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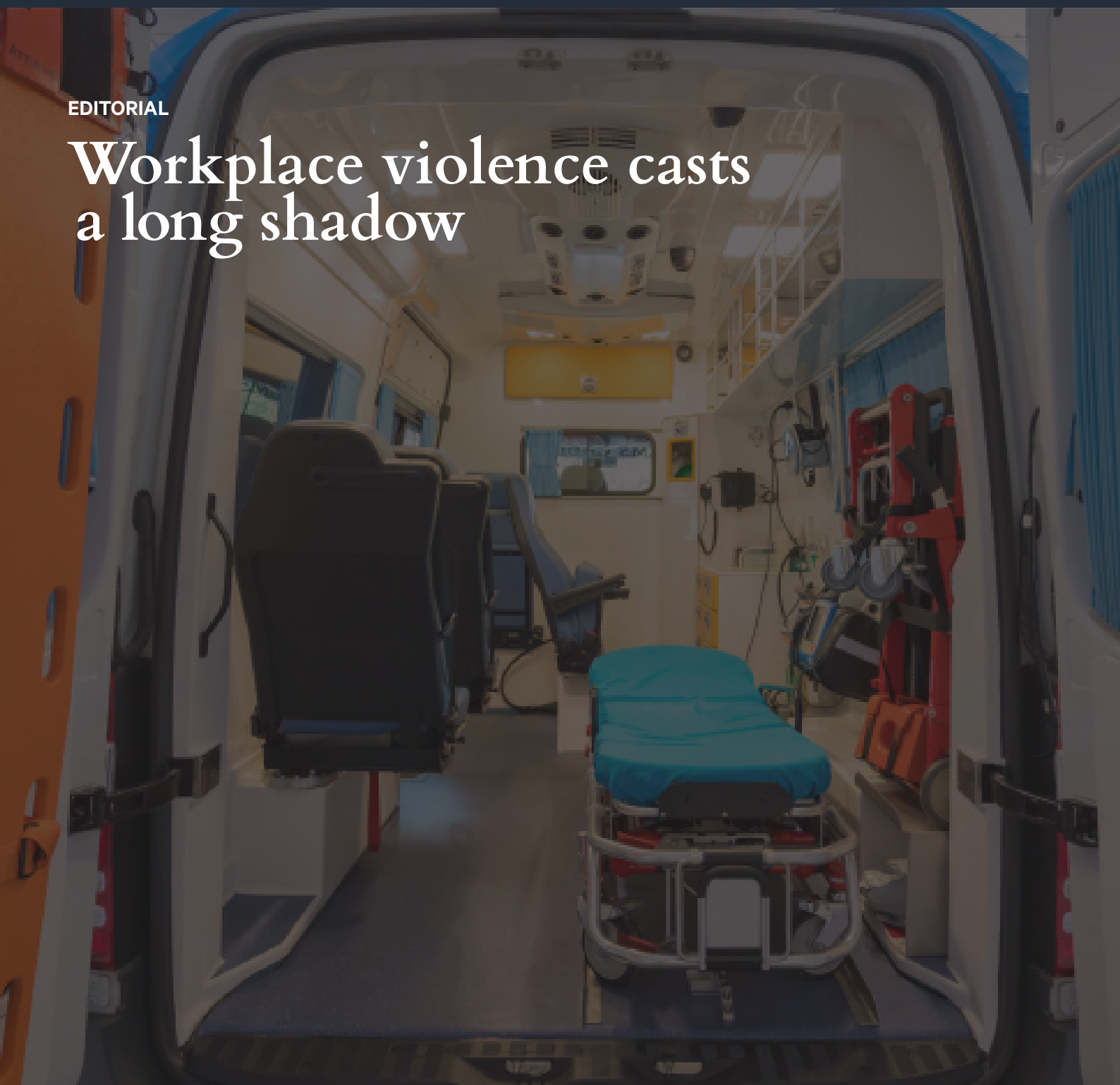
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#### VIEWPOINT:

Reluctant victims: healthcare workers and workplace violence

#### EDITORIAL

# Workplace violence casts a long shadow



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# Summaries

## **Workplace violence casts a long shadow**

*Michael Ardagh, Sandra Richardson*

This editorial comments on the paper by Strawbridge et al., “Reluctant victims: healthcare workers and workplace violence”, in the same issue of the *New Zealand Medical Journal*. It acknowledges the significant and ongoing impact workplace violence can have on its victims. It reiterates that it is common and under-reported, and that we aren’t doing enough to prevent it and manage it when it occurs.

## **Insights into a large waterborne *Campylobacter* outbreak from a cross-sectional telephone survey**

*Brent J Gilpin, Shevaun Paine, Tim Wood, Carla J Eaton, Claire Newbern, Tiffany A Walker, Graham Mackereth, Nicholas Jones*

The largest waterborne *Campylobacter* outbreak to date occurred in Havelock North, New Zealand in 2016, with an estimated 8,770 illnesses and four deaths. This manuscript provides key new insights into campylobacteriosis and waterborne outbreaks, based on telephone surveys conducted shortly after the outbreak. Telephone surveys provided insights into the outbreak not otherwise obtainable from routine surveillance systems, including the attack rates among different demographics, size of the outbreak, economic and social costs, potential of pharmacy-based surveillance, compliance with public health messaging and the need to communicate to households when the water is safe to drink.

## **Agreement between self-reported fractures in a clinical trial with New Zealand Accident Compensation Corporation claims data**

*Mark J Bolland, Zaynah Nisa, Anna Mellar, Chiara Gasteiger, Veronica Pinel, Borislav Mihov, Andrew Grey, Greg Gamble, Anne Horne*

We assessed the agreement between fractures reported to us during a 10-year clinical trial verified against X-ray reports or images with Accident Compensation Corporation (ACC) claim data. We found that a substantial proportion (~40%) of verified fractures did not have a matching ACC fracture claim and likewise a similar proportion of ACC fracture claims did not have a matching verified fracture. Most verified fractures did have an ACC claim (96%) but about one-third were classified as soft-tissue injuries. If clinical researchers wish to repurpose ACC fracture claims data for clinical research, they need to be aware of these limitations.

## **Paediatric periorbital and orbital infections: a decade of experience at Christchurch Hospital**

*Samuel Tomkins, Tony Walls, Hayleigh Miller*

Periorbital and orbital infections are infections in front of and around/involving the eye. These commonly occur in children, and they are a spectrum of disease from simple infections treated with oral antibiotics to severe infections requiring multiple operations and intravenous antibiotic therapy. This study looked at the experience of Christchurch Public Hospital over a 10-year period dealing with these kind of infections, including common predisposing factors, typical hospital stays and interventions required.

## **What legal protections are available to paramedics to prevent suicide? A review of case law concerning Section 41 of the Crimes Act 1961 (New Zealand)**

*Dylan A Mordaunt, Nicole Jones*

This paper looks at what legal protection New Zealand paramedics may have if they need to use force to stop someone from taking their own life. By reviewing 20 court and tribunal decisions, it found that the law can support intervention, but only in narrow circumstances: the danger must be immediate, the response must be reasonable and safer options should be considered first. The review also found a major grey area when a person refuses treatment but may still be at risk, because paramedics do not have the same clear powers as police or mental health clinicians. The authors argue that clearer national guidance, more multidisciplinary training and possible legal reform are needed to better support health-led responses to mental health emergencies.

## **Regional and ethnic projections of gastric cancer incidence in Aotearoa New Zealand to 2045: identifying opportunities for targeted action**

*Michael Walsh, Karen Bartholomew, Jonathan Koea, Clarence Kerrison, Nina Bevin, Maryann Heather*

Cases of stomach cancer in Aotearoa New Zealand are projected to increase by nearly 50% by 2045, rising from around 500 to over 700 cases per year. Māori and Pacific peoples, who already experience the highest rates of stomach cancer, are projected to see their case numbers nearly double over this period. A significant share of this burden could be prevented through programmes that test and treat *Helicobacter pylori*, a bacterial infection usually acquired in childhood, that is one of the leading causes of stomach cancer and is more common in communities affected by overcrowding and socio-economic deprivation. Meeting future service demands will require early regional planning for diagnostic and surgical services. Equity must be central to this response, as Māori and Pacific peoples face well-documented barriers to timely diagnosis and care that increased service capacity alone will not resolve.

