p = 0.07 | | | | | | |
| Test of $\theta = 0$: z = -1.68, p = 0.09 | | | | | | |
| **Overall** | | | | | 1.24 [ 1.11, 1.37] | |
| Heterogeneity: $\tau^2 = 0.05$, $I^2 = 88.57\%$, $H^2 = 8.75$ | | | | | | |
| Test of $\theta_i = \theta_j$: Q(24) = 111.90, p = 0.00 | | | | | | |
| Test of $\theta = 0$: z = 3.90, p = 0.00 | | | | | | |
| Test of group differences: $Q_b(4) = 19.59$, p = 0.00 | | | | | | |

Random-effects REML model

Odds ratio >1 suggests a higher risk for the ethnicity being addressed.

studies are required to resolve this. A funnel plot was constructed to assess potential publication bias among the included studies. The plot revealed asymmetry, with smaller studies disproportionately reporting more significant results (Figure 2). However, Egger's regression test revealed a p>0.05, suggesting no significant asymmetry; hence, the findings of the funnel plot may be due to study heterogeneity. There were more and larger cohort studies assessing stroke risk in African American and Hispanic individuals, in which we found a significantly higher stroke rate (odds ratio [OR] 1.44 [95% confidence interval (CI) 1.25–1.66], p<0.001 and OR 1.11 [95% CI 1.05–1.18], p<0.001 respectively).

## Objective 2

We included eight studies across 21 years that reported stroke rates in non-anticoagulated cohorts of over 5,000 patients across geographical locations (Table 2).[13,21,34–39] Overall stroke rates ranged from 0.6/100 to 6.8/100 person-years across studies and 0.8/100 person-years to 3.7/100 person-years in those with a $CHA_2DS_2$ VASc score of 2, confirming significant heterogeneity in stroke risk between populations. Other potential reasons for these differences are described in the discussion.

## Objective 3

Model performance can be assessed by determining calibration (how well the model fits the data), discrimination (how well the model distinguishes between those with and without the outcome of interest) and net reclassification index (the net benefit, e.g., when an existing model is updated with a new predictor).[40] We used c-statistics since this was the most reported measure.

Factors such as population characteristics, study biases and confounders led to differences in model discrimination across settings. In the studies identified, $CHA_2DS_2$ VASc c-statistic varied from 0.55 (poor discrimination) to 0.80 (excellent discrimination) across locations and periods studied (Table 3).[13,35,36,38,41–45] This finding has been observed in other risk scores, including GARFIELD-AF.[46]

## Summary of findings

In this scoping review, we found moderate- to high-quality evidence from predominantly retrospective observational cohort studies to suggest that stroke risk in AF is modified by ethnicity/race. We found significant findings in African Americans and Hispanics. Though other studies found elevated age-adjusted rates in Māori, Pacific peoples and Australian Aboriginals, we were unable to demonstrate this, likely due to the quality of published studies and eligibility criteria for this scoping review/meta-analysis. These findings may be pertinent to Aotearoa New Zealand, where almost half of Māori and Pacific AF patients aged <65 years are at high risk of stroke compared with 22% of those from other ethnicities, suggesting risk model refinement is desirable.[26]

We also found variation in stroke risk in different study populations due to inherent differences in study population and study methodology, which also caused similar variation in $CHA_2DS_2$ VASc model performance. For objective 2, there was insufficient evidence to indicate that improvements in primary prevention have led to reduced stroke rates over time.

We acknowledge that ethnicity is a social construct and, to our knowledge, no ethnicity-based biological mechanisms explain the increased risk of stroke in AF. However, it is also established, particularly in New Zealand, that ethnic differences in outcomes and disparities in treatment stem from health inequities in healthcare delivery and are a critical social determinant of health for reasons discussed above. There may be other important risk factors not yet established. In the REasons for Geographic and Racial Differences in Stroke (REGARDS) cohort, traditional risk factors and socio-economic factors accounted for only one-half of the excess stroke incidence in Blacks, while the remainder was attributed to other unknown factors and pathways.[18] It may also be the case that the relative weight of each predictor within the model varies between ethnicities; based on individual-level data from the South London Stroke Register, hypertension carried a higher population-attributable risk for stroke for individuals of Black Caribbean or African ethnicity.[47] Another consideration for the elevated stroke risk in African Americans and Hispanics is the lower rates of anticoagulation and rhythm control strategies reported in the literature.[48]

# The development, refinement and use of risk scores

Risk models are frequently developed using retrospective observational data from registries or cohort studies since these are cheaper and more convenient. However, the identified predictors and outcomes are associated with selection and measurement bias (limited by the

