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Christopher Wakeman, Shanthi Ameratunga, Teuila Percival, Braden Te Ao, Jamie Hosking

The current proposal to raise speed limits on our roads is hard to defend given what we know about the probable consequences. The likely outcome of increased deaths and injuries, worsened air quality and heightened health impacts are too significant to ignore. The state has a responsibility to assure collective health interests and avoid third-party harm, particularly to children and other vulnerable road users. It is imperative that we prioritise road safety, environmental sustainability and public health in any discussions or decisions regarding speed limits on our roadways.

Provision of care for diabetic retinopathy in New Zealand: are there ethnic disparities?

Jahnvee Solanki, Tiwini Hemi, Amy Chen, Sarah Welch, Rachael Niederer

Māori patients have poorer health access and outcomes across a range of specialty services in New Zealand, but the extent of this in eye care is unknown. We audited the quality of care provided to all patients referred to the Greenlane Clinical Centre diabetic eye clinic from January 2021 to August 2022. We found there was no difference in the quality of care provided to Māori patients at the diabetic eye clinic compared to patients of other ethnic groups. However, there were fewer Māori patients seen in the clinic than would be expected for their population size, and Māori patients had more severe eye disease. This suggests that Māori patients have more barriers to accessing the diabetic eye clinic. No ethnic group received the gold standard quality of care at the eye clinic, which highlights the need for more standardised consultation guidelines for ophthalmologists.

Time to start disease modifying drugs for adults with seropositive rheumatoid arthritis: results of the first year of the national New Zealand Rheumatology Association (NZRA) audit

William J Taylor, Nicola Dalbeth, Tracey Kain, Douglas White, Rebecca Grainger, Vicki Quincey

Early treatment using medicines that affect the behaviour of immune cells has been shown to reduce joint pain, joint damage and need for joint surgery in people with rheumatoid arthritis, compared to delayed treatment. The National Institute of Clinical Excellence in the United Kingdom recommends that treatment should be commenced by specialist (rheumatology) services within 6 weeks of referral from primary care services. We found that in New Zealand 65% of referred patients with rheumatoid arthritis are treated in rheumatology clinics within 6 weeks, but the time to treatment varies greatly—between 0 and 335 days. The number of specialist rheumatologists for the size of the population served by the local rheumatology service had the greatest association with the proportion of patients treated within 6 weeks. The data suggested that one full-time specialist rheumatologist would be needed for every 100,000 people to enable 80% of patients to receive treatment within 6 weeks. Currently, across New Zealand there is one full-time specialist for every 150,000 people, and this is unevenly distributed across the country.

Adherence to national Lynch syndrome testing guidelines for colorectal cancer in an Aotearoa New Zealand hospital-based population

Nejo Joseph, Matthew J McGuinness, Cavaghn H Prosser, Georgina Trifinovich, William Xu, Christopher Harmston

Rates of genetics testing on colorectal cancers are high in Northland. Some patients are not being adequately tested for Lynch syndrome and this can be improved. We recommend similar audits in other New Zealand hospitals and a national quality improvement programme similar to that in the UK.

Intentional physical self-injury in Auckland: patterns, associations and clinical implications in a single-centre cross-sectional study

Divyansh Panesar, Ian Civil

This is a study conducted at Auckland City Hospital looking at patients who deliberately harmed their own bodies, a situation known as intentional physical self-injury (IPSI). The study found that many of these patients required surgery, and there was a high rate of complications after surgery. It also noted that injuries from falls were generally more severe compared to other types like cuts or stabs. Younger males were more commonly affected, and many patients could not return directly home without some form of assistance after hospital treatment due to the severity of their injuries. The study stresses the need for better ways to prevent such injuries and suggests that more resources should be directed towards helping these patients both in hospitals and after they are discharged to ensure they recover fully and can return to their normal lives.

Midwifery experiences in rural Southern Aotearoa New Zealand: insights into pre-eclampsia management

Judith Sligo, Julia Corfe-Tan, Zoe Cotter, Jimmy Senara Eteuati, Hannah-Rose Hart, Rachael McConnell

Interviews were conducted with 23 Southern Region rural midwives about their management of clients with suspected pre-eclampsia, a serious condition of pregnancy, to assess the midwives' support for a new blood test (the sFlt-1/PlGF ratio test). The interview data showed that the midwives' management of possible PE was influenced by the assessment of the local context (weather, distance to a hospital, availability of couriers for blood tests), their previous experience managing pre-eclampsia, the scientific evidence and guidelines, the advice from obstetric teams and the midwifery holistic model of care. The midwives were supportive of introducing new pre-eclampsia tests or guidelines as long they were evidence based and could be used effectively in their rural settings.

Value for money of reusable versus disposable ophthalmic instruments for intravitreal injections

Saghir Ahmed Sadiq, Sarah Winsloe

Injections of drugs into the eyeball are done to preserve a patient's vision. Using reusable sterile instruments offers better value for money than disposable sterile instruments. There are trade-offs between safety, quality, cost and sustainability.

Diabetes treatment satisfaction among a multi-ethnic Aotearoa New Zealand population with uncontrolled type 2 diabetes mellitus

Ry Yves Tweedie-Cullen, Yannan Jiang, Rebecca Brandon, Audrey Tay, Ryan Yeu, Kate Smallman, Glenn Doherty, Ofa Dewes, Rebekah Doran, Penny Clark, Norma Nehren, Jennie Harré Hindmarsh, Frances King, Tony R Merriman, Allan Moffitt, Brandon Orr-Walker, Ryan Paul, Rinki Murphy

A total of 346 adults living with type 2 diabetes and poor glycaemic control across rural and urban centres in the upper North Island who agreed to take part in an 8-month randomised crossover study of taking two additional medications for diabetes were asked about their baseline level of diabetes treatment satisfaction using a validated questionnaire. Overall, treatment satisfaction was rated highly, with a

mean score of 29 (out of a maximum score of 36). Pacific peoples (comprising 32% of the sample) scored their diabetes treatment satisfaction higher than all other ethnicity groups (23% Māori, 26% European, 19% other). Hence, it is important to recognise that people may indicate high diabetes treatment satisfaction even if they are undertreated. Further attention at the healthcare provider level and health system level is required to ensure people living with type 2 diabetes and poor glycaemic control receive the additional medications they need to lower blood glucose and avoid complications.

A hard pilsner to swallow: a case series of bottle cap foreign bodies in Canterbury over a 3-month period in 2023

Asim Abdulhamid, Heidi Yi-han Su, Steven Leslie Ding

Foreign body ingestion is a common presentation to acute care that can lead to significant morbidity or mortality without appropriate and timely management. Bottlecaps are small and sharp, and though uncommon world-wide as a cause of foreign body ingestion, threaten complications of ulceration and perforation. The burden of alcohol excess and pattern of drinking in Canterbury makes this presentation far from novel. We present three cases of bottle cap ingestion to highlight their risk and endoscopic management approaches.

Speeding towards danger: the concerns and consequences of increasing speed limits on our roads

Christopher Wakeman, Shanthi Ameratunga, Teuila Percival, Braden Te Ao, Jamie Hosking

The trend of reducing speed limits in urban areas and on selected state highways in New Zealand reflects a growing consensus among local authorities and the New Zealand Transport Agency (Waka Kotahi) regarding the importance of road safety. This shift towards lower speed limits is not merely a random decision but a strategic move aligned with the Road to Zero strategy, which aims to eliminate road fatalities and serious injuries. However, the current coalition Government plans to reverse many of the speed limit reductions introduced by the previous Labour Government. The proposed changes would see many state highways reverting to 100km/h from 80, and local roads returning to 50km/h from 30, while introducing new highways designed for 110km/h speeds.

The prospect of sweeping reversals in speed limit reductions has sparked concerns regarding impacts on road safety. In a proactive move, the New Zealand Trauma Committee of the Royal Australasian College of Surgeons reached out to the ministers of transport, health and ACC last year, urging them to proceed with caution and not rush into changes that, in some respects, even go beyond the National Party's election promise to scrap lower speed limits only "where it is safe to do so".[1] This plea underscores the critical importance of prioritising safety considerations in any decision related to speed limit adjustments.

The ministers of ACC and health remained silent in response, while the minister of transport issued a brief reply emphasising the importance of keeping New Zealand's transportation system in motion. But the implied time savings for people driving are uncertain, as we discuss further below, in contrast to the high likelihood of increases in road deaths and serious injuries, as well as other adverse health and environmental impacts. It seems that increasing maximum driving speeds has been prioritised over all other considerations, which does not reflect the balance needed for responsible decision-making about our transport system. And it flies in the face of best practice in road safety based on global evidence.[2]

One of the most pressing concerns is the inevitable increase in deaths and serious injuries that would result from higher speed limits. Studies have shown that higher speeds directly correlate with a greater risk of crashes and more severe outcomes for those involved.[3] Consequently, there is little doubt that increasing maximum speeds will lead to more lives being lost on our roads. Despite progress in transport designs, high severity trauma in New Zealand is dominated by road traffic injuries, as evident in a recent 10-year review.[4]

The data and evidence surrounding speed limit changes in urban areas and state highways provide a compelling argument for the effectiveness of lower speed limits in enhancing road safety.

International studies conducted in cities like London and Edinburgh have demonstrated the positive impact of 30km/h zones on reducing injuries.[5,6] These studies revealed a 30–40% reduction in injuries within these zones, with subsequent reviews in European cities indicating a 40% reduction in injuries across various urban areas.[7] The implementation of 30km/h zones not only leads to a significant drop in injuries, but also contributes to additional benefits such as lower emissions, reduced noise levels and decreased fuel consumption, with no indication of increased congestion.[7]

The historical examples of speed limit changes in the United States of America (USA) and New Zealand provide valuable insights into the impact of speed on road safety outcomes. In the USA, the repeal of federal speed limit controls on interstates in 1995 led to an increase in road fatalities on these highways from 4–9%. This stark contrast with the 16% reduction in road fatalities following the federal government's decision to lower interstate speed limits in 1974 underscores the critical role

that speed limits play in ensuring road safety.[8] Similarly, New Zealand's decision to reduce its open road speed limit from 60mph to 50mph (80km/h) in 1973 resulted in a significant decline in road fatalities by 37%, demonstrating the positive correlation between lower speed limits and improved road safety outcomes.[9]

The relationship between traffic speeds and perceived traffic safety is a crucial factor influencing the choices of pedestrians and cyclists. Studies have shown that perceived traffic danger can deter individuals from walking and cycling, highlighting the importance of traffic calming measures to create safer and more inviting environments for non-motorised road users. Shifting short neighbourhood trips from driving to walking and cycling in New Zealand would lead to substantial health gains and healthcare savings.[10]

Proponents of raising speed limits argue that it will result in time savings and boost economic productivity. However, the purported benefits of time savings are often overstated. In cities, travel times are affected not only by speed limits, but by congestion from the number of other cars on the road and the need to stop at traffic lights and other intersections. Smoother traffic flow from lower speed limits may have travel time benefits.[10] On the contrary, the health impacts of raising speed limits are likely to be significant and far-reaching. The costs associated with the potential increase in deaths, injuries and negative health outcomes are likely to far outweigh any perceived benefits. The speed limit reductions implemented in recent years have not only saved lives, they have been well supported by the public, with over 70% of school leaders supporting permanent safe speed zones around schools.[11]

Furthermore, the adverse impacts of the proposed policy shifts in road speeds are likely to be unfairly distributed. It is well established that pedestrian and road injury risks are disproportionately borne by tamariki Māori and Pacific children, older people, disabled people, rural communities and residents of socio-economically disadvantaged urban neighbourhoods.[12] Many of these groups have lower access to cars but are more likely to be injured by them. They are also more likely to face severe and disabling consequences, with higher out-of-pocket expenses and many unmet needs alongside barriers to accessing care. Therefore, the proposed policies are most likely to accentuate risks to personal safety and opportunities for active travel in already underserved communities. To prioritise opportunities for motorists to drive at pace ahead of conditions that protect opportunities for active travel and safety of non-motorists is inherently unjust and unethical.

These risks compound the economic, resource and workforce demands placed on healthcare systems to mitigate the inequitable access to safe and inclusive transport systems, a fundamental determinant of health. Acknowledging the precautionary principle in public health, proposed policy shifts require a thorough pre-emptive analysis that takes account of our commitments to Te Tiriti o Waitangi and health equity.

In conclusion, the current proposal to raise speed limits on our roads is hard to defend given what we know about the probable consequences. The likely outcome of increased deaths and injuries, worsened air quality and heightened health impacts are too significant to ignore. The state has a responsibility to assure collective health interests and avoid third-party harm, particularly to children and other vulnerable road users. It is imperative that we prioritise road safety, environmental sustainability and public health in any discussions or decisions regarding speed limits on our roadways.

COMPETING INTERESTS
SA is a member of the following committees, which have advocacy roles in injury control: Royal Australasian College of Surgeons – New Zealand Trauma Committee; Northern Region Trauma Network; National Clinical Trauma Network – Rehabilitation Rōpū Rangatira; Healthy Transport Working Group – National Public Health Service, Health New Zealand – Te Whatu Ora.
SA has received project grants relating to child injury funded by the Health Research Council of New Zealand and the Fisher & Paykel Healthcare Foundation.
JH has received HRC project grant: Health and equity impacts of Te Ara Mua Future Streets.

AUTHOR INFORMATION
Christopher Wakeman: Senior Lecturer, Department of Surgery, University of Otago Christchurch.
Shanthi Ameratunga: Honorary Professor, Section of Epidemiology & Biostatistics, School of Population Health, The University of Auckland.
Dame Teuila Percival: Director – Moana Connect, Auckland; Paediatrician, South Auckland.
Braden Te Ao: Senior Lecturer, Section of Health Systems, School of Population Health, The University of Auckland.
Jamie Hosking: Senior Lecturer, Section of Epidemiology & Biostatistics, School of Population Health, The University of Auckland.

CORRESPONDING AUTHOR
Christopher Wakeman: Senior Lecturer, Department of Surgery, University of Otago Christchurch.
E: Christopher.Wakeman@cdhb.health.nz

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Provision of care for diabetic retinopathy in New Zealand: are there ethnic disparities?

Jahnvee Solanki, Tiwini Hemi, Amy Chen, Sarah Welch, Rachael Niederer

ABSTRACT

AIMS: Ethnic disparities have been observed in treatment at first specialist appointments across various specialties within New Zealand. This study aimed to examine documentation and treatment decisions for diabetic retinopathy by ethnicity.

METHODS: Retrospective audit of first specialist diabetic retinopathy clinic appointments for 388 patients at the Department of Ophthalmology, Te Whatu Ora Te Toka Tumai Auckland. Multiple domains of care were assessed, including comprehensiveness of history taking, examination, investigations and treatment decisions.

RESULTS: Europeans comprised 42%, Māori only 9.5%, Pacific peoples 13.19%, Asian 32.7% and Middle Eastern/Latin American/African in 2%. Māori patients were eligible for a significantly greater number of treatments (p=0.001). The comprehensiveness of history taking (p=0.809), examination (p=0.513), investigations (p=0.623) and proportion of eligible treatments provided (p=0.788) was similar but did not reach the gold standard of care across all ethnicities.

CONCLUSIONS: The standard of care provided in first specialist appointments for diabetic retinopathy appear to be similar across all ethnic groups, although Māori were underrepresented and had a higher disease burden at presentation. Our data highlights the need to reduce barriers faced by Māori in accessing GP, optometry and retinopathy screening referrals in Auckland, and improving local consultation and treatment guidelines.

Diabetic retinopathy is a common microvascular complication of diabetes mellitus that results in ischaemic damage to the retina.[1] It is a leading cause of blindness among the working-age population in developed countries, including New Zealand.[2–4]

Māori and Pacific populations are disproportionately affected by diabetes and its complications.[5] In New Zealand, the prevalence of diabetes among Māori is twice that of Pākehā, and in Pacific peoples it is three times as prevalent.[5] Māori and Pacific peoples are more likely to develop sight-threatening diabetic retinopathy, have greater rates of progression of retinopathy and are less likely to attend diabetic retinopathy screening than Pākehā.[6–8] Māori also have higher rates of other diabetic complications, including reduced time to first major cardiovascular event, increased hospitalisation due to end stage renal disease, higher rates of lower limb amputation and cardiovascular and cancer mortality compared to other ethnic groups.[9–11]

Significant inequities exist in the provision of healthcare to Māori and Pacific patients. This has been documented across various specialty services, including reduced cardiac revascularisation and timely cancer surgery provision.[12,13] These disparities may contribute to the poorer health outcomes experienced by Māori and Pacific peoples, including those related to diabetes.

Although the prevalence of diabetic retinopathy is increasing and disproportionately affects Māori and Pacific peoples, the extent of inequity in the standards of diabetic retinopathy care provided by ethnicity is largely unknown.[2–4] This retrospective study aimed to evaluate the documentation and treatment decisions in first specialist appointments for diabetic retinopathy by ethnicity at Greenlane Clinical Centre, Auckland.

Methods

Subject selection

This study received ethics approval from the Auckland Health Research Ethics Committee (AHREC) AH25370. We analysed data from all patients referred to the ophthalmology department at the Department of Ophthalmology, Te Whatu Ora Te Toka Tumai Auckland, from the diabetic retinopathy screening service between 1 January 2021 and 4 August 2022. Patients for this study were identified from the electronic Auckland

District Health Board referrals database. Both physical notes and electronic clinic letters were used for data collection.

Data collection

Ethnicity

The ethnicity of patients was extracted from the National Health Index (NHI) database. NHI ethnicity data is collected as per the Ministry of Health – Manatū Hauora Ethnicity Data Protocols, whereby hospital clerical staff provide patients with the same ethnicity question as the Statistics New Zealand 2018 Census.[14] Patient ethnicity is therefore self-identified, and patients can identify with more than one ethnicity.[14] Only one ethnicity per patient was available on the current NHI database for all patients included in this study; therefore, each patient was allocated to a single ethnicity group. The ethnicities were classified into the Statistics New Zealand Level 1 ethnicity codes for analysis: Māori, Pacific peoples, Asian, European, Middle Eastern/Latin American/African, Other Ethnicity and Residual Categories.[14,15] Other and Residual Categories patients were excluded from analysis given lack of numbers and insufficient ethnicity data in these groups.

History taking

Documentation of the type of diabetes, duration of diabetes and the latest HbA_{1c} was assessed.

Examination

The documentation of five different examination findings was reviewed. Visual acuity was recorded as the best corrected visual acuity written on the clinical notes and converted to LogMAR. The remaining four findings assessed were intraocular pressure, lens status, grade of diabetic retinopathy and presence of diabetic macular oedema (DMO).

Investigations

Documentation of performing ocular coherence tomography (OCT) and widefield retinal imaging was assessed.

Treatment decisions

Documentation of treatment decisions based on history and examination findings were evaluated. These included a discussion of better diabetic control when HbA_{1c} was greater than 58mmol/mol, urgent diabetes nurse referral when HbA_{1c} was greater than 100mmol/mol and a discussion of pregnancy plans with female patients aged 20–40 years. Other treatment decisions assessed were the completion of a CPAC score when a grade 3+ cataract was identified, the commencement of anti-VEGF treatment if visual acuity was 6/9 or worse with fovea-involving DMO, same day laser for proliferative diabetic retinopathy (PDR) and laser for non-foveal clinically significant macula oedema (CSMO). Finally, evidence of clinic letters being copied to patients was assessed.

Statistical analysis

All data was entered into an Excel spreadsheet and analysed in STATA volume 15. Categorical data are reported as n (%) and continuous data as mean ± standard deviation (SD). Analysis of variance (ANOVA) was used to compare values between groups. A p-value of ≤0.05 was considered statistically significant.

Indigenous health statement

The research team members have backgrounds and expertise that demonstrate a commitment to improving health research of Indigenous populations. The team has three non-training ophthalmology registrars, one of whom is Māori, and another of Indo-Fijian ethnicity. The research was initiated by Dr Sarah Welch, the Clinical Director of Ophthalmology at Greenlane Clinical Centre, with the aim to improve outcomes for Māori and Pacific patients. Another member, Dr Rachael Niederer, is a Royal Australian and New Zealand College of Ophthalmologists (RANZCO) ophthalmologist who is actively involved with Kāpō Māori in developing the Te Tiriti Action Plan to address Māori eye health inequities. She has been involved in previous research exploring ethnic disparities in eye health in New Zealand.

Results

Notes were reviewed for all 483 patients referred for diabetic first specialist appointments. We included 397 patients seen in clinic (82.1%) and excluded 86 who did not receive clinical review. There were eight patients in the Residual Category group and one patient in the Other group who were excluded from further analysis. Reasons for the lack of review by ethnicity are reported in Table 1.

The mean time to clinic review was 248 days ± 542. No significant difference was observed by ethnicity in the likelihood of clinic attendance (p=0.241) or in time to review (p=0.906). Patients were recorded as having missed appointments when they did not attend both their initial and

all rescheduled appointments. There was no difference in missed appointment rates by ethnicity, although numbers for this were small (p=0.219). Patients who missed their first appointment but attended subsequent appointments were not included in the missed appointment group but would have contributed to increasing the mean waiting time for all groups.

For the patients seen in clinic, mean age was 57.1 years ± 15.4 and 238 (60.3%) were male. Self-identified ethnicity was European in 162 (41.8%) patients, Māori in 37 (9.5%) patients, Pacific peoples in 54 (13.9%) patients, Asian in 127 (32.7%) patients and Middle Eastern/Latin American/African in 8 (2.1%) patients. Demographics by ethnicity are reported in Table 2.

The comprehensiveness of history taking was assessed using a history score. One point was allocated for documenting each of the following to give a maximum history score of three: type of diabetes (type 1 or type 2), duration of diabetes and HbA_{1c}. Type of diabetes was recorded in 279 patients (71.0%), duration of diabetes in 118 patients (30.2%) and HbA_{1c} in 233 patients (59.4%). The mean history score was 1.6 ± 1.0. No significant difference was observed in the mean history score by ethnicity (p=0.809), although there was a trend for a slightly lower score in European patients compared to other ethnicities. Values are reported by ethnicity in Table 3.

The quality of examination was assessed using an examination score. One point was allocated for documenting each of the following to give a maximum examination score of five: visual acuity, intraocular pressure, lens status, grade of diabetic retinopathy and presence of DMO. Visual acuity was recorded in 382 patients (96.7%), intraocular pressure in 360 patients (91.1%), lens status in 211 patients (53.4%), grade of diabetic retinopathy in 352 patients (89.1%) and the presence of DMO in 283 patients (71.6%). The mean examination score was 4.0 ± 0.9, and no difference was observed between ethnicities (p=0.513) (Table 3).

The comprehensiveness of investigations was assessed using an investigation score. The maximum score was two, with one point each for performing ocular coherence tomography and widefield retinal imaging. Ocular coherence tomography (OCT) was performed in 358 patients (90.6%) and widefield retinal imaging in 218

Table 1: Clinic attendance by prioritised ethnicity.

	European n=199 (41.8%)	**Māori n=46 (9.5%)**	**Pacific peoples n=73 (13.9%)**	**Asian n=147 (32.7%)**	**Middle Eastern/Latin American/ African n=9 (2.1%)**
Clinic attended—no./total no. (%)	162/199 (81.4)	37/46 (80.4)	54/73 (74.0)	127/147 (86.4)	8/9 (88.9)
Time to review—mean days +/- SD	266 ± 396	282 ± 494	275 ± 399	211 ± 760	217 ± 179
Reason for clinic non-attendance—no./total no. (%)					
Deceased	6/199 (3.0)	1/46 (2.2)	2/73 (2.7)	2/147 (1.4)	0/9 (0)
Missed appointments	18/199 (9.0)	7/46 (15.2)	11/73 (15.1)	11/147 (7.5)	0/9 (0)
Direct to cataract surgery	2/199 (1.0)	0/46 (0)	1/73 (1.4)	0/147 (0)	0/9 (0)
Direct to laser	0/199 (0)	1/46 (2.2)	1/73 (1.4)	0/147 (0)	0/9 (0)
Virtual clinic	1/199 (0.5)	0/46 (0)	0/73 (0)	1/147 (0.7)	0/9 (0)
No clinic booked	10/199 (5.0)	0/46 (0)	4/73 (5.5)	6/147 (4.1)	1/9 (11.1)

Table 2: Patient demographics at presentation to clinic.