## **The impact of cultural concordance between health professionals and patients: a narrative review**

*Belinda Loring, Papaarangi Reid*

This paper summarises what the international research says about whether patients are better off with a doctor of their own ethnicity (“cultural concordance”). Most of the research comes from the United States of America, but from what we can tell, an ethnic match between doctors and patients can make an important difference for patients. When doctors and patients had a cultural match, there was better communication and trust, higher rates of healthcare uptake and adherence with treatment, and some evidence of better health outcomes. Cultural match did not appear to make a large difference for white patients, but the impact was greater for non-white groups.

## **Equity, regulation and Te Tiriti o Waitangi: a rapid review of Putting Patients First**

*Heather Came, Clive Aspin, Alex Barnes, Maria Baker*

This paper uses a rapid Tiriti review to evaluate the New Zealand Government’s health workforce reform proposal, Putting Patients First. The authors conclude that the proposal fails to align with Te Tiriti o Waitangi because it ignores systemic racism, erases tino rangatiratanga and omits Māori from meaningful decision-making roles. By framing equity through a “needs not race” lens, the paper argues the reforms risk embedding monocultural practices that will further entrench health inequities for Māori. Ultimately, the authors recommend mandating cultural safety and antiracism competencies across all health professions to ensure genuine patient-centred care.

## **Reluctant victims: healthcare workers and workplace violence**

*Wendy Strawbridge, Ruth Money, Lillian Ng*

The paper describes the jolt of being assaulted by patients while working in healthcare. There are major consequences when staff are injured by patients—physical and psychological. There are important implications for the public when violent incidents are under-reported. Sickness, high turnover and lowered morale are detrimental to patient care. Healthcare organisations like Health New Zealand – Te Whatu Ora must learn from the lived experience of the healthcare workers and prioritise healthcare workers' health as more than just policy. It is also resolve and intention to strengthen systems that support and protect staff.

## **Subcutaneous gallstone: a case report**

*Georgia Butt, Rana Alsadat, Universe Leung*

A case of a 93-year-old woman with a gallstone under her skin in the right upper section of her abdominal wall. This was a rare presentation of a cholecystocutaneous fistula (connection between the skin and the gallbladder), likely due to chronic infection, but unusually she had no previous symptoms. This is an important diagnosis to consider when assessing infections in this area of the abdominal wall, as otherwise further complications may develop.

## **Vision-threatening complications in herpes zoster ophthalmicus: lessons from two unvaccinated patients with orbital apex syndrome**

*Christian P Pappas, Anna M Waldie, Aditi Shukla, Derek Chan*

Shingles is a vaccine-preventable disease caused by reactivation of the varicella zoster virus in the body's nerves, causing a painful blistering rash. The forehead is the second most common site of shingles and can often lead to viral infection and inflammation of the eye. Orbital apex syndrome is a rare complication of shingles that can cause severe eye-socket inflammation, potentially leading to permanent vision loss. To reduce the risk of shingles, all persons 50 years and older (or 18 years and older if immunocompromised) should receive the Shingrix vaccine. People who develop signs of shingles should also see their general practitioner urgently to receive antiviral treatment, which reduces the risk of severe complications.

## **Antifungal susceptibility of genital yeast isolates, Auckland, 2016–2025**

*Arthur J Morris, Wendy P McKinney, Sally A Roberts*

Most women experience at least one episode of vaginal yeast infection (candidiasis) in their lifetime and 5–8% experience recurrent infections. Many topical antifungals are used to treat these infections, e.g., clotrimazole, fluconazole, itraconazole, miconazole. We tested which antifungals were active against 1,300 isolates from 2016 to 2025. There appeared to be more resistance than in the past, but this was because many of the yeasts were from women who had recurrent infections and treatment. The most active agents were clotrimazole, nystatin and amphotericin.

# Workplace violence casts a long shadow

Michael Ardagh, Sandra Richardson

“*Workplace violence is consequential*” is the understated observation of Strawbridge et al. in their paper “Reluctant victims: healthcare workers and workplace violence”,<sup>1</sup> in this issue of the *New Zealand Medical Journal*. There is a lot known about workplace violence in healthcare and the authors emphasise much of this, including that it is common and under-reported, and that we are not meeting our duty of care towards staff as well as we should. Significantly, they present two engaging and shocking, personal “lived experiences” of violence and describe the consequences for them, which include much more than the physical and persist well beyond the moment of the violent act.

## It is common

Violence occurs throughout our health system workplaces but, unsurprisingly, its prevalence in emergency departments (EDs) is particularly high. In a recent survey of clinical directors of EDs in Aotearoa New Zealand,<sup>2</sup> 11 of 13 reported an incident, or multiple incidents, of violence by a patient or accompanying person in their ED within the past week. The majority of these included physical violence, and most reported verbal violence occurring daily or frequently. In a survey of New Zealand emergency nurses’ exposure to violence over the 2025 Christmas and 2026 New Year period, 84% of respondents reported unacceptable behaviour, with 77% of those feeling threatened.<sup>3</sup>

## It is under-reported

Unfortunately, some of the decision makers in health only perceive reality if they see it in a spreadsheet, quantified and with cost analyses provided. Violence in health workplaces is under-reported, underappreciated and inadequately responded to. The stories, injuries and struggles of those experiencing this violence are too often ignored. Added to inaction, failure of existing systems and inadequate response options simply add to the injury. Studies from Christchurch Hospital ED,<sup>4,5</sup> with exhaustive recording of events of

violence for 1 month a year, show that for the rest of the year the reporting is a fraction of what it should be. This significant under-reporting is consistently described in the international literature.<sup>6-9</sup>

The reasons for under-reporting are postulated to include staff considering that violence “is just part of the job” or its presence becoming normalised, or that individuals are desensitised to it because of its ubiquity. Process barriers are recognised, and staff are known to forgo reporting because they consider it will achieve nothing.<sup>1,6-9</sup> A consequent negative self-fulfilment occurs—under-reporting because of a perception nothing will be done contributes to nothing being done, a cycle that must be broken. But there are more factors to consider. For example, failure to acknowledge the impact of verbal abuse—too often minimised, yet it allows a culture that further normalises violence. In addition, a common failure is upholding “zero-tolerance policies” in a meaningful way, with caution expressed towards taking action involving external reporting (through police) or legal methods (such as trespass actions).<sup>7</sup> The lack of concrete consequences can be demoralising for staff directly affected.

## We know what we should be doing

We have a useful and authoritative volume of advice about how to address workplace violence in healthcare. As an example, Richardson et al.<sup>10</sup> published an evidence base and guide to non-pharmacological management of the aggressive ED patient, and there is much guidance about the pharmacological management of such patients. There is less robust evidence of guidance, protocol and policy for expected support, ongoing rehabilitation and recognition of the continued psychological stresses associated with both physical and verbal assault. Constant exposure to a traumatic environment—one where the expectation, if not always the reality, of violence is present—inevitably leads to higher levels of hypervigilance, mental exhaustion and the potential to impact cognition, compassion and critical thinking. Consequently, and taking a more global approach

to both prevention and management of workplace violence in EDs, both the Australasian College for Emergency Medicine (ACEM)<sup>11</sup> and the College of Emergency Nurses New Zealand (CENNZ)<sup>12</sup> have published statements.

The ACEM policy document on workplace violence<sup>11</sup> states:

*“Jurisdictional health system managers and hospitals have a legal responsibility to ensure that the ED is a safe workplace for all employees, while at the same time providing community access to safe, high quality, equitable emergency medical care. Hospital administrators must ensure that policies, procedures, staffing models, preventative training and education, verbal de-escalation and safe restraint training and education, ED design and incident reporting systems contribute to the prevention, minimisation and effective management of violence in the ED.”*

The authors of this editorial question whether “jurisdictional health system managers and hospitals” in New Zealand can confidently claim that they have fulfilled this responsibility. Violence towards healthcare staff does not arise in a vacuum. Contributing factors need to be acknowledged, whether they are short staffing, inadequate environments (for example, a crowded ED or long

waiting times) or communication failures. This does not excuse violence, but acknowledgement and attention to these contributors is necessary if any meaningful response is to occur.