**Figure 2:** Funnel plot.

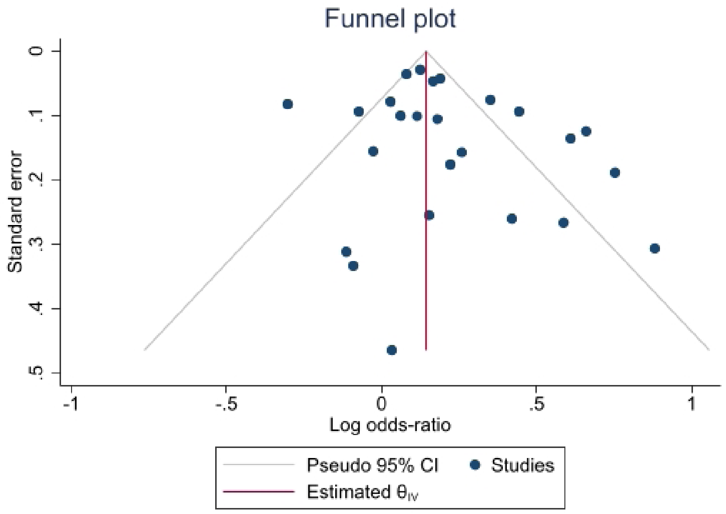


**Table 2:** Stroke rates in non-anticoagulated atrial fibrillation cohort studies.

| Study | Mid-point year | Study design | Country | Setting | Subjects | Stroke rate | CHA$_2$DS$_2$ VASc=2 stroke rates |
|---|---|---|---|---|---|---|---|
| Abraham et al. 2013[34] | 1997 | Prospective | United States | Community-based | 5,981 | 0.6/100 person-years | - |
| Singer et al. 2013[38] | 2000 | Prospective | United States | Hospital-based | 10,932 | 2/100 person-years | 0.8/100 person-years |
| Olsen et al. 2011[13] | 2003 | Retrospective | Denmark | Hospital-based | 73,538 | - | 3.7/100 person-years |
| Chao et al. 2016[21] | 2004 | Retrospective | Taiwan | Population-based | 186,570 | 3.9/100 person-years | 3.5/100 person-years |
| van den Ham et al. 2015[35] | 2005 | Retrospective | United Kingdom | Community-based | 60,594 | - | 1.9/100 person-years |
| Friberg et al. 2012[37] | 2007 | Retrospective | Sweden | Hospital-based | 90,490 | 5.4/100 person-years | 2.9/100 person-years |
| Lip et al. 2022[36] | 2018 | Retrospective | United States | Hospital-based | 128,047 | 6.8/100 person-years | - |
| Lee et al. 2022[39] | 2018 | Retrospective | Korea | Population-based | 5,855 | 3.32/100 person-years | 1.91/100 person-years |

**Table 3:** Discrimination of $CHA_2DS_2$ VASc in different settings.

| Study | Study mid-year | Study design | Country | Setting | Subjects | c-statistic |
|---|---|---|---|---|---|---|
| Singer et al. 2013[38] | 2000 | Prospective | United States | Hospital-based | 10,927 | 0.66 |
| van den Ham et al. 2015[35] | 2000 | Retrospective | United Kingdom | Population-based | 60,594 | 0.59 |
| Olsen et al. 2011[13] | 2001 | Retrospective | Denmark | Hospital-based | 73,538 | 0.66 |
| Aspberg et al. 2016[42] | 2007 | Retrospective | Sweden | Hospital-based | 152,153 | 0.69 |
| Chao et al. 2016[41] | 2008 | Retrospective | Taiwan | Population-based | 186,570 | 0.7 |
| McAlister et al. 2017[43] | 2008 | Retrospective | Canada | Population-based | 58,451 | 0.66 |
| Reps et al. 2020[44] | 2012 | Retrospective | United States | Hospital-based | 33,262 | 0.58 |
| Saliba et al, 2015.[45] | 2012 | Retrospective | Israel | Population-based | 41,140 | 0.55 |
| Lip et al. 2022[36] | 2018 | Retrospective | United States | Hospital-based | 128,047 | 0.8 |

intended use of the database) and missing information. Further, risk models are often derived from insurance claims records, or hospital-based cohorts, which are likely to have higher baseline risk profiles compared with the intended population, a form of confounding by indication. Though data from randomised controlled trials may seem a tempting source to develop risk models, strict inclusion/exclusion criteria limit generalisability. Prospective cohort studies are the preferred method for developing a risk model for these reasons.[49] Studies have demonstrated significantly different observed outcome rates; for instance, stroke rates from AF increase from an annualised rate of 1.22% in prospective studies to 3.8% in retrospective studies. Unfortunately, prospective studies are potentially expensive and time consuming.[50]

Other methodological errors include heterogeneity in the predictor and outcome definition and the timing of model application. In one systematic review of 33 studies including 151 different predictors, one-third of predictors were categorised at high risk of error.[51] Finally, few risk prediction studies include a sample size calculation and therefore may be under-powered to detect a significant finding. As a result of this heterogeneity, significant variation in observed outcomes can be seen between studies, even in those with supposedly similar risks.