	European n=162 (42%)	**Māori n=37 (9.5%)**	**Pacific peoples n=54 (13.9%)**	**Asian n=127 (32.7%)**	**Middle Eastern/ Latin American/ African n=8 (2%)**	**P-value**
Male—no./total no. (%)	98/162 (60.5)	24/37 (64.9)	27/54 (50.0)	78/127 (61.4)	6/8 (75.0)	0.480
Age—years +/- SD	57.7 ± 18.1	54.5 ± 12.2	53.5 ± 14.8	58.5 ± 13.0	58.9 ± 6.5	0.260
Type 2 diabetes mellitus—no./total no. recorded (%)	59/108 (54.6)	23/26 (88.5)	33/39 (84.6)	92/97 (94.8)	5/5 (100)	<0.001
Duration of diabetes—mean years ± SD	16.7 ± 10.9	11.2 ± 6.9	11.8 ± 6.5	12.1 ± 8.4	7.3 ± 2.5	0.063
HbA_{1c} (mmol/mol)—mean ± SD	65.1 ± 18.6	74.1 ± 17.8	80.3 ± 20.2	65.9 ± 20.1	63.5 ± 12.2	0.001
Vision (LogMAR)—mean ± SD	0.17 ± 0.29	0.24 ± 0.41	0.20 ± 0.27	0.20 ± 0.37	0.08 ± 0.12	0.720
Proliferative DR—no./total no. (%)	10/162 (6.2)	6/37 (16.2)	5/54 (9.3)	9/127 (7.1)	1/8 (12.5)	0.329
DMO—no./total no. recorded (%)	40/133 (30.1)	12/25 (48.0)	12/43 (27.9)	30/106 (28.3)	1/7 (14.3)	0.264

Table 3: Documentation of history, examination and investigations by prioritised ethnicity.

	European (n=162)	**Māori (n=37)**	**Pacific peoples (n=54)**	**Asian (n=127)**	**Middle Eastern/ Latin American/ African (n=8)**	**P-value**
History score—mean +/- SD	1.4 ± 1.1	1.7 ± 1.0	1.8 ± 1.0	1.8 ± 1.1	1.8 ± 1.0	0.809
Examination score—mean +/- SD	4.2 ± 0.7	4.2 ± 0.7	4.4 ± 0.7	4.3 ± 0.8	4.2 ± 0.7	0.513
Investigation score—mean +/- SD	1.4 ± 0.6	1.5 ± 0.6	1.7 ± 0.6	1.4 ± 0.7	1.5 ± 0.6	0.623
Total score out of 10—mean +/- SD	7.0 ± 1.7	7.2 ± 1.4	7.4 ± 1.6	7.1 ± 1.9	7.5 ± 0.9	0.701

Table 4: Treatment decisions by prioritised ethnicity.

Treatments provided	European (n=162)	Māori (n=37)	Pacific peoples (n=54)	Asian (n=127)	Middle Eastern/ Latin American/ African (n=8)	P-value
If female aged 20–40 discussed pregnancy plans—no./no. eligible (%)	1/14 (7.1)	1/4 (25.0)	1/4 (25.0)	0/0	0/1 (0)	0.662
If significant cataract CPAC performed—no./no. eligible (%)	4/10 (40.0)	2/4 (50.0)	3/7 (60.0)	4/5 (42.9)	0/0 (0)	0.759
If DMO with vision 6/9 or worse anti-VEGF started—no./no. eligible (%)	9/19 (47.4)	2/10 (20.0)	3/6 (50.0)	5/14 (35.7)	0/1 (0)	0.542
Same day laser for PDR—no./no. eligible (%)	9/10 (90.0)	5/6 (83.3)	6/7 (85.7)	10/10 (100.0)	0/0 (0)	0.647
Urgent diabetic nurse referral if HbA_{1c} >100mmol/mol—no./no. eligible (%)	3/6 (33.3)	1/3 (33.3)	1/6 (16.7)	0/5 (0)	0/0 (0)	0.514
Discussed improving diabetic control if HbA_{1c} >58mmol/mol—no./no. eligible (%)	7/49 (14.3)	5/20 (25.0)	8/29 (27.6)	7/44 (15.9)	1/3 (33.3)	0.527
Laser for non-foveal CSMO—no./no. eligible (%)	6/19 (31.6)	4/7 (57.1)	2/4 (50.0)	7/13 (53.8)	0/0	0.523
Letter copied to patient—no./total no. (%)	116/162 (71.6)	25/37 (67.6)	33/54 (61.1)	91/127 (71.7)	7/8 (87.5)	0.285
Total treatment score—mean +/- SD	1.0 ± 0.7	1.3 ± 1.1	1.1 ± 1.1	1.0 ± 0.7	1.0 ± 0.5	0.169
Treatment denominator—mean +/- SD	1.8 ± 0.9	2.6 ± 1.3	2.2 ± 1.2	1.8 ± 1.0	1.5 ± 0.8	0.001
Treatment percentage—mean +/- SD	49.2 ± 40.3	42.8 ± 25.2	50.4 ± 41.2	54.4 ± 38.4	58.3 ± 50.0	0.788

patients (55.2%). The mean score for investigations was 1.5 ± 0.7. No significant difference was observed between ethnicities (p=0.623), although there was a trend towards slightly more investigations in Pacific patients (Table 3).

The total score out of ten was 7.1 ± 1.7. No difference was observed between ethnicities (p=0.701), although there was a slight trend towards better scores in Pacific patients and lower scores in European patients (Table 3).

Clinic letters were copied to 275 patients (69.6%). No significant difference was observed by ethnicity (p=0.285), although the likelihood of a letter being copied to a patient was slightly lower for both Māori and Pacific patients.

There were a wide range of interventions that patients were eligible for depending on their HbA_{1c}, childbearing status, stage of diabetic retinopathy, presence of visually significant cataract and presence of diabetic macula oedema. The treatments given and the number of patients eligible for these treatments in each ethnic group are reported in Table 4.

A treatment percentage score for each patient was calculated by dividing the number of interventions provided (treatment score) by the number of interventions the patient was eligible for (treatment denominator). There was no difference in the percentage of eligible treatments provided by ethnicity (p=0.788) (Table 4). Māori patients had a significantly higher number of treatments they were eligible for, reflecting a greater disease burden at presentation (p=0.001) (Table 4).

Discussion

This study observed no significant difference in the comprehensiveness of history taking, clinical examination and investigations documented for patients by ethnicity. This is unlike previous literature, which has described that less time is spent on history taking and fewer investigations are arranged for Māori patients in primary health consultations.[14] Several factors may be contributory, including more time available and fewer health issues that need addressing at ophthalmology appointments than primary care. Furthermore, our study found no difference in the proportion of eligible treatments provided to patients by ethnicity. This unique finding reflects well on the Greenlane Clinical Centre eye department—studies of cardiac revascularisation and primary care consultations have found fewer treatments being prescribed to Māori patients despite the same eligibility for treatment.[12,13,16]

Māori patients were under-represented and had a significantly higher number of treatments they were eligible for compared to other groups. This represents a greater severity of disease and later presentation of Māori patients to diabetic retinopathy services. Māori account for 8.4% of patients in the Te Whatu Ora Te Toka Tumai Auckland catchment area and comprised 9.5% of the patients referred to Greenlane Clinical Centre in this study.[17] Given that Māori have more than twice the prevalence of diabetes (7.1% as opposed to 3.1%) and thrice the levels of moderate to severe diabetic retinopathy (12.9% as opposed to 4%) than Europeans, this is a significant underrepresentation of Māori.[5,6] This suggests Māori patients face increased barriers to accessing diabetic retinopathy screening and ophthalmology referral. Previous studies have also identified that Māori patients face increased barriers to accessing diabetic retinopathy screening.[18,19] Barriers include physical distance, difficulty taking time off work, fewer GP referrals to screening services, non-community based services and personal costs of care.[18,19] Previous experiences of culturally insensitive comments and mistrust in the healthcare system have also been identified as barriers to attending diabetic retinopathy screening in Māori population surveys.[19,20]

Culturally appropriate clinical practice is essential to improve participation in health services.[19] Such practices involve demonstrating an understanding of cultural beliefs, engaging whānau in health initiatives, promoting community or marae-based clinics and patient education.[8,19,21,22] The marae is the centre of everyday life and community for Māori, even in urban settings.[21] A recent qualitative study found that Māori women feel more comfortable participating in marae-based cervical screening services due to the familiarity and accessibility of the marae compared to a hospital.[21] A pilot marae-based diabetes education and health promotion programme in South Auckland also increased interest in exercise and health screening among Māori.[22] The diabetic retinopathy screening service in Auckland is not marae-based. It is also unknown what level of education is provided to Māori patients in Auckland regarding diabetic retinopathy. A survey of Māori patients in Northland demonstrated that only half were educated about and referred to diabetic screening services by their general practitioner.[19] Promoting greater education in primary

care and starting mobile marae-based retinopathy screening services may improve Māori participation in retinopathy screening and increase referrals to specialist appointments. The costs and effects of implementing these have not yet been published and are areas of future research opportunity.

Although Māori are underrepresented in referrals to ophthalmology specialist clinics, once they are referred, their overall rates of attendance to initial and rescheduled appointments are comparable to Europeans in this study. Previous research has shown that the non-attendance rates to ophthalmology specialist appointments among Māori is initially high, but improves for follow-up appointments.[19] Higher initial rates of non-attendance are due to various factors, including not receiving appointments, difficulty contacting clinic schedulers to reschedule or cancel appointments and previous negative staff interactions.[20,23] Our study highlights that with significant effort by clinic schedulers and with culturally sensitive care, we are able to achieve equivalent eventual clinic attendance for Māori patients. Greenlane Clinical Centre staff must be commended for these efforts, and this work should be continued.

Medical record keeping ensures an accurate account of patient disease and treatment requirements.[24] The overall documentation rate of a complete history, examination and investigations was suboptimal across all ethnicities in this study. Incomplete assessment is associated with under-treatment.[25] This has been reflected in the substandard treatment scores in all groups, with no ethnic group receiving the gold standard of care for their diabetic retinopathy. These findings highlight the need for standardised diabetic retinopathy consultation and treatment guidelines at tertiary centres in New Zealand.

This study has a few limitations. It is a study of small numbers and is retrospective. We were unable to measure time spent with patients and the development of rapport. Clinician judgement, patient preferences and interventions discussed that were not documented would have been missed in our data collection. Furthermore, ethnicity data is limited to the available NHI data, which had one mandatory ethnicity per patient available on the NHI database.[14,26] Using a single ethnicity per patient rather than total output ethnicity is advantageous because it allows ethnic minorities such as Māori to not be outnumbered by Europeans, while allowing clean data comparisons between groups. Disadvantages of this method include that the ethnicity selected for a patient in the NHI database may not be the ethnicity a patient identifies with most strongly, it may miss some ethnic minorities and it does not allow for patients to fall into multiple ethnic groups.

Overall, this study found no significant differences in documentation of history taking, examination, investigations and proportion of eligible treatments offered across all ethnicities in first diabetic retinopathy consultations. Māori patients had a greater disease burden and were underrepresented in those referred to clinic, highlighting the need for culturally appropriate and accessible GP, optometry and diabetic retinopathy screening clinics for this demographic. Once referred to ophthalmology clinic, overall attendance rates were similar between all ethnicities. No ethnic group received the gold standard of care for diabetic retinopathy. Future directions of study include analysing the effects of increasing diabetic retinopathy education in primary care, starting marae-based retinopathy screening clinics and creating clear consultation guidelines for first diabetic retinopathy specialist appointments. Further qualitative studies to understand the barriers that Māori patients face in accessing GP and optometry referrals to diabetic retinopathy screening clinics will also highlight other interventions that can address these barriers.

COMPETING INTERESTS
None to declare.

AUTHOR INFORMATION
Jahnvee Solanki: Non-training ophthalmology registrar, Te Whatu Ora Te Toka Tumai Auckland, Greenlane Clinical Centre Ophthalmology department.
Tiwini Hemi: Non-training ophthalmology registrar, Te Whatu Ora Te Toka Tumai Auckland, Greenlane Clinical Centre Ophthalmology department, Auckland.
Amy Chen: Non-training ophthalmology registrar, Te Whatu Ora Te Toka Tumai Auckland, Greenlane Clinical Centre Ophthalmology department, Auckland.
Dr Sarah Welch: Clinical Director, Consultant Ophthalmologist, Te Whatu Ora Te Toka Tumai Auckland, Greenlane Clinical Centre Ophthalmology department, Auckland.
Dr Rachael Niederer: Consultant Ophthalmologist, Te Whatu Ora Te Toka Tumai Auckland.

CORRESPONDING AUTHOR
Dr Rachael Niederer: Greenlane Clinical Centre Ophthalmology Department, 214 Green Lane West, Epsom, Auckland 1051, New Zealand. Ph: +64 21 516 619. E: dr_rachnz@yahoo.co.nz

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Time to start disease modifying drugs for adults with seropositive rheumatoid arthritis: results of the first year of the national New Zealand Rheumatology Association (NZRA) audit

William J Taylor, Nicola Dalbeth, Tracey Kain, Douglas White, Rebecca Grainger, Vicki Quincey

ABSTRACT

AIM: This audit describes variation in the time from referral to starting disease modifying drug (DMARD) for people with newly diagnosed seropositive rheumatoid arthritis (RA), how frequently this was within the recommended 6 weeks and whether regional, service-level or patient-level factors were associated with this variation.

METHOD: Rheumatologists submitted data on new patients with a new diagnosis of rheumatoid factor and/or cyclic-citrullinated peptide antibody positive RA. The association between visit funding, ethnicity, socio-economic deprivation, rurality, local specialist staffing levels and the time to DMARD treatment was assessed using Cox proportional-hazard models.

RESULTS: Data were collected on 355 patients over 12 months. Overall, 64.8% of patients commenced DMARD treatment within 6 weeks of referral and this was associated with rheumatologist FTE per 100,000 population (adjusted HR 2.47, 95%CI 1.27–4.81; p=0.008) and the rurality (Geographic Classification of Health [GCH]) of the patient (for R2 compared to U1 adjusted HR 0.20, 95%CI 0.09–0.43; p<0.001). There was no association between time to DMARD and ethnicity or socio-economic deprivation.

CONCLUSION: There was significant variation in time to DMARD treatment, mainly related to variation in rheumatologist staffing levels and patient rurality. Rheumatologist staffing levels of 1.0 FTE/100,000 population was associated with 80% of patients meeting the recommended 6-week time to DMARD treatment.

Rheumatoid arthritis (RA) is a persistent, immune-mediated inflammatory arthritis characterised by joint pain and swelling, which untreated frequently causes bone and joint destruction, and significant disability. RA may be associated with serious systemic manifestations such as scleritis, interstitial lung disease or cutaneous vasculitis. It is not common, affecting 0.4% of the population in industrialised countries, and is possibly less common in Aotearoa New Zealand, with an estimated prevalence of 0.27% and incidence 16/100,000 person-years.[1] In recent decades, the management of RA has been revolutionised by three main factors: early intervention with disease modifying drugs (DMARDs), availability of highly targeted immune-modulating therapy (especially monoclonal antibody technology) and a strategy of treatment escalation to attain low disease activity. DMARDs are distinguished from symptomatic treatment in their ability to prevent joint damage, as well as by treating inflammation effectively, and are typically slow in their onset of effect.

Early DMARD treatment has been associated with a greater degree of disease control,[2] reduction in need for subsequent orthopaedic surgery[3] and greater likelihood of drug-free remission.[4] These observations have led to management recommendations such as those developed by the United Kingdom (UK) National Institute for Health and Care Excellence (NICE): adults with early inflammatory arthritis should be commenced on DMARD therapy within 6 weeks of referral.[5] This recommendation has also been endorsed by patients and rheumatologists in Aotearoa New Zealand.[6,7]

The British Society for Rheumatology (BSR) began an ongoing prospective audit programme

that has been reporting on such standards since about 2019.[8] Its focus is on potential inflammatory arthritis rather than rheumatoid arthritis, for which the evidence of benefit of early intervention is strongest. The most recent BSR report of about 14,000 patients with suspected early inflammatory arthritis (EIA) reported that 56% of about 5,000 patients with RA pattern EIA are commenced on conventional synthetic DMARD (csDMARD) treatment with 6 weeks of referral, and that this benchmark has remained stable over time.

In Aotearoa New Zealand, it has previously been shown that achievement of the BSR/NICE practice standards are infrequent, but this study was confined to Wellington.[9] The New Zealand Rheumatology Association (NZRA) decided to initiate a low resource and low clinician-burden national audit that aimed to determine the extent to which rheumatology services (including private practices) were meeting the standard of commencing csDMARD therapy within 6 weeks of referral for patients with rheumatoid factor and/or anti-citrullinated peptide antibody positive rheumatoid arthritis. The NZRA audit was also designed to collect data that could assess factors that might explain service-level, patient-level and geographical variation in wait-time from referral to commencement of csDMARD. This manuscript reports data from the first year of the NZRA audit.

Method

In September 2022, members of the NZRA were invited to submit anonymised data within a few weeks of seeing each new patient with RF and/or anti-CCP positive patients with RA. Nearly all specialist rheumatologists and rheumatology advanced trainees in Aotearoa New Zealand are believed to be members of the NZRA. Patients were excluded if they had previously been seen by a rheumatologist and diagnosed with RA, but there were no other exclusion criteria. Data were entered by clinicians into a secure REDCap online data form hosted by the University of Otago.[10,11] Overall ethics approval was obtained from the University of Otago Human Ethics Committee (Health) and individual sites obtained locality approval according to local requirements (HD22/053). Patients were not required to give formal consent for aggregation of their anonymised information, as this study was considered to be primarily a quality improvement activity.

Waiting time was calculated as the number of days between the referral date (date received by the rheumatology service provider) and the date of the first specialist appointment (FSA). Instances of reversed dates (referral date occurring after FSA date) were identified and resolved.

One benchmark standard was assessed as the main performance indicator: commencement of a DMARD within 6 weeks of referral. This is the NICE QS33 Statement 2 from the 2020 update.[8] We assessed the following potential factors that might be associated with wait times: private versus Te Whatu Ora – Health New Zealand provided clinical service, Te Whatu Ora – Health New Zealand district and region, capacity of Te Whatu Ora – Health New Zealand employed specialist rheumatologists, rurality of patients' residence (GCH), socio-economic status (New Zealand Index of Deprivation [NZDep] 2018), age, gender and ethnicity of patients.

The number of full-time equivalent (FTE) rheumatologist Senior Medical Officers (SMO) employed by Te Whatu Ora – Health New Zealand for each region and district service was determined in 2022 by the NZRA as part of a submission to Te Whatu Ora – Health New Zealand,[12] and is also expressed as FTE/100,000 total population:

- Northern 13.71, 0.71 FTE/100,000
- Te Manawa Taki 6.75, 0.66 FTE/100,000
- Central 5.95, 0.61 FTE/100,000
- Te Waipounamu 8.1, 0.67 FTE/100,000

The Aotearoa New Zealand specialist healthcare system is mainly taxpayer funded through Te Whatu Ora – Health Zealand, which is divided into four regional groups of services: Northern (mainly Auckland and extending to the northern part of the North Island), Te Manawa Taki (from Hamilton southwards to include Tauranga and New Plymouth), Central (Wellington and extending northwards to include Palmerston North, Whanganui and Hawke's Bay) and Te Wai Pounamu (the South Island). Patients generally access specialist care such as rheumatology services through referral from primary care. Specialist services are free from the patient perspective, but primary care services are only partly subsidised by Te Whatu Ora – Health New Zealand. In addition, healthcare can be funded through private health insurance or direct patient out-of-pocket funding.

The total FTE for Aotearoa New Zealand is 34.51, 0.67 FTE/100,000, which is less than the 1 FTE/100,000 staffing level recommended by the NZRA.[12]

Table 1: Demographic and disease characteristics.

Variable		N/355 (%)
Female sex		264 (74)
Clinic funding by Te Whatu Ora – Health New Zealand		286 (80)
Domicile of patient, Te Whatu Ora – Health New Zealand region	Northern	123 (34)
	Te Manawa Taki	54 (15)
	Central	64 (18)
	Te Waipounamu	114 (32)
Duration of symptoms	<3 months	109 (30)
	3 to 12 months	175 (49)
	>12 months	71 (20)
Ethnicity	European	204 (57)
	Asian	52 (14)
	Pacific peoples	37 (10)
	Māori	31 (8)
	Other	31 (8)
NZDep2018 quintile	1 (most deprived)	59 (16)
	2	89 (25)
	3	71 (20)
	4	68 (19)
	5 (least deprived)	66 (18)
Rurality (GCH)	U1 (most urban)	232 (65)
	U2	48 (13)
	R1	54 (15)
	R2	16 (5)
	R3 (most rural)	3 (1)
	Not identified	2 (1)

The Geographic Classification of Health (GCH) consists of five geographically defined categories, from "Urban 1" to "Urban 2" based on population size, and from "Rural 1" to "Rural 3" based on population size and drive time to the closest major, large, medium and small urban areas.[13] NZDep2018 and GCH codes were generated by reference to concordance tables of these indexes against Statistical Area 1 2018 (SA1-2018) code. The SA1-2018 code is an output geography that allows the release of more detailed information about population characteristics than is available at the meshblock level. Built by joining mesh-blocks, SA1s have an ideal size range of 100–200

residents, and a maximum population of about 500.[14]

Time to csDMARD commencement was modelled using survival analysis. Patients who were not commenced on a DMARD at their first specialist appointment were right censored. Univariate Cox proportional-hazard regression models were used to consider the influence of several potential explanatory factors: service at district and regional level, rheumatologist FTE per population size, patient age, gender, ethnicity, small area deprivation (NZDep2018 quintile) and rurality (GCH code). A multivariable Cox proportional model with all these variables was also used assess the independent effect of these factors. SPSS (IBM SPSS Statistics, Version 29) was used for the statistical analysis.