The ACEM policy document goes on to detail expected solution implementations. The detail of the recommendations is beyond the scope of this editorial but, in summary, they describe preventative interventions, including providing an ED environment that is less conducive to violence, interventions for the violent event itself and post-incident interventions, including addressing comprehensive reporting and ongoing support for the victims of the violence.

A similarly broad list of recommendations is presented in the CENNZ document, emphasising the importance of a national approach, ED nurses’ rights, education and the role of regulatory frameworks. ED reporting, and the need for global responses to contributing issues such as social factors, are also identified.<sup>12</sup> While the context of this advice (and this editorial) is the ED, it is universally applicable no matter what the health context.

In their paper Strawbridge et al. present two cases of personal “lived experiences” of violence. They reinforce all of the things we know and are not attending to adequately. In addition, they starkly remind us that workplace violence can cast a dark and long shadow. We must do better.

**COMPETING INTERESTS**

Presentations made on the topic of violence and aggression for MobileHealth Hub with remuneration/honorarium paid to Sandra Richardson.

**AUTHOR INFORMATION**

Michael Ardagh: Professor of Emergency Medicine, University of Otago, Christchurch, Aotearoa New Zealand.

Sandra Richardson: Nurse Researcher, Emergency Department, Christchurch Hospital, Health New Zealand – Te Whatu Ora Waitaha, Aotearoa New Zealand.

**CORRESPONDING AUTHOR**

Michael Ardagh: Department of Surgery and Critical Care, University of Otago, Christchurch, 36 Cashel Street, Christchurch, Aotearoa New Zealand.  
E: Michael.ardagh@otago.ac.nz

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# Insights into a large waterborne *Campylobacter* outbreak from a cross-sectional telephone survey

Brent J Gilpin, Shevaun Paine, Tim Wood, Carla J Eaton, Claire Newbern, Tiffany A Walker, Graham Mackereth, Nicholas Jones

## ABSTRACT

**AIM:** To understand the impacts and responses of households during the Havelock North drinking water outbreak.

**METHODS:** Fifty days after the outbreak, cross-sectional telephone questionnaires were administered to a cohort of households.

**RESULTS:** Seventy-six percent of the people surveyed indicated drinking unboiled tap water, with 35% of those developing diarrhoea, compared with only 3% of those who did not drink the water. Symptoms correlated with increasing quantities of water consumed, and 31% reported a relapse of diarrhoea after initial improvement. The attack rate among those less than 20 years old (41%), was higher than those aged 50 and over (22%). Individuals with diarrhoea had an average of 7 days off school or work. Only 27% of individuals with diarrhoea visited a doctor or hospital, but 72% were in households that purchased items from a pharmacy. Following the issue of a boil water notice, 82% of households boiled their water, and 67% purchased bottled water, with only 5% taking no precautions. A third of the 169 households surveyed continued one or both of these responses for at least 3 weeks after the boil water notice was lifted.

**CONCLUSIONS:** Telephone surveys provided insights into the outbreak not otherwise obtainable from routine surveillance systems, including the attack rates among different demographics, size of the outbreak (5,540 cases within Havelock North), potential of pharmacy-based surveillance, compliance with public health messaging and the need to communicate to households when the water is safe to drink.

*Campylobacter* is the most common cause of bacterial gastroenteritis around the world.<sup>1</sup> Symptoms of infection include diarrhoea (which may be bloody), fever, abdominal pain/cramps, nausea and vomiting.<sup>2</sup> Transmission may occur through consumption of contaminated food or water, contact with animals or their faeces or by person-to-person faecal-oral transmission.<sup>1</sup> Infections via consumption of undercooked or contaminated food, particularly poultry products and raw milk, are well documented.<sup>3-6</sup> In contrast to foodborne outbreaks which generally only affect a small number of individuals, contamination of drinking water supplies with *Campylobacter* has led to numerous large outbreaks.<sup>2,7-11</sup>

The largest waterborne *Campylobacter* outbreak to date occurred in the town of Havelock North, New Zealand in 2016. It was caused by contamination of the town's unchlorinated, groundwater-derived drinking water supply with sheep faeces following heavy rainfall, with the contamination lasting for 5 days.<sup>12</sup> There were 953 notified *Campylobacter* cases and four deaths.<sup>12</sup> A series of landline telephone surveys were undertaken during and after the outbreak which provided the basis for an age adjusted estimate of 5,540

illnesses among the 14,118 residents of Havelock North, and up to another 2,230 illnesses among those living outside of Havelock North.<sup>12</sup> In this paper we describe insights from the fourth of these telephone surveys regarding the epidemic curve, attack rates, dose response, access to healthcare, economic impact and awareness or compliance with public health messaging.

## Methods

### Data collection

Four landline telephone surveys were conducted by UMR Research Ltd (ISO20252 accredited) on behalf of the Hawke's Bay District Health Board using a call centre based in Auckland, New Zealand. The surveys were conducted on 16 August 2016, 18 August 2016, 22 August 2016 and on the 27/28 September 2016 (days 8, 10, 14 and 50 after the outbreak started).

Households were selected for the initial three survey waves using a combination of landline telephone numbers sourced from a local directory and random digit dialling using numbers generated by a computer-assisted telephone interviewing (CATI) system to include numbers not listed in

the local directory. The locations of the selected households were overlaid with the distribution grid for the Havelock North water supply to exclude households not supplied by Havelock North water. Survey four participants were a subset of those contacted during three initial survey waves selected based on willingness to participate in the follow-up survey. For all survey waves, questions were usually answered by a single person on behalf of the household. The questions asked in this survey are provided in the Appendix.

Confirmed and notified cases of campylobacteriosis were extracted from EpiSurv notifiable disease database as previously described.<sup>12</sup>

This study was undertaken under the direct supervision and mandate of the Hawke's Bay Medical Officer of Health Dr Nicholas Jones under the New Zealand *Health Act 1956*.

### Statistical analyses

Attack rates were calculated from notified cases relative to the Havelock North population, from the proportion of telephone respondents with diarrhoea, and from the proportion of telephone respondents who drank the Havelock North water and had diarrhoea. Results were adjusted by age group.

P-values for demographic groups were calculated using Pearson's Chi-squared test. Poisson confidence intervals (95% CI) for attack rates were calculated using binomial distribution for proportions. To assess potential differences in the number of cups of water drunk by symptom status, a *t*-test to compare the difference between the observed means in two independent samples was performed. All calculations including odds ratios were performed using MedCalc Version 20 (MedCalc Software, Ostend, Belgium).

## Results

### Participation and representation

Not all the questions were answered by all the respondents, so denominators differ for some questions. Of the 195 households included in surveys one to three, 169 participated in the fourth survey, representing 473 residents. The surveyed population aligned reasonably well with the age distribution of Havelock North residents, although those aged 30–39 years old were slightly under-represented in the sample and those aged 60–69 years old were slightly over-represented ( $p < 0.01$ ) (Table 1).

### Drinking water exposure

During the 5 days that it is likely that the water in Havelock North was contaminated (7–12 August 2016), 361 of the 421 people for whom this question was answered indicated that they had consumed unboiled Havelock North tap water, with 125 (35%) developing diarrhoea (Table 1). Among the 60 who stated that they did not drink the water, only two (3%) developed diarrhoea (odds ratio 15.4, 95% CI 3.7–63.9,  $p < 0.01$ ). While in every age group those who developed diarrhoea drank more water than those that did not, this was only statistically significant for those 15–19 years of age, those over 50 years of age and for all cases combined (Table 1). On average, individuals who developed diarrhoeal symptoms drank 5.3 glasses of unboiled tap water per day, whereas those who did not develop diarrhoea drank an average of 3.9 glasses per day ( $p < 0.01$ ).