It is accepted that a much better alternative to developing new models in new patient samples is to update existing prediction models and adjust or recalibrate them to the local circumstances or validation sample available.[40] For stroke prevention in AF, we have highlighted the evidence to suggest that modification of $CHA_2DS_2$ VASc according to ethnicity or local factors improves risk prediction caused by heterogeneity in predictor effects.[19,21] Given the limitations of risk prediction tools, some organisations including the European Society of Cardiology recommend that clinicians should use locally validated tools and take an individualised approach to thromboembolic risk, considering each patient's unique factors. The decision to start anticoagulation must balance population-level evidence with patient-specific risks, comorbidities and their risk tolerance.[9,52,53] As such there is an interest in developing predictive risk measures for such purposes. The challenge lies in their development, which we will summarise.

Once the optimal cohort has been identified and predictor and outcome data collected, a multivariable regression analysis determines the strength of associations (coefficients) between predictors and outcomes. These coefficients can refine existing risk models for the intended population or assess the importance of new predictors. The model may then be categorised into risk profiles based on sensitivity, specificity and cost effectiveness. Detailed guidance on risk model development is available, and consulting a biostatistician is advised.[40,54,55]

Risk models should be considered geographically and temporally relevant. Over time, vascular event rates may decline due to better risk management. As an example of such “model deterioration”, the Framingham Stroke Risk Score, developed in the 1990s, later over-estimated risk and was withdrawn for ischaemic heart disease prediction.[56,57] Similarly, emerging predictors (e.g., biomarkers) may improve model performance, highlighting the need for regular refinement of risk scores.[7]

There are two important guidelines for the development of a risk model, covering such aspects as defining and selecting predictors, and methods to reduce bias. Transparent Reporting of a multivariable prediction model for Individual Prognosis or Diagnosis (TRIPOD) is a guideline for reporting studies developing or validating a prediction model.[58] The Prediction model Risk Of Bias ASsessment Tool (PROBAST) helps researchers assess the methodology, risk of bias and applicability of a study that develops, validates or updates a diagnostic or prognostic prediction model.[59]

Strengths of this scoping review include the use of a range of databases to obtain relevant studies; the application of strict inclusion/exclusion criteria; and the inclusion of a range of ethnicities. We acknowledge the limitations of scoping reviews, such as potential selection bias from limited databases. The methodology of this review is also subject to limitations. First, some relevant studies may have been excluded due to a lack of sufficient information in the title or abstract to indicate the manuscript met the inclusion/exclusion criteria. Secondly, some important papers could not be included as they reported only age-adjusted rates. Thirdly, inclusion was limited by language as only English texts were considered. Fourthly, some studies reported time-to-event outcomes, whereas we reported binary outcomes, which may have led to imprecision in the data reported. Finally, though the European Society of Cardiology has recently endorsed $CHA_2DS_2$ VA (i.e., without criterion for birth sex or gender) as the risk score of choice, there have been no studies in an ethnically/racially diverse population to date, and hence this was not included in this study.[9]

## Conclusion

The main results show that risk scores like $CHA_2DS_2$ VASc, while widely used, may require refinement for populations with unique risk profiles, improving risk prediction caused by heterogeneity in predictor effects. We encourage the refinement of widely accepted risk scores for Aotearoa New Zealand based on our unique population characteristics, as well as the need to update existing risk models. We encourage researchers to consider the potential pitfalls, good practices and available guidelines of model development to improve predictive accuracy and utility.

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### COMPETING INTERESTS

KMM received a Health Research Council of New Zealand grant as part of his doctoral studies for this research. The other authors did not receive any financial support for the research, authorship, and/or publication of this article.

HW has received the following consulting fees:

- DalCor Pharma UK, Inc: fees for serving on the Steering Committee for the GenE Study
- CSL Behring: fees for serving on the Steering Committee for the AEGIS-II
- Sanofi Aventis Australia Pty Ltd: fees for serving on the Steering Committee for the SOLIST-WHF and SCORED Trials
- Esperion Therapeutics: fees for serving on the Steering Committee for the CLEAR Outcomes Study
- Janssen Research and Development LLC: fees for serving on the Steering Committee for the Librexia AF study and Librexia ACS studies
- Merck Sharp & Dohme (New Zealand) Ltd: grant support paid to the institution for the MK0616 study

HW is Chair of the DSMB for the EVIDENCE Study, NHMRC Clinical Trials Centre, the University of Sydney; is on the CSL Behring Advisory Board; and the VEVRE HF Advisory Board.