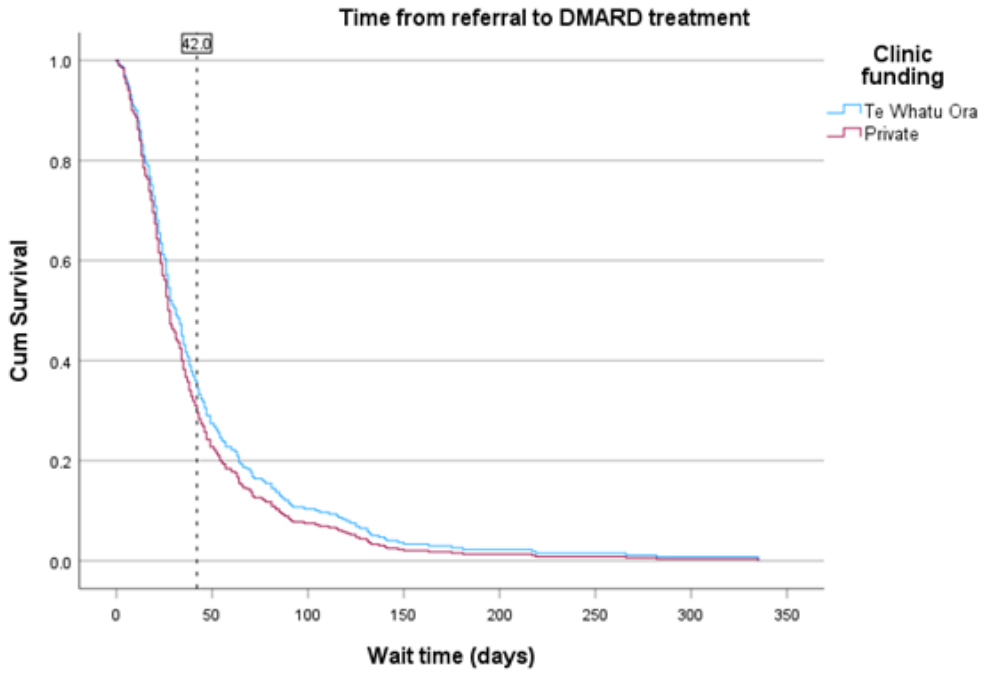
Results

By 31 August 2023, 59 rheumatologists or advanced trainees from 68 clinic locations had registered for the audit and 47 clinicians had entered data on at least one patient. In total, data were available for 355 patients. Demographic and disease characteristics of these patients are shown in Table 1. The mean age (median, inter-quartile range and range) was 54.2 years (57, 36 to 78, 16 to 88). Nearly all patients (335/355, 94.4%) commenced a DMARD at the time of the first specialist appointment. Cases from the most rural areas (R3) and small urban centres (U2) were slightly under-represented compared to the whole population: U1 63% cf 65%, U2 13.5% cf 18%, R1 15% cf 12%, R2 4.5% cf 5.7%, R3 0.85% cf 1.2%.

The overall median time to DMARD treatment was 28 days (range 0 to 335), see Figure 1. There was no significant difference in the proportion receiving DMARD treatment by 6 weeks for patients seen in the public sector (185/286, 64.7%) and in the private sector (45/69, 65.2%). Within the public sector patients, wait-times to DMARD were longer in the Central and Te Waipounamu regions of Te Whatu Ora – Health New Zealand than in Northern and Te Manawa Taki (Cox regression HR, 95%CI: Central 0.67, 0.47–0.94; Te Waipounamu 0.69, 0.51–0.94; Te Manawa Taki 1.13, 0.78–1.65; Northern REF) (Figure 2).

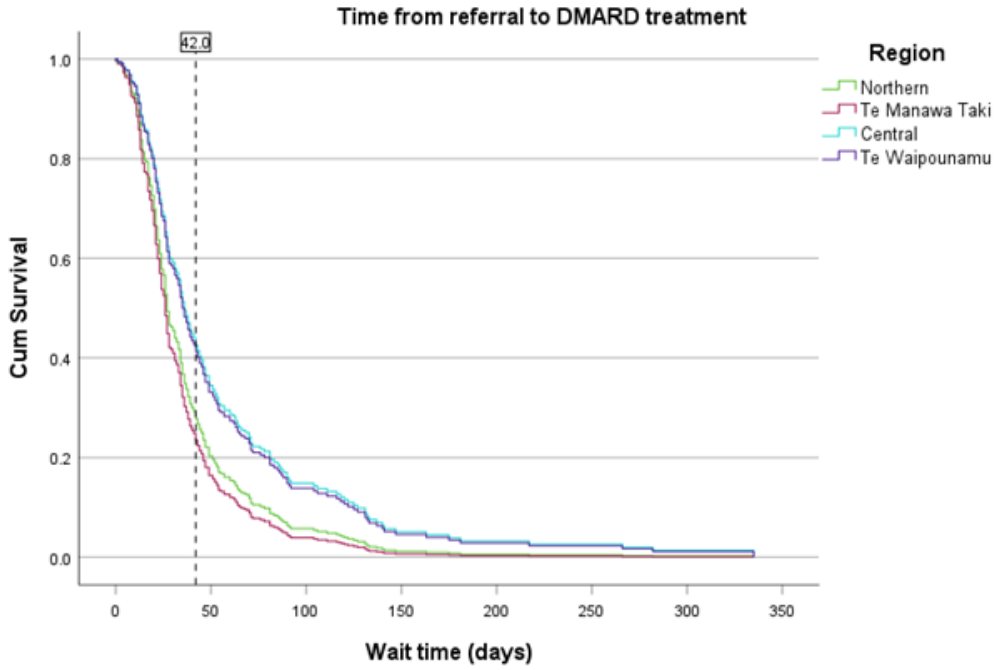
Overall, 64.8% of patients were started on a DMARD within 6 weeks of referral (NICE QS33 Statement 2, 2020). The service with the longest wait-time had the lowest SMO FTE (0.36/100,000 population). There was a roughly linear relationship between proportion of patients commencing

Figure 1: Time to DMARD treatment for patients treated within Te Whatu Ora – Health New Zealand compared to those in the private sector.



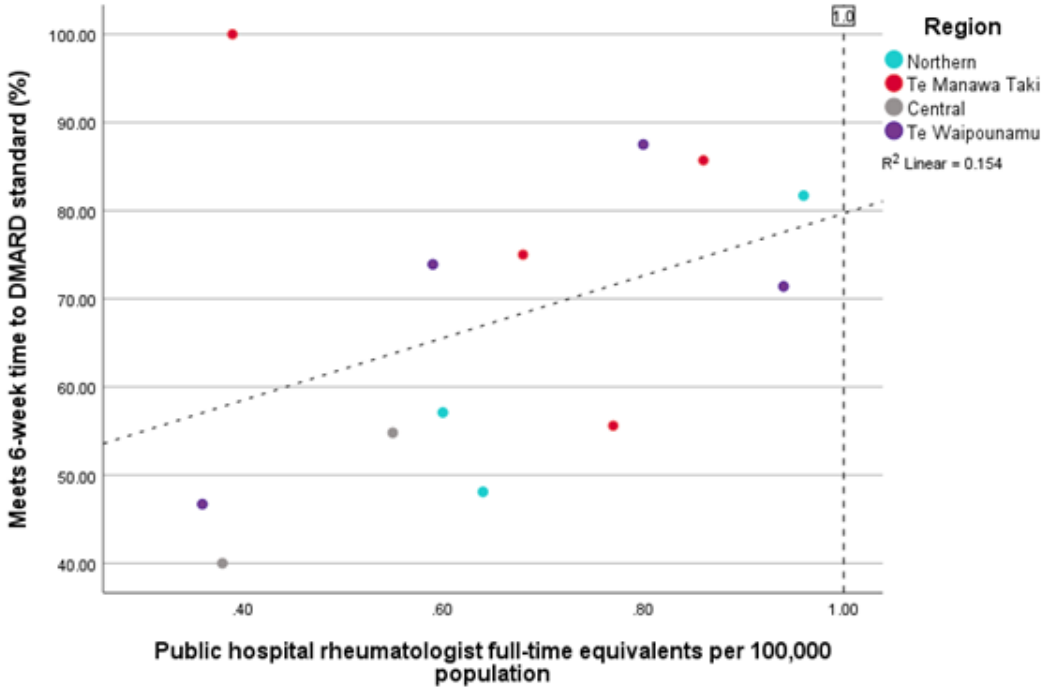
The vertical line at *wait time = 42 days* shows the proportion of patients not commencing DMARD treatment by 6 weeks.

Figure 2: Time to DMARD treatment by Te Whatu Ora – Health New Zealand region of patient residence.



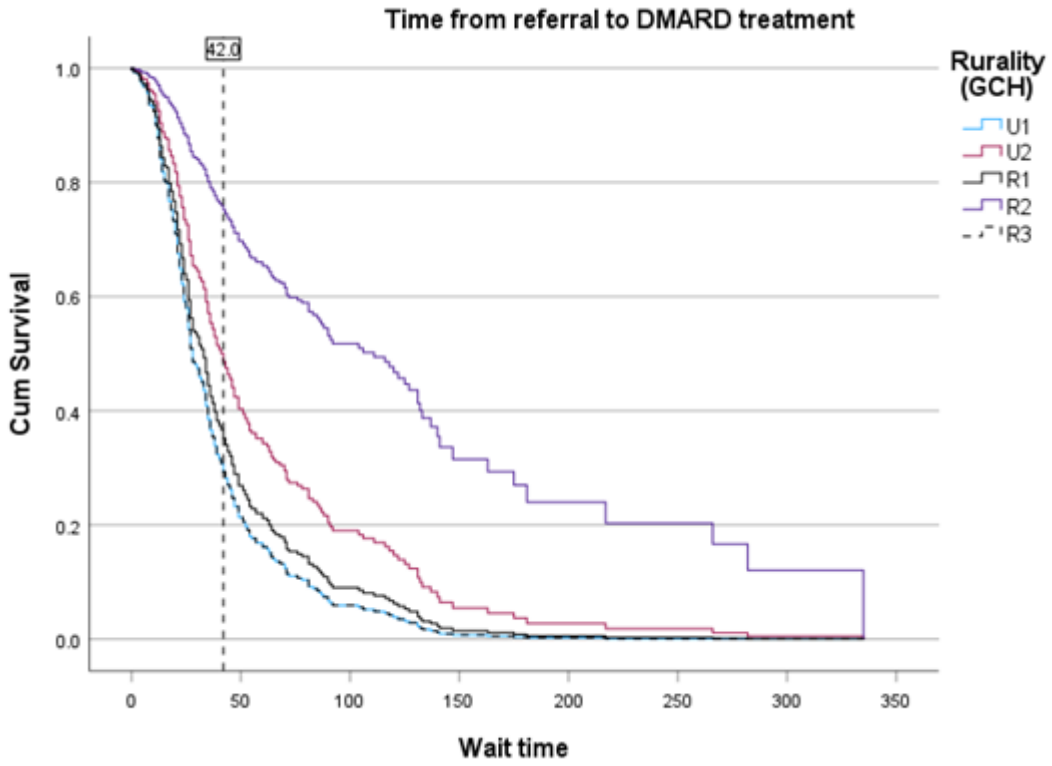
The vertical line at *wait time = 42 days* shows the proportion of patients not commencing DMARD treatment by 6 weeks. Only patients seen through Te Whatu Ora – Health New Zealand clinics are included.

Figure 3: Variation in proportion of patients commencing DMARD by 6 weeks, by specialist rheumatologist staffing levels.



Each data point represents a particular district rheumatology service, which are coloured according to Te Whatu Ora – Health New Zealand region in which the service is based. The vertical line at FTE/100,000 = 1.0 suggests that at this level of staffing, 80% of patients would be started on DMARD therapy by 6 weeks. Only patients seen through Te Whatu Ora – Health New Zealand clinics are included.

Figure 4: Time to DMARD treatment by rurality of patient residence.



The vertical line at *wait time = 42 days* shows the proportion of patients not commencing DMARD treatment by 6 weeks. Only patients seen in Te Whatu Ora – Health New Zealand clinics were included. Note that the lines for U1 and R3 are superimposed.

DMARD by 6 weeks and rheumatologist SMO FTE, with about 15% of the variance in DMARD start by 6 weeks explained by rheumatologist SMO FTE (Figure 3). Removal of the top left outlier greatly increases the strength of the association (59% of variance explained). The regression line suggested that 80% of patients could be seen within 6 weeks when the specialist rheumatologist staffing levels are at recommended levels of 1 FTE per 100,000 population. Rheumatologist SMO FTE level was significantly associated with time to DMARD treatment (Cox regression HR 2.00, 1.09–3.67; p=0.025). There was no association between time to DMARD treatment and ethnicity or socio-economic deprivation (NZDep2018 quintiles).

Patients living in more rural areas appeared to wait longer for DMARD treatment, although the very small numbers of patients from the GCH category of R3 (most rural) made interpretation difficult. The GCH category was significantly associated with the likelihood of commencing DMARD category (Cox model -2 log likelihood 2,506; Chi-square 21.0, df 4; p<0.001) with patients in R2 (HR, 95% CI 0.23, 0.11–0.49) and U2 (HR, 95% CI 0.59, 0.41–0.84) waiting longer than the most urban patients (Figure 4).

A multivariable model (Table 2) confirmed these findings, with rurality and SMO FTE remaining the only factors associated with time to DMARD treatment.

Discussion

This national audit shows that there is significant variation in how long it takes for patients referred, and subsequently diagnosed, with seropositive rheumatoid arthritis to commence DMARD treatment. The most important factors associated with this variation were specialist rheumatologist staffing levels and patients living in more rural areas. Once seen by a rheumatologist almost all patients were commenced on a DMARD, suggesting high quality management occurs fairly consistently once patients are seen.

There is significant geographic variation in specialist rheumatologist staffing levels across

Table 2: Multivariable Cox proportional-hazard model* for factors that might be associated with time from referral to starting DMARD treatment. Only patients seen through Te Whatu Ora – Health New Zealand clinics are included.

Variable		HR (95% CI)	P-value
Rheumatologist FTE/100,000 population		2.47 (1.27 to 4.81)	0.008
Ethnicity (p=0.42)	Non-Māori/non-Pacific peoples (n=219)	Reference	
	Māori (n=29)	0.93 (0.59 to 1.47)	0.76
	Pacific peoples (n=36)	0.76 (0.51 to 1.14)	0.19
NZDep2018 quintile (p=0.51)	Categories not shown		
Rurality (GCH, p<0.001)	U1 (n=183)	Reference	
	U2 (n=41)	0.61 (0.41 to 0.90)	0.01
	R1 (n=46)	0.86 (0.62 to 1.21)	0.39
	R2 (n=11)	0.20 (0.09 to 0.43)	<0.001
	R3 (n=3)	0.90 (0.27 to 3.04)	0.86
Gender	Male (n=68)	1.06 (0.79 to 1.42)	0.71
Age (decades)		0.94 (0.87 to 1.02)	0.12

* Overall model -2 log likelihood 249, p<0.001.

Aotearoa New Zealand, ranging from 0.36 FTE/100,000 population to 0.96 FTE/100,000 population. Unsurprisingly, this inequity contributes to a large proportion of the variance observed in waiting times. A relationship between staffing levels and waiting time has also been observed in the National Early Inflammatory Arthritis Audit of the UK. Aotearoa New Zealand levels of specialist rheumatologist capacity (0.67 FTE per 100,000) are much lower than in Belgium (2.39), USA (2.40), Australia (1.34–2.37)[15] and the UK (0.90–1.24).[16] The BSR[16] and Australian Rheumatology Association[15] recommend 1.25–1.67 FTE/100,000 and 2 FTE/100,000 respectively for sufficient specialist rheumatologist staffing. The NZRA have recommended rather more modest rheumatologist staffing levels of 1 FTE/100,000. According to the findings of this audit, this level of specialist capacity would improve time to DMARD treatment such that 80% of patients would commence DMARD treatment by 6 weeks. It should also be noted that publicly funded rheumatology services in New Zealand are constrained to seeing people with inflammatory diseases only, in contrast to other countries; this is clearly because of very low numbers of specialist rheumatologists in Aotearoa New Zealand. Unfortunately, the number of specialist rheumatologists only minimally increased between 2011 and 2018.[17]

In comparison to the BSR *National Early Inflammatory Arthritis Audit* report to March 2023, which showed that only 56% of patients with early inflammatory arthritis commenced DMARD treatment within 6 weeks in the UK, Aotearoa New Zealand services overall perform quite well, with 67.8% of patients with seropositive RA commencing DMARD treatment within 6 weeks, despite many fewer rheumatologists. This is likely because Aotearoa New Zealand rheumatology services are restricted in their scope to inflammatory diseases and do not accept referrals for non-inflammatory musculoskeletal conditions.

Even accounting for local specialist rheumatologist capacity, patients with new seropositive RA who live in rural areas waited longer for their first specialist appointment and commencement of DMARD treatment. The category R2 is defined as a 60- to 90-minute drive from a major urban

area and a 25- to 60-minute drive from a medium urban area. Although only 6% of the population live in this category (R2), they waited significantly longer than patients who live in major urban areas (adjusted Cox regression HR 0.20 [0.09–0.43]). Only 11 patients were living in R2 and even fewer in R3, so the estimates of effect are very imprecise. Hopefully, further planned data collection will help clarify the effect of rurality. Although this audit is not able to distinguish why rural patients wait longer, plausible reasons include the additional time required and cost to travel to regional hospitals, lack of public transport and the difficulties with taking sufficient time off work to attend appointments.

We did not observe a significant association between ethnicity and waiting times, although the point estimates suggested that Māori patients and Pacific peoples patients may have slightly longer waiting times to commence DMARD therapy. Again, additional data collection and greater numbers of Māori patients and Pacific peoples patients may allow more confidence in these estimates. Although not a main objective of the audit, we do note that the proportion of Māori referred with seropositive RA and therefore included in the audit is much lower than expected (8.4% compared to 16% population proportion of Māori), whereas this was not the case for Pacific peoples patients. It is unclear whether Māori develop RA less frequently, are referred less often or whether the younger age structure of the Māori population has a major influence (RA incidence tends to peak in older age groups).

There are some limitations to this audit. Although all rheumatologists in Aotearoa New Zealand were invited to participate, not all did. Some regions of Aotearoa New Zealand were especially under-represented and the overall recruitment of patients with newly diagnosed seropositive RA was less than would be predicted by the epidemiology of RA. Over the 12 months, 560 patients would be expected to develop seropositive RA compared to 355 (63%) who were included in audit. Furthermore, the data collection was kept to a minimum to reduce clinician burden; this meant that some issues could not be explored in depth.

Another limitation is that prioritisation or triage grading data were not collected. It is likely that patients who are triaged as more urgent are indeed seen more quickly, and we have previously shown that within a single rheumatology service, an "urgent" grading of the referral was associated with a shorter waiting time to first specialist assessment.[18] It is possible that the outlier in Figure 3 was able to achieve shorter waiting times than would be expected for the service's staffing level by making seropositive RA much more of a priority than other services. It would be of interest for future audits to adjust for referral priority grading.

There are other plausible explanations for the Figure 3 outlier, although these cannot be verified from the data gathered in this study. The main possibilities are selection bias (only those patients who were seen quickly were included), imprecise estimates because of small numbers of cases at this particular site (only seven cases) or service-specific strategies such as dedicated early inflammatory arthritis clinics.

We are hopeful that further data collection and promotion of the audit among rheumatologists will prompt greater participation, but ultimately these data ought to be easily available from Te Whatu Ora – Health New Zealand administrative datasets. At the current time, useful outpatient activity, especially diagnostic and treatment coding, is infrequently available from routinely collected administrative data. Gaps in routinely available administrative outpatient data should be an important focus for Te Whatu Ora – Health New Zealand in order to address equitable access to planned care. Specialist SMO groups will be invaluable partners in identifying data domains of key clinical importance.

This study has shown that lower than acceptable specialist rheumatologist staffing levels in Aotearoa New Zealand are associated with delays in commencing effective treatment for people with newly diagnosed rheumatoid arthritis. Te Whatu Ora – Health New Zealand needs to commission additional specialist SMO posts in rheumatology, particularly in districts with <0.6 FTE/100,000 with some urgency but aim for at least 1 FTE/100,000 in all districts over time. These staffing levels would achieve commencement of DMARD therapy in time frames that promote best patient outcomes.

COMPETING INTERESTS
The authors declare that they have no conflicts of interest.

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AUTHOR INFORMATION
William J Taylor: Consultant Rheumatologist, Wellington Regional Rheumatology Unit, Capital Coast and Hutt Valley District Health Board, Te Whatu Ora – Health New Zealand, Wellington; Gisborne Hospital, Te Whatu Ora Tairāwhiti, Gisborne; Department of Medicine, University of Otago, Wellington.
Nicola Dalbeth: Consultant Rheumatologist, Rheumatology Department, Te Whatu Ora Te Toka Tumai Auckland, Auckland; Head of Department, Department of Medicine, The University of Auckland.
Tracey Kain: Consultant Rheumatologist, Tauranga Rheumatology Clinic, Grace Orthopaedic Centre, Tauranga.
Douglas White: Senior Lecturer, Waikato Clinical School, The University of Auckland; Consultant Rheumatologist, Rheumatology Department, Waikato Hospital, Hamilton.
Rebecca Grainger: Consultant Rheumatologist Wellington Regional Rheumatology Unit, Capital Coast and Hutt Valley District Health Board, Te Whatu Ora – Health New Zealand, Wellington; Professor of Medicine, Department of Medicine, University of Otago, Wellington.
Vicky Quincey: Consultant Rheumatologist and Clinical Director, Rheumatology Department, Waikato Hospital, Hamilton.

CORRESPONDING AUTHOR
Associate Professor William Taylor: Rheumatology Department, Hutt Hospital, High Street, Lower Hutt. Ph +64 21 727 212. E: william.taylor@otago.ac.nz

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https://nzmj.org.nz/journal/vol-137-no-1600/time-to-start-disease-modifying-drugs-for-adults-with-seropositive-rheumatoid-arthritis-results-of-the-first-year-of-the-nationa

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Adherence to national Lynch syndrome testing guidelines for colorectal cancer in an Aotearoa New Zealand hospital-based population

Nejo Joseph, Matthew J McGuinness, Cavaghn H Prosser, Georgina Trifinovich, William Xu, Christopher Harmston

ABSTRACT

AIM: Lynch syndrome (LS) is estimated to affect 1–3.9% of patients with colorectal cancer (CRC). Testing for LS is important in determining management and establishing surveillance for "Lynch families". Previous studies have identified poor rates of testing for LS in CRC patients. This study aimed to describe adherence to guidelines for testing of newly diagnosed CRC for LS.

METHODS: A single institution cohort study of patients over 18 years with colorectal adenocarcinoma from 2018–2022 in Te Tai Tokerau, Aotearoa New Zealand was conducted. Rates of baseline immunohistochemistry (IHC) testing for mismatch repair (MMR) deficiency, further testing for MLH1-deficient cases and rates of germline mutational analysis were audited to determine adherence to national guidelines. The rate of LS in newly diagnosed CRC was estimated.

RESULTS: Six hundred and sixty patients were eligible for universal testing for LS, of which 84% (n=553) completed initial IHC testing. MMR deficiency was reported in 20% (n=114) cases. Eighty-nine percent (n=101) was attributable to MLH1 deficiency, of which 99% (n=100) were appropriately tested for BRAF-V600E mutation. Sixty-four percent (4/11) patients indicated for hypermethylation testing were appropriately tested. Seventeen patients had an indication for germline mutational analysis, of which only 29% (n=5) were tested. The estimated incidence of LS in newly diagnosed CRC was 0.7–3.8%.

CONCLUSION: Compliance with initial IHC testing was good. However, there is a need to improve rates of confirmation genetic testing. The incidence of confirmed LS in this study is 0.7%, however this may be as high as 3.9%.

The lifetime risk of colorectal cancer (CRC) for individuals with pathogenic mutations of mismatch repair (MMR) genes (Lynch syndrome) varies from 28–100% in males and 25–83% in females in the literature.[1–7] Despite considerable risk of CRC and other malignancies, it is estimated that in the United Kingdom (UK), 95% of individuals with Lynch syndrome (LS) are not aware of their condition.[8,9]

Testing patients diagnosed with CRC is an opportunity to identify individuals with LS. This has implications for the patient and their families, as other family members may be carriers of the same pathogenic gene variant. This may allow targeted risk-reducing interventions, including endoscopic surveillance, preventative surgery and chemoprophylaxis. Identification of LS preoperatively also influences management.[10] Clear guidelines for testing all patients with newly diagnosed CRC (universal testing) have been outlined by both the Aotearoa New Zealand Ministry of Health – Manatū Hauora and the National Institute For Health and Care Excellence (NICE) in the UK.[11,12]

In response to evidence of poor implementation of guidelines for LS testing in CRC, a recent national quality improvement project was commenced in the UK.[11,13] This group oversaw an increase in MMR deficiency testing from just 43% of CRC cases in 2019 to 91% in 2022. To our knowledge, there has been no published data on adherence to CRC screening guidelines recommended by the Ministry of Health – Manatū Hauora in Aotearoa New Zealand.