### Reported diarrhoeal symptoms

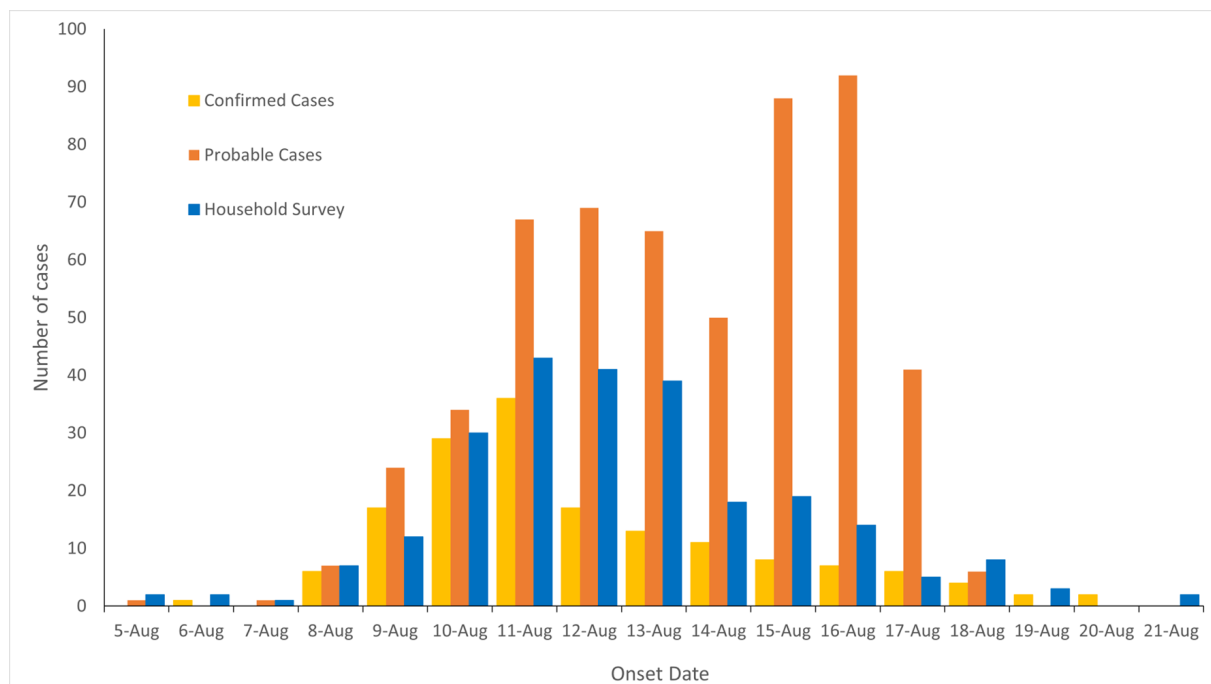
Within the 169 households surveyed, 81 households contained at least one member who suffered diarrhoea, with a total of 144/473 individuals with diarrhoea. Of these, 45 (31%) reported a relapse after improvement, with two individuals reporting that their diarrhoea had not stopped after more than 6 weeks. The attack rate was higher in those under 30 years of age (44%) compared with those over 50 years of age (26%) ( $p < 0.01$ ). Among telephone survey respondents, those over 70 years old had a lower attack rate than most other age groups. This contrasted with notified cases where those over 70 years old had the highest attack rate (Table 1). Among the 144 individuals with diarrhoea, 34 visited a general practitioner (GP), one visited a hospital and three visited both a GP and a hospital. In households of two or more where at least one person had diarrhoea, 86% (66/77) had at least one person who did not report diarrhoea (Table 2).

The onset dates of cases in the household survey aligned well with confirmed cases, with a peak in cases on 11 August (Figure 1). The apparent second peak in probable cases (symptomatic but not confirmed by isolation of *Campylobacter* from a patient sample), on 15 and 16 August was not observed among household survey cases.

### Impact of outbreak and household symptoms on daily life

Of the 473 people surveyed, 131 symptomatic individuals (28% of the total) indicated they had to take an average of 7 days off work or school

**Figure 1:** Onset dates of Havelock North residents who were confirmed notified cases, probable notified cases and household telephone respondents.



(range of 1 to 21 days, total of 936 days). Another 41 days were taken off by 11 individuals that had no symptoms of campylobacteriosis.

Of the 81 households with at least one person suffering from diarrhoea, 55 (68%) indicated that they spent money at pharmacies, with an average spend of NZ\$58 (range from NZ\$10 to NZ\$200, total of NZ\$3,180). Within these 55 households, 26 (47%) contained individuals who sought treatment by a GP or hospital, while for the other 29 the pharmacy was their only contact with the medical profession. Another 10 households with no cases of diarrhoea indicated they spent a total of NZ\$230 at pharmacies due to the outbreak (average of NZ\$23, range from NZ\$4 to NZ\$44).

On 12 August 2016 a boil water notice was posted and not withdrawn until 3 September 2016. Among surveyed households, 135 (80% of total) indicated that they boiled their water during the outbreak, with 11 of these indicating they routinely boil their tap water and an additional 51 indicating they were still boiling their tap water at the time of the fourth survey (27/28 September). Two-thirds of households (n=113) also chose to buy bottled water, with households using bottled water for a median of 24 days (range from 1 to 46 days).

## Discussion

The 2016 Havelock North waterborne *Campylobacter* outbreak resulted in an estimated 6,260 to 8,320 illnesses.<sup>12</sup> Core to this estimate was the use of cross-sectional telephone questionnaires administered during and after the outbreak to households within Havelock North. During the last of these telephone questionnaires a range of additional questions beyond disease incidence were asked, and this paper provides an analysis of the data, providing insights into campylobacteriosis, disease surveillance, outbreak investigation and community response.

### Attack rates

The observation that those who drank more water were more likely to have become ill supports a dose-dependent relationship, which was previously reported for a waterborne *Campylobacter* outbreak in Tune, Denmark.<sup>13</sup> Notified cases were distributed across the reticulated network,<sup>12</sup> and the water was contaminated for potentially 5 days, suggesting that all of those who reported drinking the water were likely to have ingested *Campylobacter*. However, only 35% of people who consumed the water reported symptoms,

**Table 1:** Age distribution of Havelock North residents, notified cases, telephone survey respondents and drinking water exposure–related gastric symptoms.

Age group (years)	Havelock North population	Notified cases in Havelock North		Telephone survey			Telephone survey who drank the water				
				Individuals	With diarrhoea		With diarrhoea		No diarrhoea		Attack rate <sup>h</sup>
				N (%) <sup>d</sup>	N (%) <sup>e</sup>	Attack rate <sup>f</sup>	N	Cups/day	N	Cups/day	
<5	715 (4.9%)	39 (5.0%)	5.5%	16 (3.4%)	6 (4.2%)	38%	6	4.3	8	2.6	43%
5–9	960 (6.5%)	38 (4.9%)	4.0%	30 (6.3%)	14 (9.7%)	47%	12	3.8	14	3.5	46%
10–14	1,110 (7.5%)	44 (5.7%)	4.0%	44 (9.3%)	18 (12.5%)	41%	15	5.7	21	4.1	42%
15–19	920 (6.2%)	51 (6.6%)	5.5%	37 (7.8%)	14 (9.7%)	38%	10	<b>7.2<sup>g</sup></b>	14	<b>3.7<sup>g</sup></b>	42%
20–29	1,015 (6.9%)	52 (6.7%)	5.1%	26 (5.5%)	9 (6.25%)	35%	7	4.9	7	3.9	50%
30–39	1,265 (8.6%)	51 (6.6%)	4.0%	<b>17 (3.6%)<sup>d</sup></b>	<b>3 (2.1%)<sup>e</sup></b>	18%	3	5.7	10	3.8	23%
40–49	1,920 (13.0%)	<b>75 (9.7%)<sup>b</sup></b>	3.9%	76 (16.1%)	29 (20.1%)	38%	28	6.0	36	4.3	44%
50–59	2,005 (13.6%)	<b>65 (8.4%)<sup>b</sup></b>	3.2%	63 (13.3%)	17 (11.8%)	27%	14	5.0	32	4.1	30%
60–69	1,900 (12.9%)	84 (10.9%)	4.4%	<b>84 (17.8%)<sup>d</sup></b>	19 (13.2%)	23%	16	4.2	52	3.8	24%
70+	2,920 (19.8%)	<b>275 (35.5%)<sup>b</sup></b>	<b>9.4%<sup>c</sup></b>	80 (16.9%)	<b>15 (10.4%)<sup>e</sup></b>	19%	14	5.9	42	3.8	25%
Total	14,730	774	5.3%	473	144	30%	125	<b>5.3<sup>g</sup></b>	236	<b>3.9<sup>g</sup></b>	35%
<30	4,720 (32.0%)	224 (28.9%)	4.7%	153 (32.3%)	<b>61 (42.4%)<sup>e</sup></b>	<b>39.9%<sup>f</sup></b>	50	5.2	64	3.7	<b>44%<sup>h</sup></b>
30–49	3,185 (21.6%)	<b>126 (16.3%)<sup>b</sup></b>	4.0%	93 (19.7%)	32 (22.2%)	34.4%	31	6.0	46	4.2	40%
Over 50	6,825 (46.3%)	<b>424 (54.8%)<sup>b</sup></b>	<b>6.2%<sup>c</sup></b>	227 (48.0%)	<b>51 (35.4%)<sup>e</sup></b>	<b>22.5%<sup>f</sup></b>	44	<b>5.0<sup>g</sup></b>	126	<b>3.9<sup>g</sup></b>	<b>26%<sup>h</sup></b>