### ACKNOWLEDGEMENTS

We would like to thank biostatistician Irene Zeng for providing helpful feedback.

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### URL

https://nzmj.org.nz/journal/vol-138-no-1611/refining-predictive-risk-models-for-stroke-in-atrial-fibrillation-a-scoping-review-and-meta-analysis-for-aotearoa-new-zealand-ma

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# Fibrous dysplasia of the temporal bone presenting as a parotid abscess

Kimberly D’Mello, Tanja Jelicic

Fibrous dysplasia of the temporal bone (FDTB) is a benign, localised bone disease in which the temporal bone is progressively replaced with fibrous tissue and woven bone. This results in deformity and functional impairment.[1] A parotid abscess as the first presenting sign of FDTB is incredibly rare, and this report presents such a case with an associated literature review of the clinical presentation, histological and radiographic features and management. In lieu of prospective trials to assess treatment outcomes, we hope the evidence presented will increase clinician awareness in identifying FDTB in patients with atypical symptoms and inform surgeons on its management.

## Case report

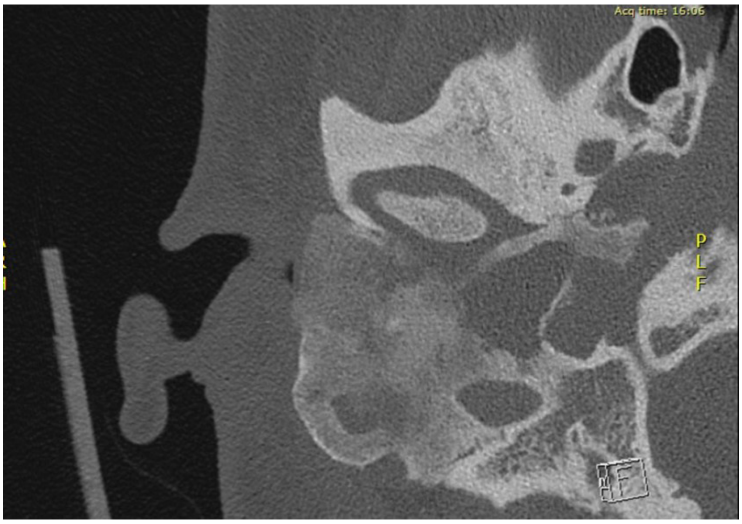
A 22-year-old Samoan male presented with a 3-day history of right-sided tender neck swelling and trismus. He was morbidly obese (body mass index 40.5) and reported years of intermittent ear discharge and right-sided hearing loss but had never consulted a general practitioner (GP). His medical history was unremarkable.

Examination revealed an enlarged, erythematous and tender right parotid gland (8x10cm) and trismus limiting mouth opening to 3cm. Saliva was expressed without pus, dentition was normal and cranial nerves were intact. Flexible nasoendoscopy showed medial displacement of the right tonsil but a normal nasopharynx and epiglottis. The vocal cords had preserved function. Otomicroscopy revealed right external auditory canal (EAC) occlusion by a firm, skin-covered mass. Severe right-sided conductive hearing loss was confirmed on audiometry. Inflammatory markers were elevated.

Computed tomography (CT) illustrated an oedematous right parotid gland with a 25mm–deep lobe fluid collection, cervical lymphadenopathy and temporal bone changes consistent with fibrous dysplasia. These included mastoid air cell obliteration, a ground-glass appearance, anterior cortical destruction and lateral EAC stenosis with no facial nerve involvement. Magnetic resonance imaging (MRI) was contraindicated due to the patient’s weight.

Ultrasound-guided aspiration drained 11ml of pus. The patient underwent right subtotal petrosectomy with blind sac closure, removing cholesteatoma extending to the infratemporal

**Figure 1:** Computed tomography scan—coronal image showing dysplastic changes in the mastoid process, with increased bone volume and areas of lucency and ground-glass opacity, indicative of fibrous dysplasia.



fossa and mesotympanum. Histopathology confirmed monostotic fibrous dysplasia causing EAC occlusion, secondary cholesteatoma and a parotid abscess.

At 4 months post-operation, the patient was asymptomatic with a stable blind sac closure.

## Discussion

FDTB, first described by Lichtenstein in 1938, has over 100 cases documented in the literature.[2–3] Temporal bone involvement in generalised fibrous dysplasia is uncommon and usually unilateral, making up an estimated 18% of all cases.[4] However, its prevalence can be under-estimated due to asymptomatic cases. FDTB that presents as a parotid abscess is extremely rare; to our knowledge, this is the first time it has been reported in the literature.