This retrospective cohort study aimed to identify adherence to guidelines published by the Ministry of Health – Manatū Hauora for LS testing among patients with CRC. Furthermore, we aimed to obtain the most accurate estimate of the incidence of LS in newly diagnosed CRC in Aotearoa New Zealand based on the currently available data.

Methods

Patient selection

All consecutive adult patients (>18 years) with newly diagnosed colorectal adenocarcinoma referred to Te Tai Tokerau locality between 1 January 2018 and 31 December 2022 were eligible. The Whangārei Hospital data warehouse was searched for all patients diagnosed with colorectal cancer. Patients with histology codes for neuroendocrine tumours, gastrointestinal stromal tumours, lymphomas, squamous cell carcinomas, leiomyosarcomas and melanomas were excluded. Patients with previously diagnosed LS were also excluded.

Variables

Patient data collected included: age at first treatment, sex (classified as male or female) and ethnicity (self-identified). Tumour, node and metastasis (TNM) staging and tumour grade were extracted for patients having resection of their cancer. It was not possible to provide stages of cancer given the lack of M staging available.

Outcomes

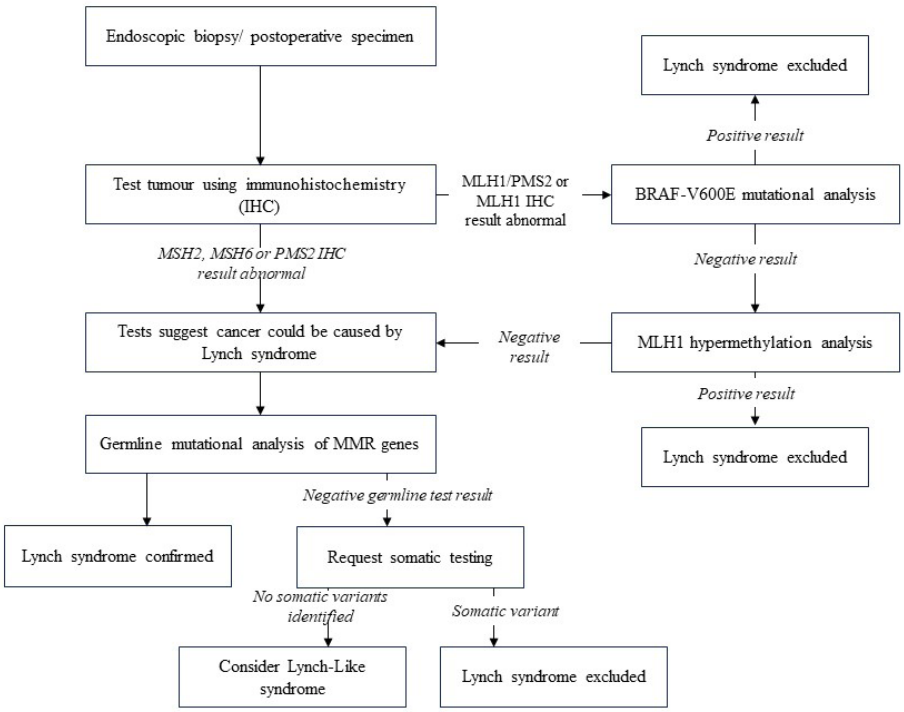
The primary outcome was adherence to testing protocols as established by the Ministry of Health – Manatū Hauora (**Figure 1**); this was established by i) proportion of patients with CRC receiving immunohistochemistry (IHC) testing, ii) proportion of patients with an MLH1 deficient proceeding to mutational analysis of the BRAF-V600E gene and hypermethylation testing of the promoter region respectively, and finally iii) proportion of patients identified to have a high likelihood of LS completing genetic testing.

Secondary outcomes included patterns of MMR deficiency and the proportion of patients with newly diagnosed CRC and completed IHC testing, with LS or Lynch-like syndrome (LLS—MMR deficiency in the absence of a proven germline mutation that cannot be explained by BRAF and MLH1 hypermethylation[14]) in Te Tai Tokerau, Aotearoa New Zealand.

IHC for MMR proteins

IHC was performed for four MMR proteins (MLH1, MSH2, MSH6 and PMS2) using a Staining Automat according to the manufacturer's protocol, in a 4-µm-thick formalin-fixed paraffin-embedded (FFPE) sections. The primary antibodies used for detecting MMR proteins were the anti-hMLH1 antibody (clone ES05), anti-MSH2 antibody (clone 25D12), anti-hMSH-6 (clone PU29) and anti-hPMS2 antibody (clone M0R4G). The normal staining

Figure 1: Aotearoa New Zealand Ministry of Health – Manatū Hauora guidelines for the testing of Lynch syndrome in newly diagnosed patients with colorectal cancer.



patterns for MLH1, MSH2, MSH6 and PMS2 are nuclear. The absence of nuclear staining in tumour cells and the presence of nuclear staining of non-neoplastic cells were considered to represent an abnormal pattern.

Methylation analysis of MLH1 gene promoter C region

Methylation status of the promoter region of the MLH1 gene was established by means of Agena Bioscience's EpiTYPER MassARRAY System, using base-specific cleavage and MALDI-TOF Mass Spectrometry. This was performed following DNA extraction from paraffin-embedded tissue and treatment with bisulfite. Hypermethylation of the MLH1 promoter region leads to transcriptional slicing of the MLH1 gene. The following thresholds were used: non-hypermethylated (0–10%); equivocal (11–20%); hypermethylated (>20%).

Detection of germline mutations and copy number variances

Targeted gene sequencing of coding regions and splice sites was performed on DNA extracted from blood. Libraries were prepared and enriched using SureSelectXT target enrichment (Agilent Design ID 0825941). Indexed libraries were pooled and sequenced to a targeted coverage of 700 reads/base (Illumina NextSeq500 2x75bp). Seqliner v0.8 was used to generate aligned reads and call variants against hg19 human reference genome. PathOS v1.5 was used to annotate and transform variants to standard nomenclature and filter for rare, non-synonymous variants within 20bp of coding exons. Copy number was analysed using Gaffa 3.0 Targeted. Variants are described according to HGVS Nomenclature version 19.01 with minor differences in accordance with Molecular Pathology policy.

Statistical analysis

Baseline categorical data were presented as number and percentage and analysed using the Fisher's exact probability test. Continuous data were presented as median and interquartile range (IQR) and analysed using the Wilcoxon signed-rank test. A significance level of $p < 0.05$ was used to indicate statistical significance.

Ethical consideration

This study was deemed "out of scope" by the Health and Disability Ethics Committee on 23 August 2023. Locality approval was obtained from the Te Tai Tokerau research group.

Results

Participants

In total, 718 patients were referred to Te Tai Tokerau in the 5-year time period with CRC.

Table 1: Demographic variables.

Characteristic	N	Overall, N=660	Patients not completing IHC testing, N=107	Patients completing IHC analysis, N=553	p-value
Gender	660				>0.9
F		303/660 (46%)	49/107 (46%)	254/553 (46%)	
M		357/660 (54%)	58/107 (54%)	299/553 (54%)	
Age	660	72.00 [64.00–80.00]	76.00 [65.00–85.50]	72.00 [64.00–79.00]	0.005
Ethnicity	660				0.14
NZ European		482/660 (73%)	80/107 (75%)	402/553 (73%)	
NZ Māori		91/660 (14%)	19/107 (18%)	72/553 (13%)	
Other		11/660 (1.7%)	1/107 (0.9%)	10/553 (1.8%)	
Other European		73/660 (11%)	6/107 (5.6%)	67/553 (12%)	
Pacific peoples		3/660 (0.5%)	1/107 (0.9%)	2/553 (0.4%)	

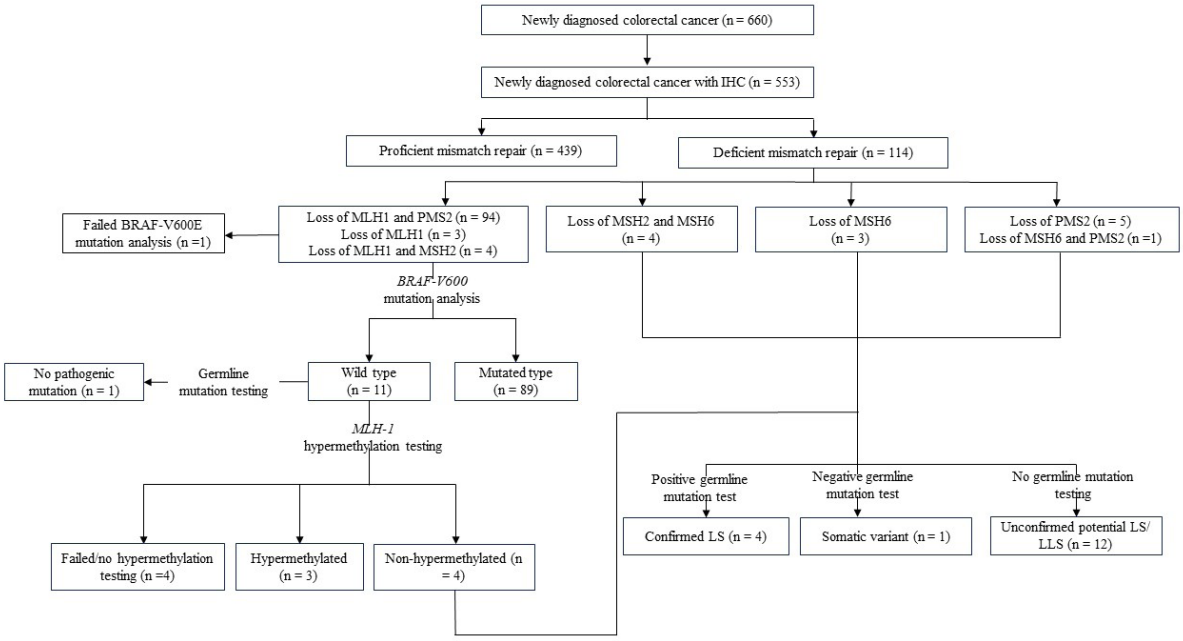
Table 2: Clinicopathological variables.

Characteristic	N	Overall, N=553	Non-LS associated CRC, N=534	LS associated CRC, N=4	p-value
T stage	450				0.20
T0		6/450 (1.3%)	6/447 (1.3%)	0/3 (0%)	
T1		48/450 (11%)	48/447 (11%)	0/3 (0%)	
T2		71/450 (16%)	69/447 (15%)	2/3 (67%)	
T3		238/450 (53%)	237/447 (53%)	1/3 (33%)	
T4		87/450 (19%)	87/447 (19%)	0/3 (0%)	
Unknown		103	102	1	
N stage	450				>0.9
N0		273/450 (61%)	271/448 (60%)	2/2 (100%)	
N1		114/450 (25%)	114/448 (25%)	0/2 (0%)	
N2		61/450 (14%)	61/448 (14%)	0/2 (0%)	
N3		2/450 (0.4%)	2/448 (0.4%)	0/2 (0%)	
Nx		103	101	2	
Unknown					
Acuity	535				>0.9
Acute		80/535 (15%)	80/531 (15%)	0/4 (0%)	
Elective		455/535 (85%)	451/531 (85%)	4/4 (100%)	
Unknown		18	18	0	
Tumour differentiation	460				0.11
G1		189/460 (41%)	186/456 (41%)	3/4 (75%)	
G2		213/460 (46%)	213/456 (47%)	0/4 (0%)	
G3/4		58/460 (13%)	57/456 (12%)	1/4 (25%)	
Unknown		93	93	0	

Fifty-six patients were excluded for the following reasons: neuroendocrine tumour (NET) (n=25), anal squamous cell carcinoma (SCC) (n=16), benign polyp (n=1), gastrointestinal stromal tumour (GIST) (n=2), mesothelioma (n=1), appendiceal mucinous neoplasm (n=2), lymphoma (n=1), goblet cell carcinoma (GCC) (n=2), known LS (n=2) and no documentation of CRC (n=7).

Six hundred and sixty patients were identified to have colorectal adenocarcinomas and were eligible for the current study. The median age of patients was 72 (IQR: 64–80) and 46% (n=303) were female. Seventy-three percent (n=482) were NZ European, 14% (n=94) were Māori and 11% (n=73) were "other European". 0.5% and 1.7% comprised Pacific peoples and other ethnicities respectively. There were no significant differences between patients completing and not

Figure 2: Flow chart of screening for Lynch syndrome (LS) by immunohistochemical staining for mismatch repair (MMR) proteins in patients with newly diagnosed colorectal cancer (CRC).



completing IHC testing on univariate analysis (**Table 1**). Table 2 shows the pathological tumour and nodal staging of the resected cancers—189 (41%), 213 (46%) and 58 (13%) of patients had well, moderately and poorly differentiated tumours, respectively (**Table 2**).

IHC testing

Eighty-four percent (n=553) of patients had initial IHC testing (**Figure 2**). The proportion of patients completing IHC testing in 2018–2020 and 2021–2022 were 77% (n=302) and 93% (n=251) respectively. Notably, in the years 2018–2020 all patients proceeding to surgery were tested for MMR deficiency using the postoperative specimen (n=249). Testing of endoscopic and distant metastatic (n=53) biopsies were also carried out, but irregularly and infrequently. In contrast to this, in the years 2021–2022 the endoscopic biopsies of primary tumour or biopsy of distant metastasis was performed routinely for all patients (n=203), except in acute CRC resections, where postoperative specimens were tested (n=48).

One hundred and seven (16%) patients with colorectal adenocarcinoma did not undergo tumour IHC testing. From 2021–2022, 17 patients did not complete IHC testing for the following reasons: patients that proceeded directly to palliative care (n=6); endoscopic biopsies not being tested for patients not proceeding to surgery (n=8); MMR not processed (n=1); and missing results (n=2). Patients proceeding directly to palliative care were diagnosed on the basis of radiological imaging and therefore did not have biopsies taken. From 2018–2020, 90 patients with adenocarcinoma did not have results for IHC testing because studies were not performed for endoscopic/distant metastases biopsies of patients not proceeding to surgery (n=88) and due to missing results (n=2).

MMR results

In IHC evaluation, loss of any mismatch repair (MMR) protein expression occurred in 114 (20%) of all patients. The most frequent pattern of MMR deficiency was loss of expression of both MLH1 and PMS2 (n=94, 82%). Loss of expression of both MSH2 and MSH6 was observed in four (3.5%) patients and loss of only MSH6 expression in three (2.6%) patients. Other patterns of MMR deficiency were as follows: PMS2 only (n=5; 4.4%), MLH1 and MSH2 (n=4; 3.5%), MSH6 and PMS2 (n=1; 0.9%) and MLH1 only (n=3; 2.6%). Therefore, 13 patients had a deficiency of at least one of MSH2, MSH6 or PMS2 proteins in the absence of MLH1 deficiency and were eligible for germline mutational analysis.

MLH1 BRAF-V600E and hypermethylation analysis

One hundred and one MMR patients had MLH1 deficiency, of which 100 (99%) underwent analysis for mutation of the BRAF-V600E gene as outlined by Ministry of Health – Manatū Hauora guidelines. Eleven patients had tumours that were negative for the BRAF-V600E mutation and therefore identified to potentially have LS or LLS. Seven of these patients (64%) eligible for hypermethylation testing completed it. Of the seven that did proceed, two did not have hypermethylation of the promoter region of the MLH1 gene (**Figure 2**). Therefore, five patients with MLH1 deficiency were eligible for germline mutational analysis.

Genetic analysis

Five patients (29%) eligible of the eligible 17 were referred to the New Zealand Familial Gastrointestinal Cancer Service (NZFGCS) and proceeded to germline mutational analysis. Three of these patients had MLH1 and PMS2 deficiency on MMR analysis, one had a MSH6 deficiency and one had PMS2 deficiency only. Four patients were confirmed to have pathogenic mutations of MMR genes (LS). One patient did not have a pathogenic variant of the MMR protein on genetic testing (**Figure 2**).

Best estimate of proportion of CRC cases with LS

The rate of confirmed LS in the present study is 0.72% (4/554). Notably, there were 17 patients that did not complete the testing protocols (12 did not finish germline mutational analysis, four did not complete hypermethylation testing and one did not undergo BRAF-V600E mutation analysis). The upper limit of the estimate, or maximum number of patients that potentially have LS in this cohort, is therefore 4.0%.

Discussion

This study analysed adherence to established testing protocols for LS in patients diagnosed with CRC adenocarcinoma. There was a high level of IHC testing for MMR proficiency of newly diagnosed CRC; this significantly improved once colonoscopic and radiological biopsies were tested and was 93% of all eligible patients in the most recent 1-year. BRAF-V600E mutation and MLH1 promoter hypermethylation analysis was conducted appropriately in 99% of patients and 64% of patients respectively. Only 29% (5/17) of patients eligible for germline mutational analysis proceeded to undergo this test. The estimated incidence of LS/LLS in newly diagnosed CRC ranged from 0.7–4.0% in Te Tai Tokerau.

The Aotearoa New Zealand Ministry of Health – Manatū Hauora and NICE recommend microsatellite instability testing (MSI) or IHC testing to detect abnormalities that may indicate LS for all patients diagnosed with CRC (universal screening).[11,12] There is considerable variation in testing availability and adherence to established guidelines internationally and between institutions. In previous audits of universal screening, rates of IHC testing varied internationally 74–98%.[15–17] Notably, most previous institutional audits only reviewed 1 year of testing. In contrast to this, our study spanned a 5-year time period and reported an overall testing rate of 84% of all CRC cases. Testing rates noticeably improved in 2021–2022 (93%) from 2018–2020 (77%) due to a change in practice to reflexive testing of all tumour biopsies instead of postoperative specimens. Therefore, IHC testing rates have been optimised to include as many patients as clinically feasible.

In the present study, only 29% of patients were referred to the NZFGCS (for genetic testing) when indicated as per the NICE guidelines. In a systematic review of universal LS testing in CRC, the pooled proportion of patients completing germline mutational analysis was 76.3%, which suggests that our institution may be performing below international standards.[18] The rate of testing ascertained in this study, however, is comparable to the 29% of eligible patients receiving germline mutational analysis in 2019 from the recent UK quality improvement study.[19] This statistic was obtained prior to the establishment of mainstreamed constitutional gene testing as part of the project. In the present study, both "major" DNA MMR proteins (most common pathogenic variants in LS occur in MLH1 and MSH2), as well as "minor" (MSH6 and PMS2) protein deficiencies failed to be referred to germline mutational analysis.[20] The absence of any discernible trend demonstrates systemic failure in reflexive referral germline mutational analysis. It should be noted, however, that this number may also represent some patients that were offered genetic testing but opted out. Poor rates of germline mutational analysis prevent the conclusive identification of individuals with LS or LLS. This can then be used to carry out familial "cascade" testing to identify other individuals with LS and reduce the proportion of people with LS unaware of their condition.

Identifying individuals and families then allows for appropriate genetic counselling and surgical follow-up. This is especially important in the Aotearoa New Zealand context, where the rate of early onset CRC (EOCRC) is rising.[21] Pathogenic genetic variants are responsible for up to one-third of all CRCs in patients below 35 years.[22] Screening and early detection are likely to curtail the morbidity and mortality in this sub-group, who have excellent outcomes with early intervention.[23]

The incidence of LS among unselected newly diagnosed CRC reported in the current literature ranges from 0.7–3.7%.[6,24–27] The rate reported in the current study (0.7%) lies within this range; however, a number of patients with MMR-deficiency failed to proceed to germline mutational testing when indicated, making this a likely under-estimation of the true rate. Variation in reported incidence may be due to geographic differences but may also likely be impacted by the proportion of elderly patients included in the study. Furthermore, some studies also exclusively test patients that have undergone surgery; this may also impact the reported rates of LS. When analysing proteins individually, the following percentages of germline variants were found: in non-hypermethylated MLH1 negative cases, 20.34% was explained by germline MLH1 variants; in MSH2 this was 44.70% (including EpCAM), in MSH6 this was 58.16% and in PMS2 this was 45.13%. In the current study, patients not receiving germline mutational analysis had MMR deficiency of MSH2, MSH6 and PMS2, which again increases the likelihood that the true rate of LS in our cohort is higher than the confirmed rate. It also underlines the importance of completing germline mutational analysis in this cohort.[18] The low rate of germline mutational analysis may be due to a lack of clinician awareness of specific gene profiles that warrant further investigation. This phenomenon may also be due to poor clinician cognisance of referral pathways for these patients. In the UK, improved awareness through the appointment of a local "Lynch champion", along with regional expert networks, showed improvements in all testing related to LS screening in patients diagnosed with CRC.[19]

The present study has several limitations, primarily its retrospective design and reliance on electronic records, which means that there may be incomplete and missing information. This is also a single-institutional review, and therefore the generalisability of the results to other institutions in Aotearoa New Zealand is not known. However, the objective of this study was not to make conclusive comments on national testing standards and instead to identify any existing gaps in testing which may then be subject to quality improvement. Missing data and incomplete testing also limit the accuracy of the estimate of LS in patients diagnosed with CRC. It does, however, include a large number of patients over a reasonable time period.

Conclusion

Rates of universal IHC testing in patients with colorectal cancer in Te Tai Tokerau are high and improved significantly once colonoscopic and radiological biopsies were included in assessment. Low rates of hypermethylation testing of the MLH1 promoter region and germline mutational analysis persisted across the study period and may mean that patients who have LS are not appropriately identified and followed up. Based on the results of this study, we would recommend similar audits be carried out across Aotearoa New Zealand. A future quality improvement study should also increase the awareness of LS testing through local "Lynch champions", as was proven successful in the UK.

COMPETING INTERESTS
None to declare.

AUTHOR INFORMATION
Nejo Joseph, MBChB: Department of Surgery, The University of Auckland, Auckland, New Zealand.
Matthew J McGuinness, MBChB: Department of General Surgery, Whangārei Hospital, Te Tai Tokerau, Whangārei, New Zealand; Department of Surgery, The University of Auckland, Auckland, New Zealand.
Cavaghn H Prosser: Department of Surgery, The University of Auckland, Auckland, New Zealand.
Georgina Trifinovich, MBChB: Department of Surgery, The University of Auckland, Auckland, New Zealand.
William Xu, MBChB: Department of General Surgery, Whangārei Hospital, Te Tai Tokerau, Whangārei, New Zealand; Department of Surgery, The University of Auckland, Auckland, New Zealand.
Christopher Harmston, MBChB, FRACS: Department of General Surgery, Whangārei Hospital, Te Tai Tokerau, Whangārei, New Zealand; Department of Surgery, The University of Auckland, Auckland, New Zealand.

CORRESPONDING AUTHOR
Mr Christopher Harmston: Consultant Surgeon, Department of General Surgery, Whangārei Hospital, Te Whatu Ora – Te Tai Tokerau, Whangārei, New Zealand. Ph: +64 (0)21 270 5751. E: harmstonchris@gmail.com

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Intentional physical self-injury in Auckland: patterns, associations and clinical implications in a single-centre cross-sectional study

Divyansh Panesar, Ian Civil

ABSTRACT

INTRODUCTION: Intentional physical self-injury (IPSI) is a pressing health challenge and there is little awareness of injury patterns, management and outcomes. This study examines IPSI's epidemiological and clinical aspects in one major Auckland hospital, highlighting demography, injury patterns and implications for clinical practice and prevention.

METHODS: Using Auckland City Hospital Trauma Registry data, a retrospective, descriptive study was conducted covering adult patients admitted from January 2015 to December 2019. It assessed demographic characteristics, injury patterns and outcomes, using Mann–Whitney U tests, Fisher's exact tests and Chi-squared tests.

RESULTS: Among 137 IPSI admissions, 92 (67%) required surgery, and 24% experienced post-operative complications. Major trauma was identified in 39 (28.5%) admissions. Discharge destinations varied, with only 64 (47%) patients returning home unassisted. Injury severity did not significantly vary across sex, age or injury event location. Major injuries often resulted from falls (19 of 39) and minor injuries from lacerations/stabs (73 of 98).