<sup>a</sup>Percentage of the Havelock North population in each age group.

<sup>b</sup>Percentage of the Havelock North notified cases in each age group, with those in bold being significantly different ( $p < 0.01$ ) to the Havelock North population.

<sup>c</sup>Attack rate calculated from notified cases relative to Havelock North population, with those in bold being significantly higher ( $p < 0.01$ ).

<sup>d</sup>Percentage of telephone respondents in each age group, with those in bold being significantly different ( $p < 0.01$ ) to the Havelock North population.

<sup>e</sup>Percentage of telephone respondents in each age group with diarrhoea, with those in bold being significantly different ( $p < 0.01$ ) to the Havelock North population.

<sup>f</sup>Attack rate calculated from proportion of telephone respondents with diarrhoea, with those in bold being significantly different to each other ( $p < 0.01$ ).

<sup>g</sup>Significant difference in the number of cups per day consumed by those with diarrhoea compared with those without diarrhoea ( $p < 0.01$ ).

<sup>h</sup>Attack rate calculated from proportion of telephone respondents who drank the Havelock North water and had diarrhoea, with those in bold being significantly different to each other ( $p < 0.01$ ).

**Table 2:** Summary of the prevalence of diarrhoea within households.

		Household size						
		1	2	3	4	5	6	7+
Number of people in household with symptoms	0	21 (84%)	44 (63%)	12 (52%)	7 (23%)	2 (17%)	1 (25%)	1 (20%)
	1	4 (16%)	20 (29%)	4 (17%)	8 (27%)	4 (33%)	1 (25%)	1 (20%)
	2		6 (9%)	6 (26%)	6 (20%)	4 (33%)	2 (50%)	0
	3			1 (4%)	5 (17%)	0	0	2 (40%)
	4				4 (13%)	2 (17%)	0	0
	5					0	0	0
	6						0	1 (20%)
	7							0
Household attack rate	81/169 (48%)	4/25 (16%)	26/70 (23%)	11/23 (48%)	23/30 (77%)	10/12 (83%)	3/4 (75%)	5/5 (100%)
Individual attack rate	144/473 (30%)	4/25 (16%)	32/140 (23%)	17/69 (25%)	92/120 (77%)	20/60 (33%)	5/24 (21%)	13/35 (37%)

and within a household it was uncommon for all members to be sick. This attack rate of 35% is important for the epidemiological investigation of campylobacteriosis, highlighting that in similar situations only a limited number of those exposed will have symptoms.

Among those who claimed not to have drunk the water, only two reported symptoms. These symptoms could be due to campylobacteriosis acquired from another source such as exposure to poultry.<sup>3</sup> However they could still be connected to the outbreak: exposure to contaminated water during brushing of teeth, consumption of food prepared using unboiled tap water, swallowing of water during bathing/showering or from person-to-person transmission. Brushing of teeth has previously been implicated in development of campylobacteriosis during waterborne outbreaks in Norway<sup>9</sup> and in Darfield, New Zealand.<sup>7</sup>

Two differences between notified cases and telephone survey respondents were in disease incidence in over-70-year-olds and in the potential second peak seen for notified cases. While 35.5% of notified campylobacteriosis cases in this outbreak were over 70 years old,<sup>12</sup> in this telephone survey over-70-year-olds had the lowest attack rates. Older community members were proactively contacted during the outbreak to determine their health status and if they needed any support. This appears to have artificially increased the apparent

incidence among the older population in notified data. This proactive identification of cases may also partly explain what appeared to be a possible second peak in notified cases on 15 and 16 August (Figure 1), which was not supported by the telephone questionnaire data. Lower attack rates with increasing age could reflect increased immunity obtained from previous *Campylobacter* exposures.<sup>14,15</sup>

### Pharmacy surveillance

A survey of local pharmacists' activities during this outbreak<sup>16</sup> highlighted the important role of pharmacists in public wellbeing, pharmaceutical distribution and medicine therapy management. Drug sales data have been previously identified as a useful surveillance tool,<sup>17,18</sup> with this study quantifying the potential sensitivity of this approach. Seventy-two percent of the households with diarrhoea spent money at a pharmacy due to the outbreak, with less than half of those engaging with other medical care. This suggests that pharmacy-based surveillance could detect twice as many cases as may be possible via disease notification. The ease of access and lower cost relative to GPs increases the potential for sick individuals to visit pharmacies. However, without diagnostic tests this would not be particularly specific and, as highlighted by purchases from households without illness, there would be a false-

positive rate that would need to be accounted for.

### Impact

The telephone surveys also highlight the considerable loss in productivity caused by gastrointestinal outbreaks such as this, with individuals having an average of 7 days off school or work. A number of non-ill individuals were also unable to work or attend school due to the need to care for sick household members or as a consequence of the closure of schools or early learning centres. An age group-adjusted extrapolation to the whole population of Havelock North would be over 30,000 absentee days during this outbreak. This is important not only for the public health response, but also for evaluating the cost-benefits of future interventions and preventative actions. Households also spent an average of NZ\$58 at pharmacies, which through extrapolation to the population of Havelock North would suggest expenditure at pharmacies of over NZ\$100,000 due to this outbreak.

A relapse of symptoms after recovery was reported by 31% of cases, which is higher than previously reported relapse rates of up to 20% of cases.<sup>19</sup>

### Boiled water

On 12 August 2016, in response to the outbreak, the Hastings District Council flushed the reticulation network and began chlorinating the water supply.<sup>12</sup> A boil water notice was released to media and posted on social media the same day. In this study, we found that most households boiled their water or obtained water from other sources. While the boil water notice was lifted on 3 September 2016,<sup>20</sup> 51 households (38% of the total who boiled their water) were still boiling their tap water 3 weeks later. Boiling of drinking water is known to pose an inherent risk of burns or scalds, particularly to the elderly,<sup>21</sup> which is concerning when residents of at least 26 of these 51 households were over 65 years old. This highlights the importance of conveying not only the boil water notice but also the recommendation to stop boiling water to minimise the inherent risk that boiling water poses. For this communication to be effective, it may require additional supporting evidence of the safety of the water. There were 11 households who reported routinely boiling their water, but despite this seven still had cases of

diarrhoea. Previous studies have noted that many of those who boil their water for drinking will still use unboiled water for washing food and brushing teeth.<sup>22-25</sup>

### Conclusions

Not all individuals who develop gastrointestinal symptoms seek medical treatment, which means it is often difficult to assess the scale and impact of outbreaks. Telephone surveys or online questionnaires can be used to understand more about disease outbreaks, the disease itself and the behaviours of the public in response. Intense public interest in this outbreak may have increased the willingness to participate, which may not be as high for less prominent outbreaks.