Non-inherited, somatic-activating GNAS1 point mutations have been implicated in FDTB aetiology.[5] This disease has a mean age at diagnosis of 16–25 years, which is consistent with our clinical case. It also shows a female predominance of 55–59%.[6–8] Monostotic manifestations are the most common in general fibrous dysplasia, constituting 70% of cases, followed by polyostotic forms (23%) and McCune–Albright syndrome (7%). However, there is no consensus on the most common form in the temporal bone. Our clinical case is likely monostotic because these lesions generally grow slowly and remain quiescent after puberty, whereas polyostotic forms typically manifest in late childhood.[9]

The most common presenting symptom is conductive hearing loss due to EAC stenosis or ossicular chain impingement. Canal occlusion can lead to epithelial incarceration and keratin accumulation, fostering secondary cholesteatoma formation.[9–10] Sensorineural hearing loss and infection also occur due to complications from cholesteatoma, cochlear destruction, internal auditory canal stenosis or vestibular fistulisation. Patients can also present with tinnitus, dizziness, pain, trismus and neurological signs from middle or posterior cranial fossa involvement. The first presentation as a parotid abscess is rare but possible due to the anatomy of the anterior mastoid cortex. The fibrodysplasia lesion likely expanded within a thinning shell of cortical bone, leading to skeletal destruction and invasion into neighbouring structures.[9] Given that the deep lobe of the parotid lies between the mastoid process and the mandibular ramus, the erosion of the patient's anterior mastoid cortex suggests this was the invasion pathway. The relatively asymptomatic nature of the disease was primarily due to the absence of external deformity and the slow progression, which was tolerated until the parotid abscess developed.

Differential diagnoses encompass both benign and malignant lesions. Benign possibilities include: meningioma, aneurysmal bone cyst, unicameral cyst, fibroma, Paget's disease, osteochondroma, giant cell tumour, eosinophilic granuloma, exostosis and osteoma. Malignant options are sarcoma and metastatic osteoblastic lesions.[9] The diversity in fibrosis, calcification and varied symptom profiles can complicate pre-operative diagnosis. Therefore, imaging is essential.[3] High-resolution CT is the gold standard, and MRI is recommended in cases of suspected extensive disease. CT assesses: 1) the degree of external auditory canal stenosis, 2) the involvement of middle or inner ear structures, 3) the presence of an associated cholesteatoma, 4) the extent of possible facial nerve involvement, and 5) the dysplasia type. Our imaging revealed that the patient exhibited the most common pattern, the pagetoid or "ground glass" pattern, present in 56% of all cases (Figure 1). This pattern appears as a combination of dense and radiolucent areas indicative of fibrosis. The sclerotic pattern, observed in 23% of cases, is characterised by uniformly dense bone. The cystic pattern, seen in 21% of cases, is defined by spherical or ovoid areas of lucency surrounded by a dense boundary.[11]

Histology is not required for diagnosis as the radiological picture is pathologic. However, if histological samples are taken, the macroscopic examination should reveal expanded cancellous bone within a thinned cortex. There will be a sharp transition to normal bone but no definite capsule. It should not extend to articular surfaces of neighbouring bones or invade the periosteum. Microscopic examination should show a collagen matrix stroma with fibroblasts arranged in a whorled pattern and trabecular bone in a "jigsaw puzzle" configuration.[9]

Treatment depends on symptom profile, preventing complications and restitution of function and cosmesis.[1,6] Surgical treatment is recommended for EAC stenosis with conductive hearing loss, recurrent infections, secondary cholesteatoma, craniofacial deformity, pathological fracture, nerve compression and in cases of suspected malignancy.

Radiation therapy is contraindicated due to a high risk of malignant transformation into sarcomatous disorders such as osteosarcoma and chondrosarcoma.[9] Malignant transformation into these disorders has not yet been reported in the temporal bone.[1,3] Regular patient follow-up is fundamental to management, with worsening pain and local swelling being suspicious clinical findings to monitor.[3]

Herein, we describe a rare presentation of FDTB in a morbidly obese Samoan male. While there is no direct evidence linking obesity or ethnicity to an increased risk of fibrous dysplasia, Pacific peoples in New Zealand experience a higher prevalence of ear disease and hearing loss.[12–13] This disparity is largely attributed to socio-economic factors, inequitable access to healthcare and structural and systemic racism across various social institutions.[14] In our case, poor access to primary care—exacerbated by barriers such as cost, lack of transport, inflexible work schedules, closed clinic books and challenges in enrolling with a GP—potentially contributed to disease extension into the parotid gland.[15] To address access issues, GPs could adopt more patient-centred strategies, such as extending opening hours and offering same-day appointments.[15–16] Government investment in Pacific-led healthcare services in regions with high Pacific populations, such as Auckland and Porirua, is also essential, as culturally appropriate, holistic care not only enhances health outcomes but also aligns with Pacific families' preference for Pacific providers.[15–16] To support this, funding should enable continuity of care at a single location, while greater funding is required to increase the Pacific healthcare workforce.