CONCLUSIONS: IPSI represents a significant challenge to Auckland health services, with a notable burden of care. The study highlights the need for targeted interventions to reduce the incidence of IPSI and improve outcomes. It underscores the importance of multi-disciplinary approaches to care, integrating surgical, mental health and rehabilitative services.

The New Zealand Injury Prevention Strategy (NZIPS) identifies suicide and intentional self-harm as one of the six priority areas for national injury prevention.[1] To date, there has been no comprehensive assessment conducted in New Zealand of patients with intentional physical self-injury (IPSI). IPSI and self-harm, which encompasses a range of behaviours irrespective of the apparent intent to die, remain significant predictors of suicidal behaviour and poor mental health outcomes.[2,3] Individuals with a history of self-harm are at a considerably higher risk of suicide, with a recent estimate of 20 self-harm episodes for each suicide death annually.[4] Often viewed as categorically separate, self-harm and suicide are closely related across intervention and prevention metrics.[5] From 2015 onwards, an increase in self-harm presentations to the trauma service was on the rise, with almost double the admissions seen at the end of the 5-year period.[6]

Table 1: Self-harm admissions per year to the Auckland City Hospital Trauma Service from 2015–2019.

Year	Admissions	Per 100,000 people
2019	21	1.9
2018	25	2.3
2017	29	2.3
2016	29	2.6
2015	37	2.6

In New Zealand, a history of self-harm is identified as a potential predictor of future suicidal behaviours, with toxic substance use and physical self-injury being the primary modes of self-harm.[7] Surgeons and trauma specialists are often the first point of contact for patients who have a broad range of self-inflicted physical injuries.[8] They are at the forefront of self-harm care alongside emergency, primary health and mental health services. Despite significant public health concern and concerted efforts, the country continues to report particularly high rates of suicide and self-harm, especially for its youth and Indigenous Māori population.[1,9] With a median age of 29, younger New Zealanders are over-represented.[7] Official reports suggest that the true incidence of intentional self-harm in New Zealand is higher than what is formally recorded, with depressive disorders being the leading cause of years lived with disability (YLDs).[7,10] There is also inconsistency in data collection and coding, which may potentially under-estimate the true burden of self-harm, highlighting the need for improved data collection and reporting systems.

Globally, physical self-injury trends are heterogenous across various regions and demographics; however, there is clear indication that physical forms of self-injury are associated with significant psychological distress and comorbidity.[11] Similar over-representation of Indigenous and youth populations are seen in Australia, although there is a lack of a standardised approach to data collection and coding.[12] Studies indicate that there is significant variability in the management of self-harm patients, both from a mental health and a surgical perspective.[13,14] IPSI patients often have severe injuries that require substantial health resources in the initial and long-term period.[13,15] When committed with intent, such injuries are more severe than if occurring unintentionally.[15] The costs associated with treating these injuries are significant, indicating a need for efficient resource allocation.

There is also a growing recognition of the need for improved data collection and real-time surveillance systems to inform effective interventions as accurate data is crucial for understanding the epidemiology of self-harm, guiding interventions and ultimately improving patient outcomes.[16] New Zealand therefore requires improved surveillance and reporting systems for intentional self-harm to guide public health interventions effectively, with heterogeneity among certain sub-groups that may require targeted approaches.[9,17] This study aims to take the first step in exploring the injury patterns associated with IPSI and in providing a descriptive baseline of IPSI management and outcomes, particularly focussing on a single-centre experience. By establishing a descriptive baseline for IPSI management and outcomes, a benchmark can be developed as a foundational reference point that future research can build upon.

The primary objective of the study is to describe the epidemiology and injury characteristics of these patients, and secondarily to describe the differences in major and minor injuries, as well as the management of the patients.

Methodology

This retrospective descriptive study aimed to identify and characterise IPSI patients admitted to Te Toka Tumai Auckland – Auckland City Hospital (ACH) from 1 January 2015 to 31 December 2019. The STrengthening the Reporting of OBservational studies in Epidemiology (STROBE) checklist for cross-sectional studies was used in the reporting of this observational study.[18] The authors hypothesised that IPSI would have distinct injury types and patterns and perform poorly across all objectives—especially with more severe injuries.

ACH was deemed a suitable centre as it serviced the sizable demographic of both the Auckland Central and Waitematā districts at the time, which had a combined population of approximately 1.1 million.[19,20] IPSI was defined as deliberate injury or destruction of one's own body tissue. Drowning, burns and ingestion of toxic substances were excluded, as their primary management did not consistently involve the trauma service, and patients would often be directly admitted to nonsurgical services or transferred to other centres (e.g., specialist burns services). Ethics approval for the retrospective data review was provided by the Northern B Health and Disability Ethics Committee (reference 20/NTB/58), a decision made through the Full Review pathway. The study utilised data from the ACH Trauma Registry, which has been collecting comprehensive patient data since 1994, making it one of the most detailed and long-standing registries of its kind in New Zealand.[6]

The ACH trauma registry, utilising Collector® software, was accessed for a cohort of patients admitted between and inclusive of the years 2015 to 2019. A formal report was generated for admissions under the Auckland trauma service with the filter query

"SELF HARM" and "SELF INFLICTED". Excluded from the study were patients who did not meet the defined IPSI criteria, those under the age of 15, delayed presentations exceeding 7 days post-injury, burns, hangings, drownings and patients transferred from another hospital. The paediatric population was excluded as they would directly present to Starship Children's Hospital, which has a separate trauma team and pathways. The data retrieved were from coded medical records submitted and recorded by health professionals. All hospitalisations were coded using the International Statistical Classification of Diseases and Related Health Problems, Australian Modification (ICD-10-AM). Data accessed included patient demographics (age, sex, employment, address) and injury characteristics (aetiology, geographic location, mortality, inpatient complications, length of stay [LOS] and discharge destination). The Injury Severity Score (ISS) of each patient was extracted and calculated upon the Abbreviated Injury Scale 1998 ordinal scale.[6] This was grouped into major (ISS >15) and minor (ISS 15 or less) injuries. Statistical analysis and graphical representation were conducted using Microsoft Excel and the Microsoft Data Analysis Toolpack plug-in. For all continuous variables, the median and interquartile range (IQR) were used. The Kolmogorov–Smirnov test of normality was used to determine sample distribution, the majority of which was non-parametric. The Fisher's exact test (for smaller sample sizes) and Mann–Whitney U test were employed to compare ordinal or continuous data, and categorical variables were compared using the Chi-squared ($\chi 2$) test. A p-value ≤ 0.05 signified a statistically significant result.

Results

Demography

Within the 5-year period examined, there were approximately 8,500 total trauma admissions, with 141 admissions meeting the inclusion criteria for IPSI; however, four were excluded due to incomplete data available. This left 99 male and 38 female patients with a sex ratio (male to female) of 2:6:1. The median age of patients was 33 years (IQR 24–51) with ages ranging from 15 to 91 years. Students and unemployed persons comprised 15% (n=20) and 37% (n=51) of the IPSI cohort. Half of all IPSI patients were at their home address at time of injury. There was no significant association between where the injury occurred (home or away) and the severity of the injury.

Injury characteristics

In total, 39 (28.5%) IPSI admissions met the criteria for major trauma (ISS >15), with no statistically significant difference between men and women. Using the Mann–Whitney U test, no statistically significant difference was found between the median ages of patients with major (39) versus minor (32) injuries (p=0.64). There was no mortality among minor injury IPSI patients; however, seven patients with major IPSI died, indicating 5% of the total population and 18% of the major trauma population. The predominant mode of injury was either falls from height with 19 cases (49%) for major trauma or lacerations/stabs with 73 cases (75%) for minor trauma. There was no statistically significant difference in the injury severity between patients who were injured at home versus those who were not. There was a statistically significant association between the mechanism of injury and its severity as those with laceration/stab type injuries were less likely to have major trauma, comprising only 6% (n=8) of the whole population group. There was no significant difference in the injury severity between the primary parts injured. Head and neck injuries were the most common, followed closely by extremity (limbs) and abdominal/pelvic injuries.

Outcomes and management

Operative management during inpatient admission was pursued in 92 (67%) cases, with a complication rate of 24%. These are outlined in Table 3.

Utilising the Mann–Whitney U test, the median ISS of patients with operative management of 7 (IQR 1–22) was significantly higher than the ISS of patients with non-operative management (NOM) of 2 (IQR 1–11.5) with p=0.02. The same was found when comparing median ISS across patients with no post-operative complications—4 (IQR 1–10)—and those with complications—27 (IQR 22–38). Patients with injuries to extremities (n=73, i.e., 53%) were most likely to receive operative management, followed by those with abdominal and head and neck injuries.

Sixty-four patients (47%) were discharged home without assistance, with a significant difference when compared across major and minor injury as only 11 (28%) of the major IPSI cohort could be discharged home compared to 53 (54%) of the minor IPSI cohort. Those who were not discharged home without assistance either went to other tertiary, rehabilitation or residential

Table 2: Descriptive analysis of injury patterns and outcomes for IPSI patients admitted to the Auckland City Hospital Trauma Service 2015–2019.

	n Minor (ISS ≤15) *		n Major (ISS >15) *	
Location of occurrence—no difference				
Home	53	39%	15	11%
Away	45	33%	24	18%
				X^2 2.7228; p-value .098922
Sex distribution—no difference				
Female	28	20%	10	20%
Male	70	51%	29	51%
				X^2 0.1195; p-value .729554.
Mechanism (expanded)				
Fall	9	7%	19	14%
Laceration/stab	73	53%	8	6%
Pedestrian	5	4%	3	2%
MVA	7	5%	2	1%
Other	2	1%	9	7%
				X^2 40.8421; p-value <0.01.
Mechanism (contracted)				
Fall	9	7%	19	14%
Lacerations/stab	73	53%	8	6%
Other	16	12%	12	9%
				X^2 37.9291; p-value <0.01
Management				
Operative	60	44%	32	23%
Non-operative	38	28%	7	5%
				X^2 5.486; p-value .02
Discharge				
Home, no assistance	53	39%	11	8%
Other	45	33%	28	20%
				X^2 7.5045; p-value 0.01

Table 2 (continued): Descriptive analysis of injury patterns and outcomes for IPSI patients admitted to the Auckland City Hospital Trauma Service 2015–2019.

Case fatality				
Alive	98	72%	32	23%
Dead	0	0%	7	5%
				Fisher's exact test and p-value <0.01
Primary part injured, grouped by management				
	n Operative *		**n Non-operative ***	
Head and neck	29	21%	17	12%
Extremity	31	23%	4	3%
Other	3	2%	10	7%
Chest	6	4%	7	5%
Abdomen	23	17%	7	5%
				X^2 22.9109; p-value <0.01

* Raw number | percentage of whole population.

Figure 1: Mechanism of injury vs primary part injured for IPSI patients admitted to the Auckland City Hospital Trauma Service 2015–2019.

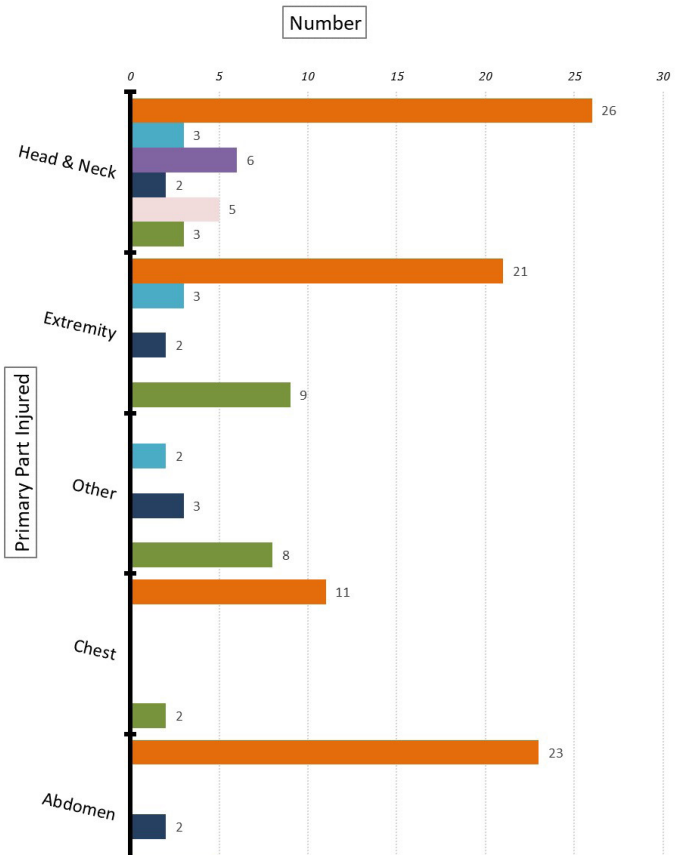
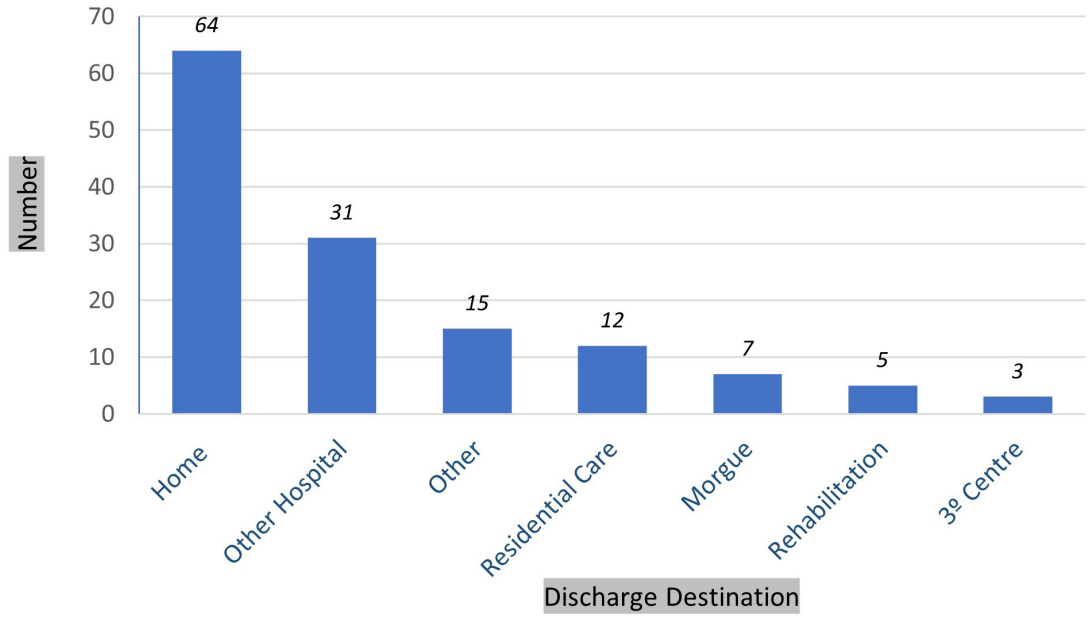


Table 3: Post-operative complications for IPSI patients.

Complication		Number
Cardiopulmonary	Aspiration	1
	Pneumothorax	1
	Pulmonary embolus	1
	Arrythmia	1
	Myocardial infarction	1
Infection	Empyema	2
	Meningitis	1
	Pneumonia	2
	Urinary	1
	Other Infection	1
Other	Death	4
	Pressure sore	1
	Other, not listed	5

Figure 2: Discharge destination for IPSI patients admitted to Auckland City Hospital 2015–2019.



facilities (including psychiatric care), or required such facilities to be provided in the community/home setting.

Using the Mann–Whitney U test, the median LOS was identical at 3 days for both operative and non-operative groups, with an IQR of 1–7.75 and 2–14 days, respectively (p=0.17). However, when comparing injury severity, the LOS was different: 5 days (IQR 2–11) for major injuries versus 3 days (IQR 1–7.25) for minor injuries (p=0.03).

Discussion

This study is a novel inquiry into IPSI within Auckland, revealing valuable insights that have the potential to impact surgical practice, enhance injury prevention and improve patient management.

Operative management was a likely outcome (67%) for IPSI patients, underscoring a pivotal aspect of treating patients with self-inflicted injuries—namely, the propensity for these cases to frequently require surgery. There is a paucity of evidence regarding the likelihood of surgical interventions for trauma admissions within an inpatient period; however, some estimates suggest that this may range from upwards of 30 to 45 per cent.[21,22] Extremity injuries were more likely to require operative management than abdominal or head and neck injuries. This is in line with NOM of abdominal and neck injuries being increasingly favoured over mandatory surgical exploration, with growing acceptance and success rates in selected cases.[23,24] Radiological adjuncts such as angiography and percutaneous drainage are noted to enhance the success rates of NOM, though risks of missed injuries and delayed haemorrhage remain considerations.[23] This also highlights the vital role comprehensive understanding of injury characteristics plays in anticipating operative management in IPSI cases. Detailed analysis of injury anatomy and severity becomes instrumental in devising personalised, effective treatment plans.

IPSI patients in this study also had relatively high post-operative complication rates (of 24%). When compared across international trauma data, estimates suggest that post-operative complication rates for trauma patients range from as low as 2.8% in some centres to around 12.5% in others.[25–27] Those with post-operative complications generally had a higher ISS than those who did not, which is generally in line with previously reported associations.[27] However, the presence of concomitant IPSI may compound this effect and aid in risk stratification.[28] Surgeons can use this information to better counsel patients regarding their risk profile for surgery, setting realistic expectations about potential outcomes and complications.

There was an evident relationship between the nature of injury and its severity, with falls from height predominantly accounting for major injuries and lacerations/stabbings defining minor injuries. However, this likely depends on the height from which one has fallen and the depth of injury from lacerations or penetrating wounds. Nevertheless, the association is in line with established injury patterns for physical self-injury, as jumping from height is a known precipitant for polytrauma and severe injury especially in the context of clear suicidal intent.[29] Self-inflicted stab or laceration wounds also seem a consistent feature in self-harm presentations internationally; however, research in this area does skew heavily towards Western countries.[13,30]

These associations indicate a complex relationship between the nature of an injury and its potential impact on the individual in the context of IPSI. It underscores the necessity for bespoke preventive measures and mental health interventions designed to mitigate the incidence of IPSI. Recognising injury patterns that are more likely to cause major trauma can enable front-line clinicians to anticipate and promptly address these, potentially reducing the time to treatment and improving outcomes. From a public health perspective, it necessitates the inclusion of preventative strategies such as infrastructure modifications and responsible media coverage. Such means-restriction strategies have been outlined previously by the World Health Organization and proven successful in New Zealand—as seen with the reintroduction of barriers on Auckland's Grafton Bridge.[31,32] However, despite recognising their importance, policies for preventing falls or jumps from height remain absent in New Zealand's suicide prevention strategies.[33]

Interestingly, the case fatality rate reported in this study for major trauma (18%) was higher than that reported for all major trauma in Auckland (12.5%) and New Zealand (8.4%).[6,34] The selection of 2019 as a baseline for comparison was based on its relevance as the most recent year of data available at the time of analysis. The mortality rate for self-inflicted injuries in trauma populations varies significantly; however, self-inflicted injury is consistently demonstrated as an independent

risk factor for increased mortality compared to non-intentional injuries.[35,36] Such findings draw attention to the heightened vulnerability of IPSI patients and highlight the severe implications of self-inflicted injuries on patient outcomes and healthcare systems. Identifying populations with higher mortality rates guides healthcare policy and resource allocation, and understanding that IPSI carries a higher risk of fatality supports the inclusion of prevention measures into the broader public health agenda.

Of the patients who survived, most could not be discharged directly home, indicating increased reliance on alternative care or rehabilitation facilities. This was further compounded by injury severity, with major trauma IPSI having an even lesser discharge-to-home rate. The presence of IPSI may indicate a more pronounced need for healthcare resources across rehabilitation services, including physical therapy, occupational therapy and psychological support. Multidisciplinary input should be instated at the early stages of trauma care to mitigate the challenge of discharge planning for IPSI patients. This post-hospitalisation trajectory also illuminates the necessity for robust support systems, prolonged post-discharge care and the establishment of long-term rehabilitation services.

There exists a wealth of evidence signifying previous self-harm as an independent risk factor for readmission for psychological distress, indicating significant mental health service use to be anticipated post-discharge.[37] However, data on the broader resource requirements for IPSI patients in the trauma setting are limited, especially concerning the need for integrated services. Some estimates suggest that as few as 6% of older patients (65+ years old) with self-inflicted injuries could be discharged directly home.[38] These considerations hold substantial implications for healthcare systems as discharge to a non-home setting often involves coordination with community and social services to ensure that patients have the necessary support upon leaving the hospital. It may be argued that IPSI patients have complex needs that extend beyond immediate mental health services and that the trajectory of recovery for these patients might include long-term rehabilitation, which can be intensive and multifaceted.

When considering the mental health needs in New Zealand, it is essential that a multisystem approach—encompassing primary prevention, public health strategies and mental health services—are cost effective and given due priority. This highlights the need for multidisciplinary trauma teams to acknowledge and integrate the often overlooked burden of mental health into their patient care protocols. Operative management must adhere to principles of acute trauma care but also consider the burden of psychosocial distress. Along with their peers, surgeons must navigate the complex ethical, psychological and medical considerations associated with self-harm, including assessing the patient's capacity to consent to treatment, understanding the underlying causes of self-harm and coordinating with mental health professionals to address both immediate and long-term needs.[8]

Several obstacles exist to the provision of adequate healthcare for mental health patients across both psychosocial and medical systems. Patients who self-harm, and healthcare workers who try to help, are often met with barriers ranging from stigmatisation to bureaucracy—such as fragmented service delivery.[39,40] Many clinicians, especially early career professionals, may experience negative attitudes towards mental health service users, which can impede the provision of compassionate and effective care.[41,42] It is suggested that such attitudes likely stem from a combination of lack of training, personal biases and systemic issues within healthcare education and policy.[41,42]

Finally, exploring the impact of IPSI from the Māori perspective is the next logical step of this research. Future work in this field should be conducted with Kaupapa Māori research-based principles. The results of this would warrant its own, separate study, in partnership with (if not solely by) Māori research experts. The interpretation of Māori data requires the expertise of kaitiaki and access to cultural resources, which are crucial in suicide prevention strategies. Currently, official data indicate that Māori are at an increased risk of suicide compared to non-Māori populations in New Zealand.[43] However, a conflicting viewpoint is represented when focussing on the university population, which suggests that Māori are at less risk of self-harm than other ethnicities.[44] The unexpected result might indicate variances in reporting and the cultural differences in university and non-university Māori groups, into which the effects of historic colonisation and marginalisation play an important role. It is crucial that research involving Māori data must be done and authorised by Māori in its application to enhance the cultural validity of the research.[45]

The viewpoint of the current study is to be a precursor to more nuanced discussions regarding IPSI in the New Zealand demographic—the first step. Further research should explore these aspects in depth, ensuring a holistic understanding of the underlying factors and how these may be influenced.

Limitations

This study, through its single-centre design and relatively small cohort size, is constrained in the wider applicability of its findings. The absence of preceding research in New Zealand presents a challenge in providing context to our findings; however, it must be emphasised that the purpose of the study was exploratory and hypothesis generating, rather than hypothesis testing. Comparisons were only made to ACH registry data from 2019, and a comprehensive analysis of the full 5-year dataset may offer more extensive insights but could also introduce complexity. Moreover, this study, being retrospective in nature and predating the COVID-19 era, is ill-equipped to consider the far-reaching impact of the pandemic on mental health globally. It does not account for the pandemic's psychosocial impact, which may have influenced the incidence and nature of IPSI. The study is reliant upon accurately coded medical records and potential variations in the human input of this data may have introduced information bias. Finally, the lack of access to mental health records restricted a more comprehensive interpretation of data. Psychiatric histories may provide insights into the motivations and risk factors associated with IPSI, allowing an examination of the correlation between psychiatric conditions and the methods or severity of IPSI.