The telephone surveys in this Havelock North outbreak were able to be undertaken remotely by individuals from outside the region (the interviewers were based in Auckland). This required minimal input from the local public health service who were both overwhelmed with responding to the actual outbreak and hampered by illness among public health staff who were also patients in the outbreak. This type of telephone survey does not require trade-offs in local resources and can be done in addition to any other response activities. Provided the exposed population can be reached, surveys can be faster than traditional approaches as they can be administered on the date of symptom onset, rather than waiting for clinical appointments, laboratory testing and notifications. While self-reported symptoms do not confirm the causative organism, it can, as illustrated, support laboratory confirmed surveillance systems. It would also be useful in places without effective surveillance systems or for organisms not tested for clinically, which would include many viruses and new emerging pathogens. The decline in landline telephone usage means that future surveys will need to make use of cellphone and/or online tools to administer surveys. These tools are not geographically bound in the same way as landline phones, so additional steps will need to be taken to identify individuals within an area of interest. This could be achieved by making use of GP patient lists, school roles or other groups. As part of preparedness activities, pre-prepared questionnaires and established relationships with professional survey companies would ensure that these types of surveys can be rapidly deployed.

**COMPETING INTERESTS**

Nil.

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**AUTHOR INFORMATION**

Brent J Gilpin: New Zealand Institute for Public Health and Forensic Science, Christchurch, New Zealand.

Shevaun Paine: New Zealand Institute for Public Health and Forensic Science, Kenepuru, New Zealand.

Tim Wood: New Zealand Institute for Public Health and Forensic Science, Kenepuru, New Zealand.

Carla J Eaton: New Zealand Institute for Public Health and Forensic Science, Christchurch, New Zealand.

Claire Newbern: New Zealand Institute for Public Health and Forensic Science, Kenepuru, New Zealand; Moderna, Philadelphia, Pennsylvania, United States of America.

Tiffany A Walker: Hawke's Bay District Health Board, Napier, New Zealand; Division of General Medicine, Grady Memorial Hospital, Atlanta, United States of America.

Graham Mackereth: New Zealand Institute for Public Health and Forensic Science, Kenepuru, New Zealand; Department of Primary Industries and Regional Development, Broome, Western Australia.

Nicholas Jones: Hawke's Bay District Health Board, Napier, New Zealand; Health New Zealand – Te Whatu Ora Hawke's Bay, New Zealand.

**CORRESPONDING AUTHOR**

Brent J Gilpin: New Zealand Institute for Public Health and Forensic Science, Christchurch, PO Box 29–181, Christchurch, New Zealand. E: [brent.gilpin@esr.cri.nz](mailto:brent.gilpin@esr.cri.nz)

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## Appendix

### Survey questionnaire

In this follow-up survey we would like to ask you a few questions about your household and the health issues that you or others may be facing because of the water supply contamination issue. The important information you give will help the District Health Board understand some of the long-term effects of the outbreak. This survey will take about 5–10 minutes and is voluntary. All the information you provide will remain confidential, and you can choose to end the survey at any time. If you have any queries about this survey you can contact the Hawke's Bay District Health Board.

Can you do this survey for us now? [If no, can someone else in the household do the survey for us?]

Yes, proceed

No, refused

---

Q1. When drinking water at home, which of the following applies about boiling tap water:

a) During the outbreak we boiled tap water, and have now stopped [1]

b) We are still boiling tap water [2]

c) We are not and have not been boiling tap water [3]

d) We have always boiled our tap water [4]

e) Unsure [5]

---

IF Q1=a) "During the outbreak we boiled tap water, and have now stopped" ASK:

Q1A. What date did your household stop boiling tap water for drinking?

---

Q2. Did you buy bottled water because of the outbreak?

Yes [1]

No [2]

Unsure [3]

---

IF Q2="Yes" ASK:

Q2A. For approximately how many days did you buy bottled water?

---

Q2B. As a household, roughly how much do you think was spent at the pharmacy or chemist because of the outbreak?

---

Q3. Which of the following do you think provided useful information on the outbreak?

TV [1]

Newspaper [2]

Radio [3]

Friends/family/neighbours [4]

Internet website [5]

Social networking websites (such as Facebook/Twitter) [6]

Healthline [7]

Usual general practitioner (GP) practice [8]

Anything else? [9]

---

Q3B. Since the last week of August, have there been further cases of gastro, with diarrhoea, in the household?

Yes [1]

No [2]

Unsure [3]

---

IF Q3B="Yes" ASK:

Q3C. Can you please tell me the age of the person and the date of onset?

---

Q4. Including yourself, how many people were living in your household before the gastro outbreak?

1 [1]

2 [2]

3 [3]

4 [4]

5 [5]

6 [6]

7 or more [7]

---

IF Q4="2, 3, 4, 5, 6, or 7 or more" GO TO Q16.

IF Q4="1" ASK:

Q5A. Can you please tell me your age?

---

Q6A. Have you had diarrhoea as a result of the outbreak?

Yes [1]

No/Unsure [2]

---

IF Q6A="Yes" ASK:

Q7A. Thinking of your first case of diarrhoea since the outbreak, which of the following describes what happened afterwards?

It got better and I have not had any since [1]

It got better and then started again [2]

It never got better [3]

Unsure [4]

---

Q8. Did you drink any unboiled Havelock North tap water the week before the outbreak (5 to 12 August 2016)?

Yes [1]

No/Unsure [2]

---

IF Q8="Yes" ASK:

Q8A. Was that at home or somewhere else?

---

Q9. Before the outbreak how many glasses of unboiled tap water were you drinking each day? Please remember to include any unboiled tap water used to make up drinks.

---

Q10. Have you been to the GP, hospital or any medical professional with gastro symptoms since the outbreak started?

---

IF Q10="Yes" ASK:

Q10A. Did you go to a GP or a hospital?

---

Q11. Have you had any joint swelling or stiffness for 3 or more days since the outbreak began?

Yes [1]

No/Unsure [2]

---

Q12. Have you taken any time off from normal activity, such as school or work, because of the outbreak?

Yes [1]

No/Unsure [2]

---

IF Q12="Yes" ASK:

Q12A. How many days have you taken off from normal activity?

---

Q16. Can you please tell me the age(s) of everyone in your household, starting with the youngest?

---

Q16A. Thinking about the person aged (...), to the best of your knowledge, have they had diarrhoea as a result of the outbreak?

---

IF Q16A="Yes" ASK:

Q17A. Thinking of their first case of diarrhoea since the outbreak which of the following describes what happened afterwards?

It got better and they have not had any since [1]

It got better and then started again [2]

It never got better [3]

Unsure [4]

---

Q18. As far as you know, did they drink any unboiled Havelock North tap water the week before the outbreak? (5 to 12 August 2016)?

---

IF Q18="Yes" ASK:

Q18A. Was that at home or somewhere else?

---

Q19. Before the outbreak how many glasses of unboiled tap water were they drinking each day? Please remember to include any unboiled tap water used to make up drinks.

---

Q20. And did the person aged (...) go to the GP, hospital or any medical professional with gastro symptoms since the outbreak started?

---

IF Q20="Yes" ASK:

Q20A. Did they go to a GP or a hospital?

---

Q21. And did the person aged (...) have any joint swelling or stiffness for 3 or more days since the outbreak began?

---

Q22. As far as you know have they taken any time off from normal activity, such as school or work, because of the outbreak?

---

IF Q22="Yes" ASK:

Q22A. How many days have they taken off from normal activity?

---

REPEAT FROM Q16 FOR ALL HOUSEHOLD MEMBERS

# Agreement between self-reported fractures in a clinical trial with New Zealand Accident Compensation Corporation claims data

Mark J Bolland, Zaynah Nisa, Anna Mellar, Chiara Gasteiger, Veronica Pinel, Borislav Mihov, Andrew Grey, Greg Gamble, Anne Horne

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## ABSTRACT

**AIM:** The aim of this article was to assess agreement between verified self-reported fractures in a clinical trial with Accident Compensation Corporation (ACC) claim data.

**METHODS:** In a 10-year randomised controlled trial of 1,054 women aged 50–60 years, participants self-reported fractures as they occurred or on routine 6-monthly questionnaires. Radiology imaging and reports were used to verify fractures, which were then compared with ACC claims data (ACC is the New Zealand no-fault accident claims organisation funded through levies). Initially, fracture claim data only were obtained, followed by all ACC claims for each participant for the study period.