Given the growth of the Pacific population in New Zealand and the prioritisation of Pacific health since the first *Pacific Health and Disability Action Plan*, early detection is important.[17] Routine otoscopic examinations during GP visits may aid in identifying infections or masses at an earlier stage.

This case highlights the need for increased clinical vigilance and a lower threshold for imaging in Pacific patients presenting with symptoms such as parotid swelling, trismus, unilateral hearing loss and/or masses in the ear canal. It also underscores the importance of including FDTB in the differential diagnosis of a parotid mass.

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**COMPETING INTERESTS**

Tanja Jelicic is involved in the multi-disciplinary care of microtia/atresia patients at Starship Children's Hospital; has recently joined the Northern Cochlear Implant Programme (NCIP) as an implant surgeon; and is actively involved in the teaching and training of medical students and junior doctors, and also lectures at The University of Auckland.

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https://nzmj.org.nz/journal/vol-138-no-1611/fibrous-dysplasia-of-the-temporal-bone-presenting-as-a-parotid-abscess

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# Suicide attempts assessment in the medical wards: factors influencing admission to a psychiatric unit

Pablo Richly, Matthew Jenkins

## ABSTRACT

**AIM:** To evaluate whether a semi-structured interview based on the Suicide Attempt Self-Injury Interview (SASII) could help identify patients requiring psychiatric admission following medical hospitalisation for deliberate self-harm.

**METHODS:** A 12-month audit analysed 107 patients admitted to medical wards at Waikato Hospital following self-harm events. The interview assessed factors including method, intent, planning, triggers and help-seeking behaviours.

**RESULTS:** The cohort was predominantly female (64%) with a mean age of 31.75 years. Most self-harm events involved overdose (85%), were impulsive (70%) and followed interpersonal conflicts (50%). While 53% alerted others about their attempt and 49% sought help afterwards, 63% had previous attempts. Of the total, 14% required psychiatric admission. Regression analysis showed that low regret was the only factor significantly associated with need for psychiatric admission.

**CONCLUSION:** The semi-structured interview identified low regret as a potential predictor for psychiatric admission, though further research is needed to validate these findings and develop more accurate risk assessment tools.

Globally, suicides account for 50% of all violent deaths in men and 71% in women.[1] In New Zealand, approximately 550 people die by suicide annually, exceeding the combined deaths from road traffic accidents and homicides, with an over-representation of Māori and Pacific peoples.[2] There is a reasonable amount of local and international data on the demographic variables of those who complete suicide. Interestingly, mounting evidence suggests that suicide attempters and completers represent two distinct, partially overlapping populations.[3] United States of America (USA) data showed that among 73,490 suicide deaths, 57,920 (79%) occurred on the first attempt,[4] while according to coronial findings, among suicide deaths recorded in the Waikato Health New Zealand Region between 1 January and 31 December 2021, approximately two-thirds (21 out of 32 cases) of individuals had no documented history of previous suicide attempts (in an email from the Office of the Chief Coroner [Coronial. Information@justice.govt.nz] on 21 Nov 2024). Moreover, in the USA, fewer than 1 in 35 suicide attempts were successful.[5] The ratio between increased suicide risk and actual attempts is even larger. In 2020–2022, it is estimated that one in six Australians (16.7% or 3.3 million people) aged 16–85 years had experienced suicidal thoughts or behaviours in their lifetime, while only 0.3% had attempted to take their own life.[6] However, those who have attempted suicide are up to 30 times more likely to go on to complete suicide.[7] In spite of this and despite its public health relevance, suicide remains challenging to predict. Research suggests that risk scales alone have limited utility in managing suicidal behaviour.[8]

In July 2023, the Consultation – Liaison Psychiatry team at Waikato Hospital implemented a semi-structured interview based on the Suicide Attempt Self-Injury Interview (SASII)[9] to assess all patients admitted to a medical ward after a deliberate self-harm event. After 12 months, an audit was conducted. The objective was to analyse if there were significant associations between individual questionnaire items and the predictive likelihood of a psychiatric admission, to further improve the early detection of patients needing transfer to a psychiatric unit after medical clearance. The data were collected, analysed and interpreted using Microsoft Excel.