Conclusion

This single-centre cross-sectional study conducted at Te Toka Tumai Auckland – ACH from 2015 to 2019 provides insight into the epidemiology, injury patterns and outcomes of IPSI in Auckland, New Zealand. Our findings draw attention to the unique characteristics and needs of IPSI patients within the trauma population, signifying the necessity for specialised consideration from surgeons, healthcare systems and public health initiatives. It brings to light a noteworthy proportion requiring operative management and the variation in injury patterns. The disparities in injury outcomes, particularly the higher case fatality rate observed in patients with major trauma compared to national averages, call for a concerted effort to improve preventative measures and healthcare responses to self-inflicted injuries. The observed reliance on post-hospitalisation resources, especially for patients with severe injuries, highlights the necessity for integrated care pathways that encompass not only acute medical treatment but also long-term rehabilitation and mental health support. The study offers an initial overview of IPSI within New Zealand and flags the importance of further examination into the factors contributing to these injuries. It is vital that future research explores the societal and cultural aspects of IPSI, with methodology that honours prevention and with intervention strategies that are both culturally sensitive and effective.

COMPETING INTERESTS
The authors have no competing interests to declare.

AUTHOR INFORMATION
Dr Divyansh Panesar: Department of General Surgery, Hutt Hospital, Health New Zealand – Te Whatu Ora.
Professor Ian Civil: Trauma Services, Te Toka Tumai Auckland, Health New Zealand – Te Whatu Ora.

CORRESPONDING AUTHOR
Dr Divyansh Panesar: Department of General Surgery, Hutt Hospital, Health New Zealand – Te Whatu Ora.
E: dpan151@aucklanduni.ac.nz

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Midwifery experiences in rural Southern Aotearoa New Zealand: insights into pre-eclampsia management

Judith Sligo, Julia Corfe-Tan, Zoe Cotter, Jimmy Senara Eteuati, Hannah-Rose Hart, Rachael McConnell

ABSTRACT

AIM: This study investigated the experiences of rural midwives in the Southern region of Aotearoa New Zealand, focussing on practices and challenges in caring for pregnant individuals displaying signs of pre-eclampsia (PE).

METHOD: Conducted as part of the University of Otago's Trainee Intern Healthcare Evaluation Project, investigating the efficacy of the soluble FMS-like tyrosine kinase 1 (sFlt-1)/placental growth factor (PlGF) ratio test, this exploratory study employed qualitative research methods. Twenty-three midwives from nine locations across the Southern region were interviewed by trainee intern doctors (TIs) using a semi-structured interview protocol. Thematic analysis was applied to the data.

RESULTS: The study highlighted the challenging context of rural midwifery, emphasising diverse working conditions, geographic complexities and the impact of the midwifery shortage. Midwives' decision making about PE depended on location, experience, scientific evidence, holistic model of care and the constant concern about PE. A model illustrating midwifery decision making in PE management was developed.

CONCLUSION: Rural midwives in Aotearoa New Zealand's Southern region managing PE cases face complex challenges. The model derived from this study illustrates the delicate balance that rural midwives navigate, emphasising the need for strategies to support their practice and preserve Aotearoa New Zealand's distinctive maternity care model.

Pre-eclampsia (PE) is a serious medical condition of pregnancy affecting approximately 3–8% of pregnancies, and is associated with significant maternal and fetal morbidity and mortality.[1–5] It is a progressive multisystem disorder characterised by new onset of hypertension and evidence of organ damage—including renal or liver insufficiency—haematological complications, neurological symptoms and evidence of uteroplacental dysfunction such as fetal growth restriction.[1,2] Although understanding of this heterogeneous syndrome has improved, the pathogenesis remains uncertain, with research focussing on the pro-angiogenic placental growth factor (PlGF), anti-angiogenic factor soluble FMS-like tyrosine kinase 1 (sFlt-1) and vascular endothelial growth factor (VEGF).[5–8] The sFlt-1/PlGF ratio test is internationally recognised for confidently excluding PE in pregnant individuals of at least 20 weeks gestation with symptoms of PE for at least 1 week following testing.[7–9] Preliminary Aotearoa New Zealand research supports its applicability and comparable performance, suggesting its use may aid risk stratification in suspected PE.[10]

Practitioner and patient education along with guidelines and protocols inform the management of PE; however, assessing risk and decision-making demands considerable clinical judgment.[2,11–13] Aotearoa New Zealand's unique model of maternity care, funded by the Ministry of Health – Manatū Hauora, is centred around the principles of partnership and the provision of continuity of holistic care.[14,15] Lead maternity carers (LMCs), primarily midwives, are the main maternity providers, responsible for assessing needs, planning and coordinating care from early pregnancy until 6 weeks post-birth.[16,17]

This article explores the experiences of rural midwives caring for pregnant individuals with symptoms of PE in the Southern region of Te Waipounamu South Island, Aotearoa New Zealand. The aim of this study was to assess the efficacy of introducing the sFlt-1/PlGF ratio test for PE risk evaluation in the Southern region.[18]

Methods

This exploratory qualitative study, conducted by trainee interns (TIs) under the supervision of the first author, addresses interest in understanding rural midwives' perspectives on implementing the sFlt-1/PlGF ratio test in the Southern region of Aotearoa New Zealand. As part of their training, groups of TIs undertake a supervised 6-week research project in collaboration with a client (in this case, an obstetrician and obstetric registrar).[18] Ethical approval was obtained from the University of Otago Human Ethics Committee (Ref 23/073). Using purposeful and snowball strategies, 54 rural midwives practising in the Southern district were identified and 49 were able to be contacted via email and/or telephone. Twenty-three (47% of those contacted) from nine locations were recruited and allocated code names linked to their location. TIs conducted interviews via Zoom (six), telephone (16), and one in person, employing a semi-structured, open-ended interview protocol developed collaboratively with the supervisor, an obstetrician and an obstetric registrar. The interviews, lasting 10–32 minutes (mean=21), focussed on midwives' practices for managing clients with PE symptoms and knowledge of the sFlt-1/PlGF ratio test. Interviews were recorded, transcribed and initially coded by multiple TIs using descriptive thematic analysis. Subsequent analysis involved the first four authors employing an inductive brainstorming approach to identify themes related to procedures, processes and understandings of Southern rural midwives who worked with clients exhibiting symptoms of PE.[19,20]

Results

Participant demographic characteristics are summarised in Table 1. Most interviewees were Aotearoa New Zealand-trained, full-time LMCs, although many had experience in other roles, including as core midwives and managers. Midwifery experience ranged from 1 to 39 years (mean=13), with most midwives caring for an average of four to six clients per month.

1. The challenging context of rural midwives' work

Southern rural midwives encountered diverse working conditions but shared common characteristics as skilled professionals whose clinical judgment in a unique, complex and often isolated environment was pivotal for those in their care. The region's broad geography made secondary and tertiary services within an hour's drive or several hours away (up to 300 kilometres from a hospital), depending on where their client lived. Pregnant individuals with PE signs or symptoms frequently were required to travel to these centres for monitoring. As one midwife explained:

> *Sometimes the complexities of being a rural midwife and caring for women who needed to access that secondary/tertiary care, with which we had a great relationship with our base hospital … but we did manage probably a lot rurally already for women who needed that extra surveillance and assessment. So, we did a lot of that before our women actually got to Dunedin. (B2)*

Challenges in the rural context were exacerbated by factors like economic pressures on families, variable laboratory facility access and distance-related logistics. When discussing managing clients with symptoms of PE, one midwife remarked, "*It sometimes just depended on also where I was, where they lived, and the time of the day*" (A4). Blood analyses not available locally required transport to larger, distant laboratories, which was to be the case for the sFlt-1/PlGF ratio test. Access to laboratory services varied considerably across the region, with some having access to relatively close laboratories that could conduct most of the required tests, through to those who were reliant on getting samples to a regional general practice for a twice-daily courier pickup to then be delivered to the laboratory in Dunedin. In most areas, courier services were not available on weekends. Fluctuations with courier services and access to testing and analysis facilities contributed to other challenges, such as blood samples going missing or failing to reach the correct destination, especially on weekends: "*But there was always some sort of hiccup with couriers and things on the weekends.*" (I2)

Birthing units were unavailable in most centres and rural units lacked antenatal capability for regular monitoring. Midwives assessed risk, gestation, distance to secondary or tertiary hospitals and weather conditions that could make helicopter or car trips treacherous. The vast distance and challenging terrain were not always understood by urban colleagues. Midwives recounted doctors suggesting clients "drop in" to see an obstetrician or

Table 1: Demographics of participants.

Characteristics	Number of participants n=23
District hub location	
Central & Clutha District	8
Queenstown-Lakes District	7
Waitaki & Southland District	8
Current role	
Lead maternity carer (employed or independent)	20
Core midwife	1
Primary unit manager	2
Employment	
Full-time	22
Part-time	1
Midwifery training	
Bachelor of Midwifery	17
Diploma of Midwifery	1
Overseas	1
Unknown	4
Years of midwifery experience	
<5 years	5
5–9 years	4
10–15 years	6
16–20 years	1
20+ years	6
Unknown	1
Years of rural midwifery experience	
<5 years	7
5–9 years	6
10–15 years	4
16–20 years	1
20+ years	4
Unknown	1

Table 1 (continued): Demographics of participants.

Average number of clients per month	
N/A to core & managerial midwifery roles	3
1–3	3
4–6	12
7–10	5

advising midwives to increase monitoring.

> *Even if you've got a locum, or a new registrar from up north or somewhere they might know where our location is, but they don't understand what services we can provide. (Q1)*

> *They might ask that we keep an eye on her, but we're like, "Hey look we're under-resourced up here. We can't keep checking bloods, there's no quick time frame." So generally, we have a very low threshold to getting women out of the region. (W2)*

Midwives described the stress of their work, exacerbated by the midwifery workforce shortage, which has disproportionately affected rural areas.[21] In response, various employment arrangements, workarounds and new local systems were adopted. Employment and partnership arrangements varied, with several mentioning recent or anticipated changes in their work.

> *We've been self-employed midwives, but we're turning into a team employed by Te Whatu Ora. (W1)*

> *Te Whatu Ora Southern have employed four of us to look after the women in the area antenatally during labour and birth if they want to birth locally, and postnatally, but not travelling through to the base hospitals to provide their labour and birth care. (A2)*

> *I work with one other midwife and we used to have our own clients and we now have a shared caseload. (A5)*

To address limited laboratory facilities and courier services, midwives described transporting blood samples to laboratories themselves or getting the client/family to do so. Some locations had recent or proposed improvements, such as one centre's capability to perform a protein creatinine ratio test, another processing urgent after-hours blood tests and a growing rural centre establishing a birthing unit with postnatal beds.

New local interventions were intended to alleviate pressure on rural midwives in the long term, but their initial implementation was stressful and often added extra challenges, among which midwives provided continual care and support, sometimes without compensation:

> *We still find about 50% of our caseload won't birth in this area. They go to the city, which is why midwives who want the equivalent of a full-time job all carry quite a big caseload because we lose a lot of the income attached to the birth fee if a woman has to birth in the city. (W4)*

Moreover, it was noted that while the rural maternity healthcare sector is particularly under stress, the entire healthcare system in Aotearoa New Zealand was stretched almost beyond capacity.[22] As one midwife pointed out:

> *I guess it's the same as all the health system in New Zealand. It's all a bit broken at the moment, isn't it? (Wi1)*

2. Tests and evidence to guide decision making

Rural midwives expressed enthusiasm for learning about tests or interventions to identify PE. Their practice was evidence based, utilising standard tests, examinations and observations to inform decision making. One midwife described using empirical and observational information to guide decisions:

I do PE screen, liver function, kidney function and do a urine PCR. So that would be my normal practice if the blood pressure is high … to do those tests first and then only refer to the consultants if those tests were abnormal. Or if the blood pressure got above 150. If they're abnormal, [I'd do a] *PE screen and I'd just monitor them regularly, get growth scans and things. So, I tend to monitor that mild sort of pre-PE myself, and then refer once I get more confirmed diagnosis. (I1)*

Midwives adhered to standard guidelines for monitoring and managing clients with suspected PE, with one midwife noting, "*We don't practice in the grey*" (B1). They had a clear awareness of their scope of practice and handed over responsibility to the obstetricians when necessary:

From our point of view, it's quite straightforward, and if the obstetricians want any further testing done, that's done through them after we consult. (G1)

If it meets the referral guidelines, I would do a phone consult to the obstetric team. (Wi2)

Midwives expressed a desire for more information on the sFlt-1/PlGF ratio test's accuracy, physiology and scientific basis, seeking reassurance about its reliability while acknowledging the importance of obstetricians' support for new tests:

We kind of rely on the advice from the obstetric team. If they could tell us how this would benefit the woman and they were comfortable doing this instead of our current process, then we would be happy to go along with that. (O1)

Midwives were committed to integrating new assessment tools into their practice, providing they were evidence based and applicable in their context. Midwives acknowledged that it was challenging to find time to undergo professional development, and few had heard about the sFlt-1/PlGF ratio test prior to this research. However, all described preferences for ways to increase their knowledge and education about the test if it were deemed useful for their practice. Many suggested practical education sessions, preferably locally. Others preferred being able to access information in their own time via recordings. Most also requested user-friendly information resources to share with their clients.

Despite their general enthusiasm and theoretical support for the sFlt-1/PlGF ratio test, some of the participants identified their concerns about the efficacy of the test in the rural context. The potential benefits of the sFlt-1/PlGF ratio test to eliminate imminent risk of PE and reduce hospitalisations were compromised by logistical barriers, particularly the need to send tests to Dunedin:

So that concerns me that it [analysis] *would be Dunedin-based. It is a time-sensitive issue because you can go from being borderline blood pressure to high quite quickly. (A4)*

If the idea is to keep women in their areas, then the test needs to be in the area, so that's actually a dealbreaker. (O2)

Nevertheless, participants were supportive of any measures that could be part of the toolkit to improve the care for their clients and, despite the logistical challenges of timing noted above, several discussed different ways that they could envisage the test being used effectively. One suggestion, which has been successfully implemented since the research was completed, was that the test might have utility for those being monitored in a secondary hospital, if it were used to inform the decision whether to return the pregnant person to the rural setting:

There's still a benefit for women who we may not be comfortable keeping up here. If she did end up down in Dunedin, and could have this test done, then it might buy her 6 days at home. If she's had an assessment by the Obs and Gynae team it may be enough to send her back home for the next week. (W4)

3. Midwifery model of care

Aligned with the midwifery philosophy in Aotearoa New Zealand, these midwives aimed to work in partnership holistically with their clients and whānau to support normal birth.[17] This commitment was evident in the way midwives described cultivating reciprocal client

relationships. Midwives educated clients and their families about PE and encouraged self-monitoring to recognise symptoms and when to contact their midwives. Midwives were concerned about disruption to family wellbeing if clients required transfer to a secondary or tertiary facility:

> *Say the woman lives in* [rural area]*, it will take her 2½ hours by the time she gets in her car to get there, but she hasn't come to the appointment, thinking that that's what she has to do. So, then she has to go home, get all her gear, sort out her family. There's a whole lot of stuff there that that woman has to organise to be able to go over… Like, it doesn't impact on me—other than having to tell the woman that she has to go to Dunedin, and that's disruptive for her family. But it's really disruptive for rural woman to have to do that and their families. (A2)*

Midwives noted that extended travel time could compromise the potential for a natural birth. If clients gave birth in a secondary or tertiary facility, their rural LMC was typically unable to be present. While keen to avoid these disruptions, midwives were also cautious about indicators of PE. When evidence suggested a pregnancy was at risk, midwives sought guidance from the obstetric team. One midwife explained that the holistic midwifery philosophy involved client advocacy and underpinned their decision making and practice:

> *There could be a difference between each midwife and how they do that* [PE] *surveillance, but really you should be consulting like the moment someone is outside of normal. That is outside of our scope of practice, but, if she's a woman with a history of something, at this point in this pregnancy, she's still a well woman with a well baby. (W4)*

A delicate balance existed between midwives' scope of practice, their commitment to evidence-based practice and the consideration of client and whānau wellbeing. One midwife explained this interaction between the medical and midwifery models:

> *What all medical staff forgets is that women are all individuals, and it should be woman-focussed and every time we introduce something* [like this new test] *… what impact does it have on the woman's physical and mental wellbeing? And you've got to be very careful that you're not abnormalising the normal and over-medicalising something. (Wi3)*

This balance was exemplified in midwives' descriptions of how they assess clients' risk with regard to PE. Because of the time sensitivity of diagnosing PE, the utility of the sFlt-1/PlGF ratio test could be merely one component of the analysis of an individual's presentation.

> *It's great to have these new tests and they can be really useful but still relying on some of those old-fashioned assessments. And not waiting for a test, when clearly you've got someone with something sitting right in front of you. (Q1)*

Midwives also noted that elevated blood pressure readings would likely require pregnant people to have an obstetric consultation regardless of the test results.

4. The constant concern about the potential for PE and a range of experiences with managing it

Midwives were vigilant for signs of PE, with one stating, "*Pre-eclampsia referrals and management are probably one of the most common issues that we are dealing with*" (B2). Some midwives referred clients at first signs of PE. Others were comfortable managing "borderline" cases and highlighted diagnostic skills, emphasising that "true" PE is often unmistakable, but sometimes requires luck and intuition for timely diagnosis. Midwives of all experience levels were aware of rapidly escalating PE cases and always emphasised caution.

Several midwives talked of clients with fluctuating blood pressure requiring repeated visits to secondary facilities or rapid deterioration, leading to helicopter transfers for delivery. Emotional terms like "sitting on a timebomb," "time sensitive" and situations turning "nasty" or "derailed" captured midwives' reluctance to handle such cases in a rural setting.

> *Being a rural midwife, probably the one thing that you don't want is a*

woman having a pre-eclamptic seizure or that woman's gone on to develop eclampsia and we're here in the rural area administering IV labetalol. (B2)

The assessment burden could be great, especially with midwives practising alone under obstetric guidance. However, tolerance for certain situations varied:

If it was an abnormal PCR I'd ring [the obstetric team]. *Yeah, they are pretty good normally, but sometimes it depends on who it is. Some people have different levels about what they would be worried about. Sometimes I might have been saying, "Hey, this is not normal", and they'll be like, "Oh, no, that's not that bad" or something. (O2)*

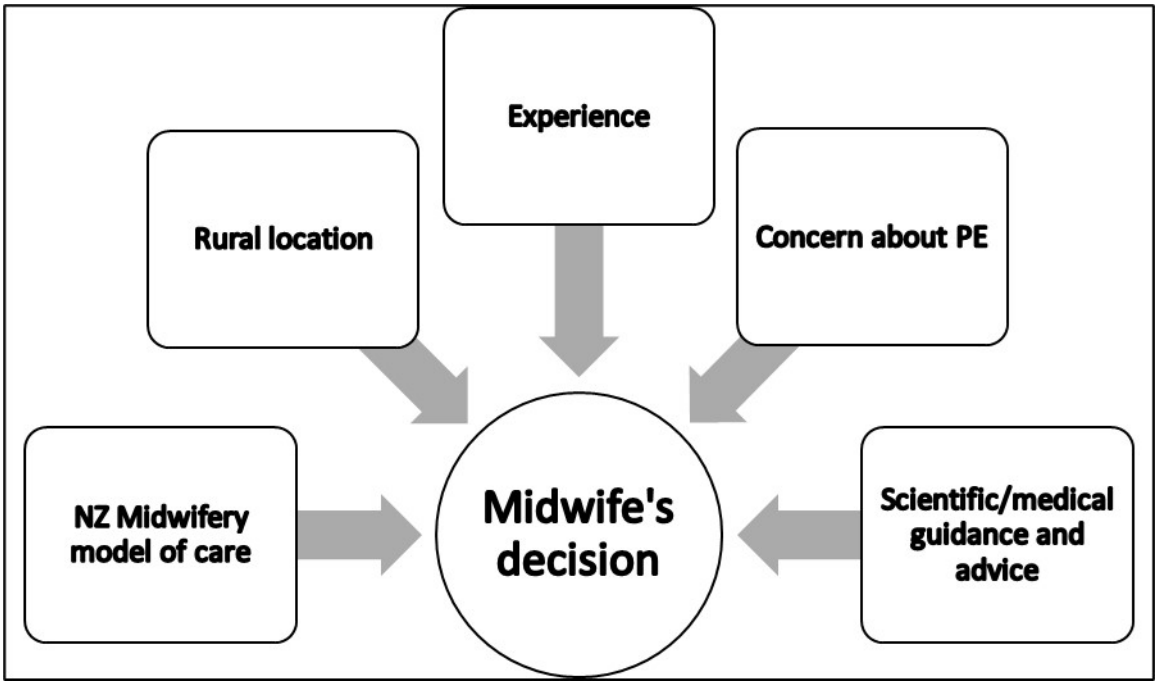
Generally, however, when there were clear signs and symptoms of PE, the recommendation was for the client to go be monitored in a secondary or tertiary facility.

If all the signs and symptoms are showing that it's most likely pre-eclampsia, I'd do a consult with the on-call reg. And then they say, "Get them on the road now." And they will go down in their own car. Usually, they're pretty annoyed that they have to travel all that way, but they do say it's better to be safe than sorry. (A3)

Discussion

Rural midwives in the Southern region of Aotearoa New Zealand bear a significant responsibility in making crucial decisions regarding PE management. Each scenario, with unique pregnant individuals, pregnancies, whānau/families, locations and environments, places the onus on midwives for assessment and decision making. Data analysis from this research provided insights into rural midwifery practice, contributing to the development of a model illustrating how midwives make decisions about PE management in rural Southern Aotearoa New Zealand (see Figure 1). This is conceptualised in the model where rural midwives' PE decision making draws from medical evidence, guidelines and consultation; the rural context (including factors like terrain, weather and whānau/family disruption); a professional partnership philosophy with a foundational understanding of "*women as healthy individuals*

Figure 1: Model of rural midwives' decision making about PE.



progressing through the life cycle"; and midwives' diverse experience in managing PE, a condition known for its seriousness, unpredictability and variable signs and symptoms.[10,17,23]

Midwives were generally consistent in their approach to PE decision making; however, some variation arose in managing clients with minor or early signs and symptoms of PE. Some expressed confidence to handle such cases in the community because they were assured in their ability to recognise developing PE and were reluctant to disrupt rural clients. This sentiment was notably strong among midwives who had witnessed clients sent to urban hospitals multiple times for monitoring, only to return without a PE diagnosis. Alternatively, others who had experienced eclamptic emergencies had a lower threshold for escalating care to an obstetric team. Local services and intervention distance also influenced the level of caution.

Midwives expressed support for PE diagnostic tests and systems. Their endorsement was confirmed by their use of recommended guidelines and medical test evidence, cognisance of professional boundaries and the importance of obstetric consultation. This nuanced perspective aligns with the dynamic midwifery approach, which is "*based upon an integration of knowledge derived from the arts and sciences; tempered by experience and research; collaborative with other health professionals*."[17] However, in the under-resourced rural context, midwives frequently found themselves balancing their core values against practical considerations. This delicate equilibrium was evident in their perspectives on introducing the sFlt/PlGF ratio test. Midwives supported the test in principle, but they felt that the challenges of implementing it in rural areas outweighed its potential benefits.

This work supports local and international research, which suggests that rural midwives face increased vulnerabilities and challenges compared to their urban colleagues.[22–27] Research shows that they require enhanced practical skills, particularly around emergency management; interpersonal relationships; and resourcefulness, courage and stamina to respond to their challenging, unpredictable and sometimes relentless work.[28,29] Evidence suggests that the risk of adverse pregnancy and birth outcomes increases with extensive travel, and midwifery-led continuity of care is correlated with maternal satisfaction and fewer adverse outcomes than other models of care.[29,30]

This study showed similar pressures for these rural Southern midwives, prompting individual, local and structural responses. Post data collection, Aotearoa New Zealand midwives also received a pay equity settlement. Nevertheless, the adequacy of these interventions to retain and sustain a midwifery workforce relied upon by rural families remains uncertain.