**RESULTS:** Three hundred and fifty-six self-reported fractures in 248 women were verified in the trial, whereas there were 328 ACC fracture claims from 238 women for the study period. Out of 356 trial fractures, 211 (59%) had a matching ACC fracture claim, and out of 328 ACC fracture claims 211 (64%) had a matching trial fracture. After obtaining all ACC claims, we identified a matching ACC claim for 340/356 (96%) trial fractures: 59% were fracture claims and 31% soft-tissue injury claims.

**CONCLUSIONS:** Repurposing ACC fracture claims data for clinical trials has significant limitations and is likely to introduce false negative and false positive events. When tolerance for misclassification is higher (e.g., large non-randomised studies), ACC claims data may be useful because 60% of claims had a verified fracture, with higher proportions for major fracture types.

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Clinical studies that use routinely gathered data from registries or insurance claims are becoming increasingly popular as more and more clinical data are stored electronically and some databases may be easier to access.<sup>1</sup> These data have well described limitations when they are repurposed for use in clinical research.<sup>1</sup> The use of registry data has been touted as a disruptive technology that will transform clinical trials,<sup>2</sup> but, although the potential is acknowledged, there are numerous challenges with the conduct and interpretation of such trials.<sup>3</sup>

We recently completed a 10-year randomised, placebo-controlled trial of zoledronate given once or every 5 years in 1,054 women aged 50–60 years at baseline in Auckland.<sup>4</sup> During the study, participants informed us when they had a fracture, either directly or as part of routine 6-monthly questionnaires, and we obtained the relevant radiology report or imaging and confirmed the presence or absence of a fracture. Thus, data were obtained for verified self-reported fractures for these 1,054 women for up to 10 years.

We planned a cost-effectiveness analysis to

complement the clinical trial results and therefore obtained Accident Compensation Corporation (ACC) claims data for fractures for the 1,054 women over the 10-year period to estimate the total cost of each fracture event. ACC is the national New Zealand no-fault accident claims organisation which is funded through levies. There were marked differences between the number of women with a verified self-reported fracture and an ACC fracture claim. The primary aim of this study was to assess agreement between self-reported fractures in a clinical trial with the administrative claims dataset covering the same study sample from ACC. The secondary aim was to determine whether there were differences in treatment estimates for the efficacy of zoledronate on fracture incidence for self-reported verified fractures from the clinical trial and fractures reported in the ACC claims database.

## Methods

The study and its protocol have been published in full.<sup>4</sup> The relevant parts are that 1,054 women

aged 50–60 years were enrolled into the 10-year study and 1,003 (95%) completed 10 years of follow up. They were asked to contact us if they had a fracture or symptoms consistent with a fracture. Every 6 months they were sent a questionnaire which asked whether they had had a recent fracture. At each participant's in-centre visits (at 5 and 10 years) fracture details were checked for the entire duration of their study participation. Once a fracture was reported in any of these ways, we obtained the radiology report (most often an X-ray report), and/or the relevant imaging when necessary, and an investigator (MB) confirmed whether there was a fracture or not. Thus, a self-reported fracture was verified when either examination of the imaging or a radiologist report confirmed it. All trial fractures (but no morphometric vertebral fractures) were included in these analyses.

After the last participant had completed their 10-year visit, we applied to ACC for fracture claims data for the 1,054 women for the time-period they were in the study. Ethical approval to do this was obtained from the Northern A Health and Disabilities Ethics Committee and participants gave written informed consent. As our primary interests were cost data, we sought ACC data on the date and details of the event, the diagnosis, Read codes, International Classification of Diseases (ICD) codes and all relevant costs. Data were linked through the National Health Index (NHI) provided to ACC by us, together with the first and last visit dates for each participant in the study. It took 172 days from initial request to ACC until approval for data access was granted and an agreement signed, and less than 1 month from provision of the list of NHI identifiers to receipt of claims data.

Initially, we only sought the ACC data for all events with an ACC classification of "fracture". However, it quickly became apparent that there was a marked difference between the number of events obtained from ACC data and the self-reported verified events during the study. After a discussion with and permission from ACC, we requested and obtained data for all claims made by participants during the study period, to determine whether we could resolve the discrepancies. Once the full set of claims was obtained, for each person we reviewed all dates and descriptions for ACC claims for fracture, and all ACC claims up to 7 days before or after a self-reported fracture, in an attempt to match an ACC claim to a self-reported fracture. The choice of 7 days was a pragmatic one, in an attempt to capture all verified fractures

without reviewing every ACC claim.

One clinician (MB) searched the ACC dataset, identified ACC claims within the 7-day period of the fracture, reviewed all information in the ACC dataset about each claim, including the accident cause, ACC diagnosis, accident description, Read code, and ICD-9 and ICD-10 codes. Based on the information provided, each claim was categorised as consistent with or not consistent with the fracture. Where there were multiple claims, each claim was assessed independently, but only one claim was ascribed to each fracture. Sixteen women had fracture events in which they had more than one fracture (25 total fractures). For these events, we treated the fractures separately. All 16 events had a matching claim (11 classified as fracture, 5 other classification). The matching ACC claim was applied to all the fractures in the event.

### Statistical analysis

Proportions are presented as counts and percentages. Relative risks and 95% confidence intervals (CIs) are presented for the risk of at least one fracture with zoledronate compared to controls. All analyses were done using R 4.42 (R Core Team, 2024, R Foundation for Statistical Computing).

## Results

In the trial, 356 self-reported fractures in 248 women were verified ("trial fractures"). In the initial ACC request for fracture claims, there were 328 claims from 238 women for the period of the study that were classified as fracture: "ACC fracture claims" (note these are classified as "fracture/dislocation" by ACC). Table 1 shows that there were large numbers of both trial fractures without a matching ACC fracture claim and ACC fracture claims without a matching trial fracture. Two hundred and eleven out of 356 (59%) trial fractures had a matching ACC fracture claim, and 211/328 (64%) ACC fracture claims had a matching trial fracture.

When we obtained all ACC claims for all participants during the study time frame, 976 women made 5,897 ACC claims. After manually matching ACC claims with each trial fracture, we identified a matching ACC claim for 340 of the 356 trial fractures (96%). Table 2 shows the details of the matching ACC claims for all the trial fractures and by the randomised treatment group. The proportion of matching ACC claims were similar across

**Table 1:** Matching of trial fracture events and Accident Compensation Corporation (ACC) fracture claims.

ACC fracture claim	Trial verified, self-reported fractures	
	Yes	No
Yes	211	117
No	145	Not applicable

**Table 2:** Trial fracture events by final Accident Compensation Corporation (ACC) claim classification.

	Entire cohort n (%)	Treatment group		
		ZZ n (%)	ZP n (%)	PP n (%)
<b>Trial fractures (total)</b>	356	102	123	131
Matching ACC claim	340 (96)	98 (96)	118 (96)	124 (95)
No match	16 (4)	4 (4)	5 (4)	7 (5)
<b>ACC claim classification:</b>				
Fracture/dislocation	211 (62)	58 (57)	86 (70)	67 (51)
Soft-tissue injury	111 (33)	31 (30)	31 (25)	49 (37)
Laceration/ puncture/sting	13 (4)	9 (9)	0 (0)	4 (3)
Other	4 (1)	0 (0)	1 (1)	3 (2)
Concussion	1 (0)	0 (0)	0 (0)	1 (1)
<b>Trial fractures with:</b>				
ACC fracture claim	211 (59)	58 (57)	86 (70)	67 (51)
ACC non-fracture claim	129 (36)	40 (39)	32 (26)	57 (44)
No ACC claim	16 (4)	4 (4)	5 (4)	7 (5)
<b>ACC fracture claim with:</b>				
Trial fracture	211 (64)	58 (62)	86 (68)	67 (61)
No trial fracture	117 (36)	35 (38)	40 (32)	42 (39)

The entire cohort refers to all 356 trial fracture events in the 1,054 women, and the treatment group is the randomised group (ZZ = zoledronate at baseline and 5 years, ZP = zoledronate at baseline and placebo at 5 years, PP = placebo at baseline and 5 years).

treatment groups. Table 3 shows the number of women with at least one trial fracture by treatment group classified by any match with an ACC claim. When we compared the pooled zoledronate groups with the control group (that is zoledronate-zoledronate [ZZ] and zoledronate-placebo [ZP] vs control [placebo-placebo, PP], Table 3), the relative risk (95% CI) for a first fracture was 0.80 (0.64–1.0, 248 women with first trial fractures, 153/703 vs 95/351), 0.86 (0.64–1.16) for matching ACC fracture claim with first trial fracture (158 women, 100/703 vs 58/351), and 0.87 (0.69–1.09) for first ACC fracture claims (238 women, 151/703 vs 87/371).