A total of 107 patients were assessed during the 12-month period and included in the final analysis. Female gender was prevalent (64%), and most patients were adults (75%), with an average age of 31.75 years (SD 16.9). Multiple response ethnicity showed a slight over-representation of Māori population (28% in the sample vs 25% in the 2023 census for the Waikato Region).

Self-harm events were predominantly due to overdose (85%), mostly involving pain medication or psychiatric medication. Over one-third of the patients required intensive care unit/high dependency unit (ICU/HDU) admission. Most episodes were impulsive (70%), with only 10 patients (9%) acknowledging a high degree of planning. While few patients (23%) self-harmed under the influence of substances, alcohol was the primary substance in these cases (84%). Interpersonal conflict was the main trigger for the events (50%), followed by depressive symptoms (21%). More than half of the patients self-harmed intending to end their lives, while others described different goals or were unable to provide a clear rationale. Although the primary reason for self-harming was to avoid suffering (44%), almost the same number of patients could not provide a clear rationale (45%). Over half of the patients alerted others before or after the attempt (53%), and almost half sought help immediately after self-harming (49%). Only 20% of the patients showed low regret when assessed, but most had a history of previous attempts (63%). Further details of the outcomes are described in Table 1. A total of 15 patients (14%) were required to be transferred to a psychiatric inpatient unit after being medically cleared. In a regression analysis (Table 2), only low regret had a significant association with the need for psychiatric admission.

The use of a semi-structured interview based on the SASII did not show to be particularly useful in our sample to identify patients who would require continued mental health follow-up in an inpatient unit. People who self-harm often have complex and difficult life circumstances and need assessment, but we need to move away from assessment models that prioritise risks at the expense of needs. Although further research should confirm these findings, it might be worth noting that low regret could be a warning sign for requesting further mental health assessment in secondary care settings.

**Table 1:** Outcomes.

| | |
|---|---|
| **Method** | Overdose 91 (85%)<br>Other 17 (16%) |
| **Medical risk** | High medical risk (required ICU/HDU) 39 (36%)<br>Moderate medical risk (>24hs to be medically cleared) 57 (53%)<br>Low medical risk (<24hs to be medically cleared) 11 (10%) |
| **Planning** | High planning 10 (9%)<br>Moderate planning 22 (21%)<br>Low planning (impulsive) 75 (70%) |
| **Trigger** | Interpersonal conflict 53 (50%)<br>Depressive symptoms 23 (21%)<br>Psychotic symptoms 1 (1%)<br>Loss or change 7 (7%)<br>Other/unknown 23 (21%) |
| **Goal** | Death 60 (56%)<br>Other/unknown 47 (44%) |
| **Reason** | Avoiding suffering 47 (44%)<br>Seeking attention 7 (7%)<br>Self-punishment 5 (5%)<br>Other/unknown 48 (45%) |
| **Disclosure of self-harm** | High (e.g., alerted others before or after the attempt) 57 (53%)<br>Moderate (e.g., confessed the attempt only when asked) 34 (32%)<br>Low (e.g., tried to hide the attempt) 16 (15%) |
| **Help-seeking** | Right after the action 52 (49%)<br>After experiencing discomfort 27 (25%)<br>Avoidant 28 (26%) |
| **Regret** | High 48 (45%)<br>Moderate (ambivalence) 38 (36%)<br>Low (would repeat the attempt) 21 (20%) |
| **Previous history** | Multiple suicide attempts (3 or more) 31 (29%)<br>Few suicide attempts 36 (34%)<br>No suicide attempts but yes self-harm behaviour 7 (7%)<br>No suicide attempts or self-harm behaviour 33 (31%) |

ICU/HDU = intensive care unit/high dependency unit.

**Table 2:** Psychiatric inpatient admission (regression).

| | Coefficients | Standard error | t-stat | P-value | Lower 95% | Upper 95% |
|---|---|---|---|---|---|---|
| Gender (male) | 0.09 | 0.08 | 1.09 | 0.28 | -0.07 | 0.25 |
| Ethnicity (Māori) | 0.03 | 0.07 | 0.41 | 0.69 | -0.12 | 0.17 |
| Method (other) | -0.04 | 0.11 | -0.35 | 0.73 | -0.25 | 0.17 |
| Medical Risk (high) | -0.01 | 0.07 | -0.13 | 0.90 | -0.16 | 0.14 |
| Planning (high) | 0.03 | 0.08 | 0.41 | 0.68 | -0.13 | 0.19 |
| Intoxicated (yes) | 0.03 | 0.08 | 0.32 | 0.75 | -0.13 | 0.18 |
| Goal (death) | -0.01 | 0.07 | -0.10 | 0.92 | -0.15 | 0.13 |
| Disclosure of self-harm (low) | 0.06 | 0.11 | 0.50 | 0.62 | -0.17 | 0.28 |
| Help-seeking (low) | 0.00 | 0.10 | 0.00 | 1.00 | -0.19 | 0.19 |
| Regret (low) | 0.33 | 0.09 | 3.61 | 0.00 | 0.15 | 0.51 |
| Prev. Hx of suicide (yes) | 0.09 | 0.08 | 1.18 | 0.24 | -0.06 | 0.24 |

Prev. Hx = previous history.