Limitations of this study include the brief time frame of the project, which resulted in a relatively small, potentially non-representative sample. Non-participating midwives (due to busyness or unavailability) may hold diverse views. Interview variations were possible because several TIs conducted interviews using different modes (Zoom, telephone and in-person). Furthermore, the research was supported by the obstetric team at Dunedin Hospital with whom the participants have professional relationships.

In conclusion, this study identified complex challenges faced by rural midwives managing PE cases in Aotearoa New Zealand's Southern region. These midwives expressed enthusiasm for any new innovations or tests that could increase the potential for diagnosing PE and restrict clients' travel for monitoring. However, because of the time taken to get samples to an urban laboratory for the analysis of the sFlt-1/PlGF ratio test, midwives thought it had limited efficacy in these rural settings. Nevertheless, midwives indicated that they thought it could be used for reassurance around safe return to rural homes after women had been admitted for monitoring in urban hospitals. Since the completion of the research, the test has, in fact, been used in this way.

The findings highlighted how midwives use their previous experience and knowledge of PE and maintain a delicate balance between evidence-based practice, rural context and midwifery philosophy in their decision making. It is apparent that each rural area and client has specific requirements and challenges, making it very difficult to generalise about specific practice. This research reinforces the importance of customised strategies for preserving Aotearoa New Zealand's distinctive maternity care model and addressing the unique challenges of rural settings.

COMPETING INTERESTS
The authors declare that there is no conflict of interest.

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AUTHOR INFORMATION
Judith Sligo: Senior Lecturer, Department of Preventive and Social Medicine, University of Otago, Dunedin.
Julia Corfe-Tan: House Officer, Te Whatu Ora Capital, Coast and Hutt Valley, Wellington.
Zoe Cotter: House Officer, Te Whatu Ora Te Matau a Maui Hawke's Bay, Hastings.
Jimmy Senara Eteuati: House Officer, Te Whatu Ora Counties Manukau, Middlemore Hospital.
Hannah-Rose Hart: Obstetric & Gynaecological Registrar, Te Whatu Ora Southern, Dunedin.
Rachael McConnell: Obstetrician & Gynaecologist, Te Whatu Ora Southern, Dunedin.

CORRESPONDING AUTHOR
Judith Sligo: Department of Preventive and Social Medicine, University of Otago, PO Box 56, Dunedin, 9054. Ph: 03 479 7223. E: judith.sligo@otago.ac.nz

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Value for money of reusable versus disposable ophthalmic instruments for intravitreal injections

Saghir Ahmed Sadiq, Sarah Winsloe

ABSTRACT

AIM: The aim of this study was to follow the instruments' pathways and cost each segment to calculate whether reusable or disposable ophthalmic instruments offer better value for money for intravitreal injections.

METHODS: The cycles and costs of reusable and single-use disposable instruments used for intravitreal injections were mapped out, including purchase costs, transport to and from the place of use, opening and disposal, sterilisation, replacement, salary costs of staff involved, etc.

RESULTS: The cost of using reusable instruments for intravitreal injections (NZ$29.00) was lower than the cost of using disposable instruments ($30.51) by $1.51 per patient.

CONCLUSIONS: Intravitreal injections performed with reusable instruments offer better value for money than when performed with disposable instruments. This equates to a beneficial financial saving just for this one low-complexity case. Such savings can multiply significantly when considering the instruments used in a wider variety of ophthalmic procedures. There are of course trade-offs between safety, quality, cost and sustainability.

Public health systems have finite resources; hence, it is important to consider value for money in our daily work. Many eye departments have changed wholesale to using single-use disposable instruments for all procedures. This was initially done in the context of avoiding transmission of viral diseases such as Creutzfeldt-Jakob disease (CJD), rather than for monetary reasons. The practice has continued as it is felt single-use instruments are labour saving and convenient, even though they may not be contributing to sustainability.

Southland Hospital provides ophthalmic services to a population of approximately 110,000 people and performs approximately 75 intravitreal injections per week in the outpatient's clean room. The equipment required is minimal, but the volume is relatively high for our department.

Our hypothesis was that reusable ophthalmic instruments are more cost effective than disposable ones for intravitreal injections. Advocates of reusable instruments argue that their continued use can reduce overall costs. However, this hypothesis needed empirical validation. The aim of this study was to follow the instruments' pathways and cost each segment to calculate whether reusable or disposable ophthalmic instruments offer better value for money for intravitreal injections.

Methods

As per the Research or Quality Assurance Decision Tree, Research Ethics Board approval was not required.[1]

The cycle taken by both reusable and single-use disposable instruments was mapped out.

For reusable instruments, this involved: the purchase cost of each instrument required and instrument tray; quantifying the number of uses during the lifetime of each instrument; obtaining the instrument tray from the hospital sterilisation department; transporting the instrument tray to the clinic by a porter; opening the sterile instrument tray onto a trolley prior to each procedure by an assisting nurse; the set-up ready for injection by an injection nurse; checking and cleaning the instruments after use by an assisting nurse or injection nurse; replacing the instruments into the instrument tray; completing paperwork/tracking for the instrument tray; transporting the used instrument tray to Central Sterilisation Services Department (CCSD) by a porter; repacking the tray by CCSD staff; sterilising the instrument tray; and the storage of the instrument tray until required again.

For single-use disposable instruments, this involved: the purchase cost of each instrument

pack; transporting the instrument pack from delivery area to the clinic by a porter; opening the sterile instrument pack onto a trolley prior to each procedure by an assisting nurse; the set-up ready for injection by an injection nurse; placing used instruments into an incineration bin and packaging into a general waste bin; completing paperwork/tracking for the instrument pack; re-ordering instrument packs; the incineration bin disposal; ordering a new incineration bin.

The instruments involved were a dual-ended calliper and an eyelid speculum, as well as an instrument tray for the reusable items and a disposable plastic tray for the single-use packs. Additional items were opened (gauze, cotton buds, gallipot and hypodermic needle) for both the reusable instrument trays and single-use disposable packs. The purchase costs of the reusable instruments and single-use disposable packs were obtained from the procurement department. The cost of sterilising one instrument tray was obtained from the sterilisation department (they have set charges as they sterilise instruments for other clients outside the hospital). The time taken for the porter to pick up/deliver the instrument pack and take a full incineration bin for disposal, the assistant nurse to open the sterile pack or single-use pack onto the trolley and complete paperwork/tracking, and for the injection nurse to set up the instruments ready for injection/clean and replace instruments into the tray, and dispose of the single-use instruments into the incineration bin was timed over five random occasions during June 2021 and averaged. The salaries of the staff involved were taken from job descriptions for those posts during June 2021. The average life cycle of a reusable instrument could not be calculated accurately, so we estimated this at 60 uses per instrument based on Yoshikawa et al.[2] However, the intravitreal instruments used are not delicate and are used many times more than on 60 occasions in actual practice.

Results

In June 2021, the capital costs of purchasing a reusable instrument tray, speculum and scleral marker were NZ$152.79. This was divided by 60 for the cost per use. The cost of a single-use disposable intravitreal injection pack was $9.61. The cost of additional items (cotton tip buds, dressing pack, 30g needle) was $3.54. The sterilisation cost per item was $0.92. The cost of a sharps container was $11.75, and for landfill was $171.00 per tonne. The average salary of a porter was taken as $41,599 per annum (pa), a senior nurse as $69,500 pa, a sterile services technician as $49,000 pa and an administration clerk as $24 per hour.

The average timings were: 20 minutes for retrieving and delivering from the sterilisation department; 2 minutes for the opening instruments onto trolley by a nurse; 3 minutes for checking/cleaning/repacking instruments after use by a nurse; 3 minutes for completing paperwork to return items to the sterilisation department by a nurse; 5 minutes for ordering and purchasing of procedure packs by the supplies department; 1 minute for the disposal of the sharps/waste after a procedure by a nurse; 5 minutes for the ordering and purchasing of sharps bins; and 20 minutes for the transport of sharps bins for disposal.

The total cost of using reusable instruments for intravitreal injection was $29.00, and the cost of using disposable instruments for intravitreal injection was $30.51. Hence, the cost of using reusable instruments was lower than using disposable instruments by $1.51 per patient. This equates to a saving of $5,889 pa for our department just for this one low-complexity case.

Discussion

Our small study shows that intravitreal injections performed with reusable instruments offer better value for money than when performed with disposable instruments. In our small department, this saves over NZ$5,000 per annum just for intravitreal injections alone.

Intravitreal injections are now the commonest procedure in ophthalmology and are increasing. Exact numbers are not known, but in 2022 there were approximately 17,000 intravitreal injections in the Auckland District Health Board for a population of approximately 1,600,000.[3] In Australia and New Zealand, the majority of units use custom intravitreal injection packs with disposable instruments.[4] Extrapolating the numbers of injections from Auckland nationally to New Zealand, then moving wholesale to reusable instruments could save approximately $77,000 nationally. Additionally, it is likely that ophthalmic reusable instruments are used more than 60 times each, which further reduces their cost per case. If similar figures hold true for other ophthalmic procedures that require a greater number of instruments, then there are even more very significant savings to be made by using

reusable rather than disposable instruments.

Disposable single-use instruments became popular due to their convenience and fears of viral contamination (e.g., CJD): hence, their perceived safety in preventing viral transmission. It is assumed that they also reduce the cost and time of maintaining reusable instruments, which require proper storage, handling, cleaning and sterilisation procedures. Disposable instruments additionally eliminate the risk of damage or malfunction of reusable instruments, which can compromise the quality and safety of medical procedures. Disposable instruments are especially useful for emergency situations, where time and resources are limited and infection control is crucial. Disposable instruments can reduce the risk of surgical site infections by 50% compared to reusable instruments.[5]

The vast majority of intravitreal injections are administered by allied health professionals and have been shown to be safe.[6] Some units use injection assistant devices, which standardise and speed up the injection procedure.[6,7] In the United Kingdom, using the InVitria injection device was less painful, quicker (by 1½ minutes) and cheaper than using conventional instruments.[7] However, the InVitria is comparatively expensive in New Zealand, costing $23.70 versus $9.62 for a procedure pack of disposable instruments.

Costs can be significantly reduced by the appropriate prescribing of intravitreal injections with regard to their effectiveness and frequency for different diseases. Careful consideration should be given to discontinuing intravitreal injections when patients are unlikely to improve in terms of vision after central retinal vein occlusion.[8]

Surgeons generally prefer to use reusable instruments due to better build quality, better materials (titanium rather than stainless steel), ease of use, feel and improved safety (less tagging of tissues). However, reusable instruments also have some drawbacks:

- The need for proper cleaning, sterilisation and maintenance of the instruments, which can increase the operational costs and the complexity of the processes.
- The risk of contamination or infection due to inadequate or faulty sterilisation, which can compromise the safety and the quality of the procedures.
- The possibility of wear and tear or damage to the instruments over time, which can affect their functionality and performance.

Reusable instruments generally have a lower carbon footprint than disposable instruments. Although reusable instruments require energy-intensive sterilisation, disposable instruments performed worse across all categories of ecological and human health harm, including climate change, metal/mineral and fossil fuel resource depletion and water scarcity.[9] These impacts were due to material processing, instrument production and sterilisation procedures.

Additionally, disposable single-use instruments also pose other significant challenges for the sustainability of the healthcare system and the environment:

- The cost of purchasing, transporting and disposing of disposable single-use instruments, which can increase the financial burden on healthcare facilities and patients.
- The generation of large amounts of medical waste, which can contribute to greenhouse gas emissions, pollution and resource depletion.
- The potential loss of valuable materials and components that could be reused or recycled.
- The ethical and social implications of discarding medical devices that could be beneficial for low-resource settings or humanitarian crises.

In summary, while cost effectiveness remains a central consideration, balancing safety, sterility and environmental impact is crucial when evaluating reusable versus disposable ophthalmic instruments for intravitreal injections.

COMPETING INTERESTS
The authors declare no competing/conflicts of interest. Originally presented as a video poster at the 2022 Royal Australian and New Zealand College of Ophthalmologists New Zealand Branch Annual Scientific Meeting.

AUTHOR INFORMATION
Saghir Ahmed Sadiq, DO, MRCOphth, FRCS, FRCOphth, FRANZCO, DM: Eye Clinic, Southland Hospital, Kew Road, Invercargill, 9812, New Zealand; Adjunct Professor, Faculty of Science, Liverpool John Moores University, Liverpool, United Kingdom.
Sarah Winsloe, RGN: Eye Clinic, Southland Hospital, Kew Road, Invercargill, 9812, New Zealand.

CORRESPONDING AUTHOR
Professor S A Sadiq: Eye Clinic, Southland Hospital, Kew Road, Invercargill, 9812, New Zealand. Ph: +64220214491 E: Professorsasadiq@gmail.com

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Diabetes treatment satisfaction among a multi-ethnic Aotearoa New Zealand population with uncontrolled type 2 diabetes mellitus

Ry Yves Tweedie-Cullen, Yannan Jiang, Rebecca Brandon, Audrey Tay, Ryan Yeu, Kate Smallman, Glenn Doherty, Ofa Dewes, Rebekah Doran, Penny Clark, Norma Nehren, Jennie Harré Hindmarsh, Frances King, Tony R Merriman, Allan Moffitt, Brandon Orr-Walker, Ryan Paul, Rinki Murphy

ABSTRACT

AIMS: To assess whether diabetes treatment satisfaction differs by ethnicity among participants with insufficient glycaemic control of type 2 diabetes mellitus in a clinical trial involving additional oral diabetes medications. Patient satisfaction is used as an indicator of healthcare quality. However, data on patients' diabetes treatment satisfaction in the context of insufficient glycaemic control is limited.

METHODS: Individuals with type 2 diabetes and an HbA_{1c} of 58–110mmol/mol (7.5–12.5%) were recruited across Aotearoa New Zealand to participate in an 8-month randomised crossover study of vildagliptin and pioglitazone as add-on therapy to metformin and/or sulfonylurea. Participants completed the Diabetes Treatment Satisfaction Questionnaire (DTSQ) at baseline pre-randomisation. Treatment satisfaction scores were compared between ethnic groups and other characteristics using the analysis of variance and linear regression. Perceived hyper- and hypoglycaemia were summarised separately.

RESULTS: Between February 2019 and March 2020, 346 participants (41% women, 32% Pacific peoples, 23% Māori, 26% European) completed the DTSQ. Mean (SD) age was 57.5 (10.9) years, diabetes duration was 9 (6.3) years and HbA_{1c} was 75 (12)mmol/mol (9.0[3.2]%). At study entry, 40% were receiving monotherapy for diabetes. Treatment satisfaction was rated highly, with a score of 29(6) (interquartile range 25–33). Pacific peoples and older people reported greater treatment satisfaction than other groups ($p < 0.001$).

CONCLUSIONS: Diabetes treatment satisfaction was high, particularly among Pacific peoples, despite suboptimal glycaemic control and insufficient glucose-lowering therapy.

Patient treatment satisfaction has been used as an indicator of healthcare quality, which is important in chronic diseases like type 2 diabetes mellitus. Several healthcare organisations measure patient satisfaction in programmes designed to improve quality of care.[1] The progressive nature of type 2 diabetes mellitus often requires treatment intensification over time to maintain glycaemic control, which is critical for preventing diabetes-related complications. However, only half the population with type 2 diabetes mellitus in Aotearoa New Zealand achieve target glycaemic control.[2] Suboptimal glycaemic control can be attributed to two factors: the patient not adhering to prescribed medications and the healthcare provider not initiating or intensifying glucose-lowering therapy when it is clinically appropriate to do so.[3] The former has complex root causes, some of which may be reflected in patients' diabetes treatment satisfaction. The latter is referred to as therapeutic inertia and is driven by a wide range of barriers at the patient, clinician and health system levels.[4]

Common patient-level causes of therapeutic inertia include unawareness of their personal level of glycaemic control, the progressive nature of type 2 diabetes mellitus,[5–7] implications for insufficient glycaemic control,[8,9] fear of or actual side effects,[10,11] concerns over the ability to manage multiple or complicated treatment regimens,[8,9] denial of disease,[12] treatment costs[13] and poor communication by and with physicians.[8,9,14] In conjunction with these patient-level causes, healthcare provider-level causes, such as concerns over patient's adherence or ability to manage more complex treatment regimens, time constraints, reactive rather than proactive care and healthcare system-level causes, such as lack of visit planning, decision support or team approach to care, also contribute to therapeutic inertia.[4] Most strategies

for addressing therapeutic inertia in diabetes use educational interventions among healthcare professionals or patients (including health literacy support), but rarely report patient diabetes treatment satisfaction in the context of insufficient glycaemic control.[4]

Generally, higher diabetes treatment satisfaction is correlated with higher medication adherence, lower HbA_{1c} and lower body weight, suggesting that higher satisfaction may be related to better glycaemic control and clinical outcomes.[15,16] Conversely, individuals (particularly women) with lower income, lower education, unemployment, difficulty accessing care and a higher number of diabetes-related complications are more likely to report lower diabetes treatment satisfaction.[16] Differences in diabetes treatment satisfaction by ethnicity, particularly in the context of insufficient glycemic control in people willing to take additional diabetes medications, have not been reported.

Insufficient glycaemic control and diabetic complications are more prevalent in people of Māori or Pacific ethnicity compared with European and other ethnic groups.[17–19] This study assessed whether diabetes treatment satisfaction among Aotearoa New Zealand adults with type 2 diabetes mellitus inadequately controlled on oral glucose-lowering medication differed by ethnicity.

Materials and methods

We report the baseline diabetes treatment satisfaction questionnaire results from a prospective randomised crossover study designed to evaluate whether people of Māori or Pacific ethnicity responded differently to vildagliptin and pioglitazone compared with non-Māori/non-Pacific peoples. This was a multi-centre trial conducted in general practices and diabetes clinic sites across Aotearoa New Zealand, including both urban and rural regions. The study protocol has been published elsewhere.[20] Participants were eligible for this study if they were aged 18–80 years, had type 2 diabetes mellitus for more than 1 year, were on stable doses of metformin and/or sulfonylurea for at least 3 months, had not used insulin in the last 3 months, had never been on dipeptidyl peptidase-4 inhibitors (DPP-4i) or thiazolidinedione and had an HbA_{1c} of 58–110mmol/mol. Self-reported ethnicity was recorded at the baseline visit. Participants were asked to tick all of the following categories that applied: Māori, Pacific peoples, NZ European, Other European, Indian, Other Asian, Other (asked to specify). Prioritised ethnicity classification as Māori or Pacific peoples was defined if either of these ethnicities were ticked or specified in "Other". If both Māori or Pacific peoples was indicated, then the prioritised ethnicity was grouped as Māori. People were grouped in four categories as Māori, Pacific peoples, European (either NZ or Other European) or Other (as all remaining ethnicities). The study was approved by the Health and Disability Ethics Committee, New Zealand (reference number: 18/STH/242) and recruitment occurred between February 2019 and March 2020. All participants provided written informed consent before data collection.

The Diabetes Treatment Satisfaction Questionnaire (DTSQ) was developed to assess peoples' satisfaction with their diabetes treatment.[21,22] It has been translated into over 100 languages and is widely used in many countries since it is internationally validated and officially approved by the World Health Organization and International Diabetes Federation. The DTSQ-status version (DTSQ-s) contains eight items, as follows: 1) overall treatment satisfaction, 2) frequency of unacceptably high blood glucose levels, 3) frequency of unacceptably low blood glucose levels, 4) treatment convenience, 5) flexibility, 6) satisfaction with understanding of diabetes, 7) willingness to continue present treatment, and 8) willingness to recommend it to others. It assesses treatment satisfaction, and two items assess patient-perceived frequency of unacceptably high and low blood glucose levels. Each item is rated on a scale from 0 to 6. Research sites undertook the DTSQ-s in person, either electronically or on paper. Visits were mainly performed in English, although a subgroup of Tongan participants enrolled in a healthcare service used only a Tongan-translated version of the questionnaire. This was done through the translation service at the Department of Internal Affairs who follow a rigorous process of translation and back translation for accuracy.

Six of the eight items (1 and 4–8) were summed to produce a total treatment satisfaction score between 0 and 36 (0–18 low; 19–36 high treatment satisfaction). Two items assessing perceived frequency of unacceptably high (item 2) and low (item 3) glucose levels were evaluated separately as a score of 0 indicated "never" while a score of 6 indicated "always". Responses of item 2 were compared by HbA_{1c}, while responses of item 3 were compared by type of diabetes medications and their incidence of hypoglycaemia. In the case of missing scores, the existing item scores were

summed and divided by the number of existing items. This was then multiplied by six to form the total treatment satisfaction score.[23]

Baseline clinical data were also collected, such as age, ethnicity, HbA_{1c}, diabetes medications and smoking status. Data are presented as number and percentage (%) or mean + standard deviation (SD). The analysis of variance (ANOVA) was used to test the differences in DTSQ total score between participants grouped by various characteristics for categorical variables, such as ethnicity, as univariate analyses. Linear regression was used to determine the association between DTSQ total scores and participants' baseline HbA_{1c}, age, duration of diabetes and body mass index (BMI). All statistical analyses were performed using SAS version 9.4 (SAS Institute Inc., Cary, NC, USA). Statistical tests were two-sided at 5% significance level.

Results

Baseline characteristics

A summary of participants' baseline characteristics is presented in Table 1. A total of 346 participants were recruited into the prospective randomised crossover study (see study publication for CONSORT diagram) and all completed the DTSQ-s at baseline during clinic visits or remotely via telephone.[20] Pacific peoples made up 32% (n=111) of participants and Māori 22.5% (n=78), while Europeans were 26% (n=90) of the study population. The mean (+standard deviation [SD]) age at baseline was 57.5 (±10.9) years. There was a statistically significant difference in age across ethnicities (p <0.0001), with European participants typically older than other ethnicities: Europeans 62.7 (±9.3) vs Pacific peoples 55.5 (±11.1), Māori 57.3 (±10.5), Other 54.2 (±10.6) years, all p-values <0.001. There was no statistically significant difference between Māori and Pacific participants. Men consisted of 59% (n=205) of the study population. The average duration of diabetes was 9 (±6.3) years with a mean HbA_{1c} of 75 (±12)mmol/mol (9.0[±3.2%]). HbA_{1c} did not differ by ethnicity (p=0.07). Most participants (56.6%, n=196) were on dual oral therapy with metformin and sulfonylurea at baseline. However, almost 40% (39.6%, n=137) were on metformin monotherapy.

Satisfaction

Treatment satisfaction was rated highly (interquartile range 25–33), with a mean total score of 28.6 (±6) (Table 2 and Appendix Table 1). One participant only scored seven items; thus, their total treatment score was estimated using imputation. Participants scored their perceived frequency of unacceptably high blood glucose levels (item 2) at a mean score of 3.3 (±2.0) out of 6. Europeans had a significantly lower score than Māori (p=0.04) and Pacific peoples (p=0.0002), indicating less frequently perceived high blood glucose levels among Europeans. The perceived frequency of unacceptably low blood glucose levels (item 3) was overall rated low, with a mean score of 1.1 (±1.6). Significant differences were found in total DTSQ scores by ethnicity (Table 2), BMI and age (Table 3). Pacific peoples and older people reported greater treatment satisfaction, while those with a lower BMI were more likely to give a higher treatment satisfaction score. No association was found between baseline HbA_{1c} and total DTSQ scores (Table 2). There was also no statistically significant association between total DTSQ scores and baseline therapy, sex or smoking status (Table 2).

Participants scored their satisfaction with their understanding of diabetes as 4.9 (±1.3) from a possible score 0 to 6. Europeans scored this aspect lower than Pacific peoples (4.4±1.5 vs 5.2±1.1, p <0.0001) and Other ethnic groups (5.0±1.2, p=0.002). Māori participants also scored their satisfaction lower than Pacific participants (4.8±1.4 vs 5.2±1.1, p=0.04). There was no statistically significant correlation between participants' satisfaction with their reported understanding of diabetes and their sex, age, baseline therapy or HbA_{1c}.

Discussion

This study found that overall diabetes treatment satisfaction and understanding of diabetes was rated highly among Aotearoa New Zealand adults from multiple ethnic groups with type 2 diabetes mellitus and insufficient glycaemic control. All participants consented to a study that tested the glucose-lowering impact of an additional oral medication, with most using one or two oral hypoglycaemic agents at baseline. The reported perception of unacceptably high or low blood sugar levels among Europeans was significantly lower than Māori and Pacific peoples. Overall, European participants rated a lower satisfaction with their diabetes treatment and understanding, while Pacific participants were more likely to rate their treatment satisfaction highly compared to all other ethnic groups.

The lack of association between HbA_{1c} and overall diabetes treatment satisfaction or understanding contradicts some previously published studies.[24,25] However, these findings reinforce the contention raised by other literature[25–27] that diabetes treatment satisfaction is multifactorial and frequently unrelated to glycaemic control. Importantly, this was assessed in those willing to take part in a study investigating the glucose-lowering impact of two additional oral diabetes medications, suggesting that this subset of people with insufficiently controlled type 2 diabetes mellitus were not in disease denial and were less concerned about treatment complexity or side effects from additional diabetes medications as key reasons for not attaining optimal glycaemic control. The higher mean diabetes treatment satisfaction score among Pacific peoples compared with other ethnicities is likely to indicate higher diabetes medication adherence, given those who intend to stop diabetes medications report lower diabetes treatment satisfaction scores.[27]

It should be noted that Pacific peoples include a wide range of people with different languages, ethnicities, cultural heritage and illness beliefs, and the results from a variety of Pacific peoples in this study were grouped together. The provision of culturally appropriate healthcare may have contributed to increased satisfaction in the Pacific participants. Tongan participants received diabetes care by mostly Tongan healthcare providers, of whom a small proportion (12.6%) completed the questionnaire in Tongan. Previous research found that Tongan people believed their diabetes to be a cyclical, acute illness and attributed its cause to factors outside of their control such as poor medical care in the past, environmental pollution and God's will.[28] The aforementioned study[28] also noted that a section of their study-specific questionnaire did not translate well from English into Tongan. As we did not use a validated Tongan version of the DTSQ, this may also be a potential limitation in our present study. Other literature indicates that a doctor's high status is respected in many Pacific cultures;[29] thus, participants may be more likely to rate their treatment satisfaction highly as a reflection of their trust in their healthcare provider.

It is not surprising that the age of European participants was higher than that of other ethnicities, as this reflects the higher prevalence of type 2 diabetes at a younger age in people of Pacific, Indian and Māori ethnicities than Europeans.[31] We observed that older participants were more satisfied with their treatment compared to younger participants. This is consistent with other research that reports higher diabetes-related distress among younger people,[32] and that the progression of type 2 diabetes mellitus is typically more rapid in this group. There are several reasons for these results, such as additional stressors of family responsibilities, work and financial constraints. In this way, managing diabetes may be yet another source of stress and burden. Further research could explore key diabetes-related stressors for younger people and strategies to facilitate self-management.

It is important to recognise that people may indicate high diabetes treatment satisfaction even if they are undertreated. Almost 40% of the participants were receiving only one glucose lowering medication despite an HbA_{1c} above target, demonstrating therapeutic inertia, which is defined as the "*failure to initiate, intensify, when appropriate and clinically required*".[33] Multiple patient-level, healthcare provider-level and health system-level factors contribute to this problem. At the patient-level, given that each of the participants consented to take part in a prospective study testing the glucose-lowering impact of adding another medication (vildagliptin and pioglitazone in a randomised, crossover fashion), it is unlikely that they had concerns over their ability to manage multiple medications, had disease denial or feared side effects from additional medications. Further attention at the healthcare provider level and health system level to overcome therapeutic inertia in managing type 2 diabetes mellitus in Aotearoa New Zealand is needed.[34]

This study is strengthened by its use of a validated questionnaire in a multi-ethnic population across Aotearoa New Zealand. However, several limitations need to be considered. As this was a multi-centre trial, a range of clinicians were involved in administering the DTSQ, which may have influenced the overall scores. Given this questionnaire focussed on collecting quantitative data, these results should be interpreted with caution as there are insufficient data to draw definitive conclusions on the underlying reasons for these results. Qualitative research into influencers of treatment satisfaction is needed along with other patient reported outcomes. Finally, the results of this study are not necessarily generalisable to the general population with insufficiently controlled type 2 diabetes mellitus, given the participants were willing to take additional oral diabetes medications as part of a

randomised crossover study. Nonetheless, diabetes treatment satisfaction was high, particularly among Pacific peoples, despite insufficient control of type 2 diabetes mellitus on insufficient oral glucose-lowering therapy.

Conclusion

These findings suggest that high patient diabetes satisfaction is not a reliable proxy for optimal diabetes control or diabetes care quality in Aotearoa New Zealand, particularly in Pacific peoples.

Table 1: Baseline demographic characteristics of participants.

	Overall (n=346)	DTSQ total score	
		0–18 (Low) (n=27)	19–36 (High) (n=319)
Age (years)	57.5 (10.9)	54.2 (11.8)	57.8 (10.8)
Sex			
Female	141 (40.8%)	14 (51.9%)	127 (39.8%)
Male	205 (59.2%)	13 (48.1%)	192 (60.2%)
Ethnicity			
European	90 (26.0%)	8 (29.6%)	82 (25.7%)
Māori	78 (22.5%)	8 (29.6%)	70 (21.9%)
Pacific peoples	111 (32.1%)	5 (18.5%)	106 (33.2%)
Other	67 (19.4%)	6 (22.2%)	61 (19.1%)
BMI (kg/m^2)	35.5 (7.8)	38.1 (7.4)	35.3 (7.8)
Duration of diabetes (years)	9.0 (6.3)	7.0 (3.3)	9.1 (6.5)
Baseline HbA_{1c} level	74.9 (11.5)	78.7 (11.3)	74.5 (11.5)
59–67mmol/mol (7.5–8.3%) (Low)	114 (32.9%)	5 (18.5%)	109 (34.2%)
68–79mmol/mol (8.4–9.4%) (Medium)	120 (34.7%)	10 (37.0%)	110 (34.5%)
80–110mmol/mol (9.5–12.2%) (High)	112 (32.4%)	12 (44.4%)	100 (31.3%)
Baseline diabetes medications			
Monotherapy	137 (39.6%)	14 (51.9%)	123 (38.6%)
Dual therapy	196 (56.6%)	12 (44.4%)	184 (57.7%)
Triple therapy	13 (3.8%)	1 (3.7%)	12 (3.8%)
Smoking status			
Current smoker	49 (14.2%)	3 (11.1%)	46 (14.4%)
Ex-smoker	125 (36.1%)	9 (33.3%)	116 (36.4%)
Never smoked	164 (47.4%)	15 (55.6%)	149 (46.7%)
Missing	8 (2.3%)	0 (0%)	8 (2.5%)

Data presented as n (%) or mean (SD).

Table 2: DTSQ total score by participants' characteristics.

Characteristic	Mean (SD)	p-value*
Sex		0.3327
Female	28.9 (6.4)	
Male	28.3 (5.6)	
Prioritised ethnicity		0.0006
NZ European	27.7 (5.8)	
Māori	27.8 (6.6)	
Pacific peoples	30.5 (5.3)	
Other	27.4 (5.9)	
Baseline HbA_{1c} level		0.1533
59–67mmol/mol (7.5–8.3%) (Low)	29.4 (5.2)	
68–79mmol/mol (8.4–9.4%) (Medium)	28.4 (6.1)	
80–110mmol/mol (9.5–12.2%) (High)	27.9 (6.5)	
Baseline diabetes medication		0.0808
Monotherapy	27.8 (6.4)	
Dual therapy	29.2 (5.6)	
Triple therapy	27.1 (5.5)	
Smoking status		0.4724
Never smoked	28.3 (6.3)	
Ex-smoker	28.5 (5.6)	
Current smoker	29.5 (5.7)	

*The analysis of variance test on total score between categorical participants' characteristics as univariate analyses.

Table 3: Linear regression on association between DTSQ total score and continuous participants' characteristics.

Characteristic	Beta coefficient	95% CI	p-value
Age (years)	0.097	0.040–0.155	0.001
BMI (kg/m^2)	-0.084	-0.165–-0.003	0.041
Duration of diabetes (years)	0.066	-0.035–0.167	0.198
Baseline HbA_{1c} (mmol/mol)	-0.050	-0.104–0.005	0.076

*Confidence interval = CI.

COMPETING INTERESTS
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AUTHOR INFORMATION
Ry Yves Tweedie-Cullen: Faculty of Medical and Health Sciences, The University of Auckland, Auckland, New Zealand; Auckland Diabetes Centre, Auckland District Health Board, Auckland, New Zealand.
Yannan Jiang: Department of Statistics, Faculty of Science, The University of Auckland, Auckland, New Zealand; National Institute for Health Innovation, School of Population Health, The University of Auckland.
Rebecca Brandon: Faculty of Medical and Health Sciences, The University of Auckland, Auckland, New Zealand; Auckland Diabetes Centre, Auckland District Health Board, Auckland, New Zealand.
Audrey Tay: Faculty of Medical and Health Sciences, The University of Auckland, Auckland, New Zealand; Auckland Diabetes Centre, Auckland District Health Board, Auckland, New Zealand.
Ryan Yeu: Faculty of Medical and Health Sciences, The University of Auckland, Auckland, New Zealand; Auckland Diabetes Centre, Auckland District Health Board, Auckland, New Zealand.
Kate Smallman: Diabetes Foundation Aotearoa, Auckland, New Zealand.
Glenn Doherty: Tongan Health Society, Auckland, New Zealand.
Ofa Dewes: Faculty of Medical and Health Sciences, The University of Auckland, Auckland, New Zealand.
Rebekah Doran: Pinnacle Incorporated, Hamilton, New Zealand.
Penny Clark: Pinnacle Incorporated, Hamilton, New Zealand.
Norma Nehren: Te Hiku Hauora, Northland District Health Board, Kaitaia, New Zealand.
Jennie Harré Hindmarsh: Ngāti Porou Hauora, Te Puia Springs, New Zealand.
Frances King: Ngāti Porou Hauora, Te Puia Springs, New Zealand.
Tony R Merriman: Department of Biochemistry, University of Otago; Division of Clinical Immunology and Rheumatology, University of Alabama at Birmingham, Alabama, United States.
Allan Moffitt: ProCare PHO; The Fono (Manurewa).
Brandon Orr-Walker: Middlemore Clinical Trials, Auckland, New Zealand.
Ryan Paul: Waikato Medical Research Centre, University of Waikato, Hamilton, New Zealand.
Rinki Murphy: Faculty of Medical and Health Sciences, The University of Auckland, Auckland, New Zealand; Auckland Diabetes Centre, Auckland District Health Board, Auckland, New Zealand.

AUTHORS' CONTRIBUTIONS
RM designed the study. RYT, AT and YJ analysed the data and RYT drafted the manuscript. RB, RY, RYT, KS, GD, RD, PC, NN, JHH, FK, TRM, BOW, RP were responsible for trial implementation and data acquisition. OD and all co-authors reviewed and edited the manuscript and approved this for submission.

CORRESPONDING AUTHOR
Rinki Murphy: Faculty of Medical and Health Sciences, The University of Auckland, 28 Park Ave, Grafton, Auckland 1023, New Zealand. Ph: +64 9 373599 ext 86313. E: r.murphy@auckland.ac.nz

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Appendix

Appendix Table 1: Summary of baseline Diabetes Treatment Satisfaction Quenstionnaire (DTSQ) scores.

DTSQ item	N	Mean (SD)	Median (Range)	Median (IQR)
1. How satisfied are you with your current treatment?	346	4.7 (1.4)	5 (0–6)	5 (4–6)
2. How often have you felt that your blood sugars have been unacceptably high recently?	346	3.3 (2.0)	3 (0–6)	3 (2–5)
3. How often have you felt that your blood sugars have been unacceptably low recently?	346	1.1 (1.6)	0 (0–6)	0 (0–2)
4. How convenient have you been finding your treatment recently?	346	4.9 (1.4)	5 (0–6)	5 (4–6)
5. How flexible have you been finding your treatment recently?	346	4.6 (1.5)	5 (0–6)	5 (4–6)
6. How satisfied are you with your understanding of diabetes?	346	4.9 (1.3)	5 (0–6)	5 (4–6)
7. Would you recommend this form of treatment to someone else with your kind of diabetes?	345	4.8 (1.7)	6 (0–6)	6 (4–6)
8. How satisfied would you be to continue with your present form of treatment?	346	4.6 (1.6)	5 (0–6)	5 (4–6)
DTSQ total score (q1, q4–q8), 1 missing data imputed	346	28.6 (6.0)	30 (9–36)	30 (25–33)

*One participant only scored 7 items (Q7 was missing) and the missing score was imputed in the calculation of total score.
Standard deviation = SD; interquartile range = IQR.

A hard pilsner to swallow: a case series of bottle cap foreign bodies in Canterbury over a 3-month period in 2023

Asim Abdulhamid, Heidi Yi-han Su, Steven Leslie Ding

Foreign body ingestion is a common presentation to acute care that can lead to significant morbidity or mortality without appropriate and timely management. Bottlecaps are small and sharp, and though uncommon world-wide as a cause of foreign body ingestion, threaten complications of ulceration and perforation. The burden of alcohol excess and pattern of drinking in Canterbury makes this presentation far from novel. We present three cases of bottle cap ingestion to highlight their risk and endoscopic management approaches.

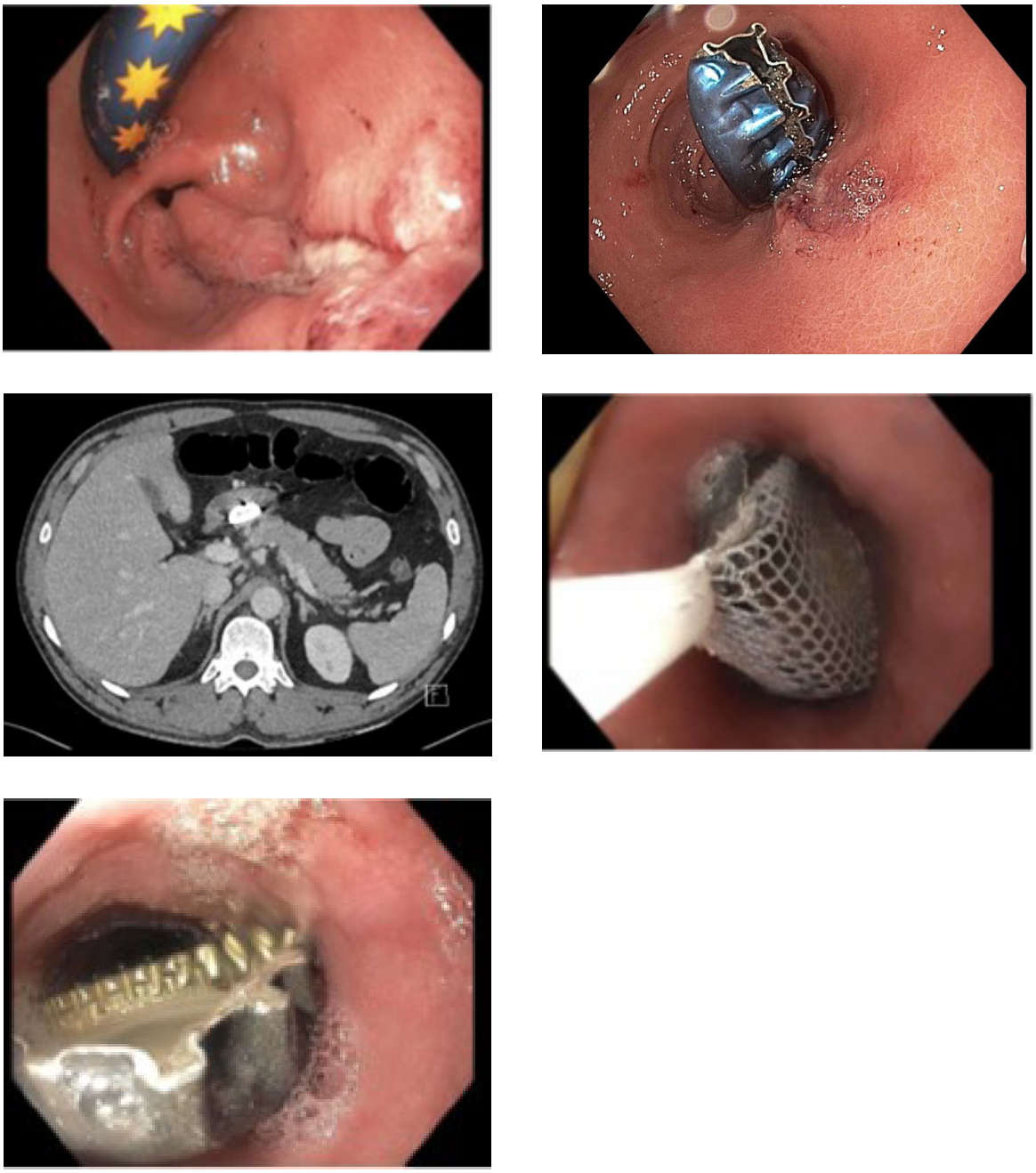
Discussion

Canterbury, among other regions in New Zealand, suffers the plight of a binge-drinking culture. Moreover, Christchurch has the second highest weekly alcohol intake per week by region.[1] The adverse consequences are realised at the hospital front door, with 4–5% of emergency department presentations relating to alcohol consumption. Inadvertent ingestion and impaction of bottle caps is rare as a phenomenon but can be life threatening owing to their sharp edges.[1,2]

Table 1: Case series.

	Case 1	Case 2	Case 3
Demographics	30y M	38y M	55y M
Presentation	Complete acute oesophageal obstruction	Postprandial pain, 2 days after accidental ingestion of food bolus	Complete acute oesophageal obstruction
Investigations	Chest X-ray	Computed tomography abdomen–pelvis	Chest X-ray
History of alcohol	+	+	+
Management	OGD Failed removal with Roth Net Pulled into extraction hood and removed with scope	OGD Failed removal with Roth Net Removed with 20mm braided snare with heat	OGD Pushed into stomach, unable to retrieve due to food in stomach Repeat endoscopy required after fast to extract using Roth Net
Complications	Minor oesophageal erosion	10mm gastric ulcer	Nil
Underlying disease	Nil	Nil	Nil
Length of stay (days)	1	2	0

Figure 1: Upper endoscopy images of impacted bottle caps.



A case series in a German university town reported 14 cases over a 10-year span, and a total of only 20 cases have entered the literature since 1988.[2,3] We describe three cases presenting to Christchurch Hospital within 3 months.

The key points upon review of our three patients include that all cases involved a history of inebriation and amnesia to ingestion of the foreign body. It is suspected that ingestion took place during the rapid consumption of excess amounts of alcohol, with or without the soporific, anaesthetic effect of antecedent inebriation. The age group was perhaps older than the archetypal student cohort (average age of 23.0 +/4.2 with a range of 18.3–35.6 in the German cohort of 14 patients over 9 years).[3] This complication took place in the absence of underlying gastro-oesophageal disease. The duration of hospitalisation and complication rates are low, reflecting the short latency to presentation, and a healthier patient cohort.

Interestingly, our three cases follow the trend of published cases in that this is a presentation exclusively of males.[2]

Endoscopic retrieval of the foreign body can be difficult. Table 1 demonstrates the improvised methods of using an extraction hood, a braided snare with heat and a Roth Net as effective endoscopic strategies. In two of the three cases, initial attempt with a Roth Net was ineffective. In the last case, a repeat procedure was required due to food debris within the stomach. Specific guidance on removal of foreign bodies is limited.[4,5] The most common approach from a case series was by grasping forceps in 56%, and mesh loop in 22.2%.[2]

Guidelines support early imaging for radiopaque objects to evaluate the presence, location and character of options, and to evaluate for signs of perforation.[4,5]

The World Society of Emergency Surgery guidelines support emergent (within 2 hours, 6 hours at the latest) endoscopy for the removal of sharp pointed objects causing complete obstruction, and endoscopy within <24 hours for incomplete obstruction due to the threat of deep and penetrating complications. While the studied patients have largely had good outcomes, the tendency to embed within the wall of the viscus demands expedient work-up and management.[5]

Though rare as presentations, conceivable measures that may abrogate its risk include advocating for consumption of cold beer where a burgeoning "brain freeze" might slow the rate of consumption, encouraging more expensive beers as a financial disincentive, drinking alternative beverages including champagne (where there remains no case reports of oesophageal obstruction) or wine and, at the heart of the issue, addressing the hitherto unshiftable entity of hazardous beer drinking.[2,3,6]

Conclusion

An impacted bottle cap is a rare but serious complication of acute and excessive alcohol intake, with the burden of this entity resting upon adult males. The nature of this foreign body obliges clinical and radiological investigation for complications prior to proceeding to emergent endoscopic extraction. Viable endoscopic techniques for extraction include the use of a Roth Net, extraction hood and braided snare with heat.

COMPETING INTERESTS
None.

AUTHOR INFORMATION
Asim Abdulhamid: Department of Gastroenterology, Health New Zealand – Te Whatu Ora Waitaha Canterbury.
Heidi Yi-han Su: Department of Gastroenterology, Health New Zealand – Te Whatu Ora Waitaha Canterbury.
Steven Leslie Ding: Department of Gastroenterology, Health New Zealand – Te Whatu Ora Waitaha Canterbury.

CORRESPONDING AUTHOR
Asim Abdulhamid: Department of Gastroenterology, Te Whatu Ora Waitaha Canterbury. E: asim.abdulhamid@gmail.com

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Elephantiasis of the Arm

NZMJ, 1924
By Farquhar Matheson, M.B., *Apia, Samoa*.

This case is so unusual that a few notes may be of interest.

The patient, a Samoan woman, æt. 36 years, has lived all her life in Samoa. In childhood she began to have attacks of "Mumu"—the native name for lymphangitis, which is associated with filariasis and the precursor of elephantiasis. About ten years ago, the arm and leg became elephantoid, increase in size taking place, gradually at first, but more rapidly since 1918. Her condition on admission to the Apia Hospital is shown in the photograph. It will be noticed that the right forearm also shows elephantoid changes. Operation for removal of arm tumour presented no special difficulties, the only trouble being in the formation of skin flaps. Sufficient healthy skin was not available to cover the raw area, but a large U-shaped flap was dissected off from the upper, inner surface of the tumour. This, although part of the elephantoid mass, acted admirably and caused no anxiety as to its viability after the operation. The deep fascia of the arm, which was closely incorporated in the tumour, was dissected off the muscles, thus converting the case into a *Kondoleon's* operation. There was no shock attached to the operation, and convalescence was uneventful with the exception of a little superficial suppuration. The latter is almost unavoidable, as it is a matter of extreme difficulty to make elephantoid skin surgically clean. After removal the tumour weighed 43lbs.; but, as elephantoid tissue loses much blood and serum when cut into, the "live" weight must have been much greater. Yet, in spite of her tremendous handicap, the woman was able to walk about unaided. In 1917, *Dr. Trail* saw a similar case, the patient being a man; and the tumour was so large that the unfortunate man required the assistance of two men to carry his arm in a piece of sacking when he wished to walk.

The epitrochlear glands are among the first to show evidence of filarial infection, but, while swellings and thickening if the tissues in this region are not uncommon, tumours of this size appear to be very rare.