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#### COMPETING INTERESTS

The authors declare no conflicts of interest.

This study was approved by the Waikato Hospital Clinical Audit Support Unit (#4519P). The New Zealand Health and Disability Ethics Committees (HDECs) waived the need for ethics approval and patient consent for the collection, analysis and publication of the retrospectively obtained and anonymised data for this non-interventional study.

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https://nzmj.org.nz/journal/vol-138-no-1611/suicide-attempts-assessment-in-the-medical-wards-factors-influencing-admission-to-a-psychiatric-unit

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# Laryngeal Phthisis.

*NZMJ*, 1925

*By* WOLFF FREUDENTHAL, M.D., *New York*
(*Read by Mr. George E. O. Fenwick, F.R.C.S., of Auckland.*)

According to reports from New Zealand, especially a private communication from Dr. Jas. Hardie Neil, cases of laryngeal phthisis are not observed as frequently there as in the commercial centres of the United States. That perhaps is the reason why the writer has been so kindly invited to present a paper on this topic to his colleagues in New Zealand. Yet he cannot help venturing the opinion that such cases might be detected more frequently if the attention of the general practitioner and the specialist in phthiseotherapy were drawn more generally to the fact that a large percentage of all phthisical patients are affected by a secondary invasion of the upper air tract, and that according to my own conviction a primary invasion of the larynx is not only possible, but occurs more often than laryngologists ever dreamed of.

Having written on this and other phases of the disease on many occasions, it will be my task to discuss what therapeutic means are at our disposal to improve or even cure these cases. The ideas expressed here are the result of continuous efforts in this direction for more than thirty years. Having been in charge of the Throat Department of Montefiore Hospital in the City of New York, and the Bedford Hills Sanatorium for Consumptives during this long period, the writer formed certain ideas that, he believes, may be followed with advantage. On the other hand, disappointments are frequent and the problems still to be solved so numerous that there is work enough for all of us, and that for many years to come. Certain positive facts have been gained, however, that enable us to formulate some general suggestions for the management of such cases.

When Theodor Heryng of Warsaw, in 1887, published his book on the "Curability of Laryngeal Phthisis," shortly after Moritz Schmidt and Herman Krause had promulgated similar ideas, his work was a revelation to most laryngologists and pathologists. Not even the great Rudolf Virchow could be convinced of the possibility of cicatrization of a laryngeal ulcer. Yet Heryng had proven unmistakably by *post mortem* findings that even extensive tuberculous ulcerations may become cicatrized. Even spontaneous healing of such a process may and does occur. I would mention here an instance in this kind in a woman, 70 years old, whose autopsy gave evidence of the absolute cure of an advanced laryngeal tuberculosis.

The progress made since Heryng's publication has been very slow, mainly because the practitioner as well as the layman never believed that anything could be done for such patients. Well do I recall the difficulties I encountered when I tried to establish a regular service for these most unfortunate people. And that occurred in one of the best hospitals in the City of New York. Things have changed. Not only are we trying to cure laryngeal phthisis, but also to prevent its occurrence. And this can be accomplished in many instances. In order to prevent a secondary involvement of the upper air tract all patients suffering from any form of tuberculosis must be examined regularly at certain intervals as to the condition of their upper air tract. This, naturally, holds good for private as well as hospital cases. It is not sufficient to examine a patient when he enters a hospital, and then in the absence of anything suspicious to wait until the tissues have broken down, or other grave conditions have set in. It is a wise policy to keep the patient under observation and to treat every manifestation, catarrhal or otherwise, as soon as the first signs appear. By all means pay attention to every nasal, pharyngeal catarrh, etc., because of its tendency to cause irritation of the larynx or bronchi. That is the safest way to prevent any deeper lesion.

Once you take charge of a patient there are three rules to be considered:—

(1) Remove every pathological condition from the upper air tract, but do it rather by medication, that is, topical applications, etc., than by operative procedures. For example, to remove tonsils in a case of advanced pulmonary phthisis is fraught with great danger. Many a fatality has occurred after such procedure. On the other hand, catarrhal conditions should be treated regularly and thoroughly. The effect is always beneficial; in other words, some relief is invariably afforded.