Fifty-nine percent of fractures had a matching ACC fracture claim, 36% a non-fracture claim and 4% no matching claim. The most common non-fracture matching claim was soft-tissue injury (31%), followed by laceration/puncture/sting (4%).

There were some differences in the proportions of ACC claims by treatment group, but they were usually only small. Under the assumptions that the verified self-reported trial fractures are the gold standard, that no women with an ACC fracture claim without a reported trial fracture actually had a fracture, and women with a trial fracture with an ACC claim for something other than fracture are treated as not having an ACC fracture claim, the sensitivity, specificity, positive predictive value and negative predictive value for an individual having at least one ACC claim for fracture, are 0.64 (95% CI 0.57–0.70), 0.92 (95% CI 0.90–0.94), 0.71 (95% CI 0.65–0.77) and 0.89 (95% CI 0.87–0.91) respectively.

Table 4 shows the individual trial fracture type with the related ACC claim type. Hip, femur, arm, shoulder and wrist fractures all had concordance of >85%. Knee, leg, tarsal, rib, sternum and spine

**Table 3:** Trial first fracture events by final Accident Compensation Corporation (ACC) claim classification.

	Treatment group			
	Total cohort n (%)	ZZ n (%)	ZP n (%)	PP n (%)
N	1054	352	351	351
No trial fracture	806 (76)	278 (79)	272 (77)	256 (73)
First trial fracture	248 (23)	74 (21)	79 (23)	95 (27)
Trial fracture only, no matching ACC claim	11 (1)	4 (1)	3 (1)	4 (1)
Trial fracture and ACC fracture claim	158 (15)	43 (12)	57 (16)	58 (16)
Trial fracture and ACC non-fracture claim	79 (7)	27 (8)	19 (5)	33 (9)
ACC fracture claim only, no trial fracture	64 (6)	18 (5)	24 (7)	22 (6)
First ACC fracture claim	238 (23)	64 (18)	87 (25)	87 (25)
ACC fracture claim and trial fracture	158 (15)	43 (12)	57 (16)	58 (16)
ACC fracture claim and no trial fracture	80 (8)	21 (6)	30 (9)	29 (8)

The number of women with a first fracture (i.e., at least one fracture) or ACC fracture claim during follow up. Treatment group is the randomised group (ZZ = zoledronate at baseline and 5 years, ZP = zoledronate at baseline and placebo at 5 years, PP = placebo at baseline and 5 years).

**Table 4:** Individual verified fracture types and Accident Compensation Corporation (ACC) claim type.

Trial fracture type	n	ACC fracture claim n (%)	Any matching ACC claim n (%)
Skull	3	0 (0)	3 (100)
Clavicle	8	3 (38)	8 (100)
Sternum	6	2 (33)	6 (100)
Rib	21	7 (33)	19 (90)
Shoulder	22	19 (86)	22 (100)
Arm	1	1 (100)	1 (100)
Elbow	16	8 (50)	16 (100)
Wrist	52	46 (88)	51 (98)
Carpal	14	8 (57)	13 (93)
Metacarpal	9	7 (78)	9 (100)
Finger	18	8 (44)	17 (94)
Spine	19	7 (37)	16 (84)
Pelvis	7	5 (71)	7 (100)
Sacrum	5	3 (60)	5 (100)
Hip	3	3 (100)	3 (100)
Femur	1	1 (100)	1 (100)
Periprosthetic femur	1	0 (0)	0 (0)
Knee	8	0 (0)	7 (88)
Patella	4	2 (50)	4 (100)
Leg	3	0 (0)	3 (100)
Ankle	52	32 (62)	48 (92)
Tarsal	10	3 (30)	10 (100)
Metatarsal	26	14 (54)	26 (100)
Toe	47	32 (68)	45 (96)

all had <40% concordance. It is possible that axial/central fractures are more likely to have an ACC fracture claim, but there were obvious outliers (e.g., metacarpal 78%, spine 37%).

## Discussion

In this clinical trial where data on fractures were systematically gathered and verified, only 59% of events had a matching ACC claim classified as a fracture, although 96% of events did have a matching ACC claim. Soft-tissue injury claims were

made for 31% of verified fractures. Conversely, 64% of ACC fracture claims were associated with a fracture event during the study, but 36% had no associated verified fracture. The proportions of verified fractures with matching fracture or non-fracture claims were similar across treatment groups. There was no clear pattern in fracture types to explain the differences between the ACC claim classifications. The main end points of the trial were women with at least one fracture or fracture type. For all fractures, relying on matching ACC claims and verified fractures or ACC claims alone

reduced the estimate of treatment efficacy and widened the uncertainty in the estimate.

These data indicate that repurposing ACC fracture claims data for a clinical trial has significant limitations. It is likely that a number of fractures may be missed by relying solely on ACC data (false negatives) and also that a number of events may be misclassified as a fracture (false positives). Collectively, this may not introduce a directional bias in the results of a clinical trial, but it will introduce error and noise and potentially introduce a bias towards the null (as seen in these current analyses). Error in the assessment of fracture may lead to a true effect being obscured because a larger sample size is required to identify any differences due to the treatment. In our trial of 1,054 women followed for 10 years, there were 356 fracture events in 248 women. The relative risk was lower and the CIs smaller (indicating more precise estimates) for treatment effects of zoledronate in the analysis of verified fractures compared to analyses of the ACC claims data, whether utilising all fracture claims or just those with a matching verified fracture. If there are relatively few events, adding noise could lead to substantial departure from the true treatment estimate in either direction, simply by chance. Thus, for a trial with relatively few events, the use of ACC fracture data alone as the source of major fracture outcomes does not seem appropriate.

One way around this would be to obtain both fracture and soft-tissue injury ACC claims data. In this case, 92% of verified fractures would have been identified, but there would be a very large number of soft-tissue injury claims without fracture, biasing any analyses toward the null. Retrospective adjudication of the extensive number of claims would be impractical and prohibitively time-consuming.

We do not know why many fractures were classified in the ACC claim as soft-tissue injury. We searched for similar information about misclassification of injuries in ACC claims but were unable to locate any relevant research. It is possible that the person who completed the ACC form chose what appeared to be the best diagnosis at the time: some fractures may not have been apparent or may have been a lesser injury compared to the presenting problem.

It took close to 6 months from submission of the request to ACC until a contract was signed to obtain the data. ACC staff said the initial delay of 4 months was caused by a gap in their triaging process. Once regular contact was established

the process was smooth, and it took about 2.5 months until the final data were obtained. Others have described the length of time to access data from various New Zealand registries, which was 441 days from enquiry to data receipt for ACC.<sup>5</sup> Researchers planning to utilise ACC data should factor such durations into their study design.

If the clinical trial is large and many participants and events are anticipated, it is possible that the noise from misclassification is only small compared to the treatment effect and it may have little impact on the treatment effect estimate or its precision. We are aware of at least one clinical trial involving >5,000 participants with extended follow-up of up to 10 years that used ACC data, at least in part, for the outcome of fractures.<sup>6,7</sup> The authors reported that nearly half the fracture data came from ACC in their 10-year analysis (491/1,016 participants), but they did not report an analysis by initial randomisation, and we are unaware as to whether they compared ACC data with that from other sources such as self-reports or hospital discharge data.

For non-randomised clinical research the same caveats apply. For research where there are likely to be a relatively small number of events and it is critical that each event is accurately classified, the use of ACC fracture data to determine the fracture outcome seems unwise. However, in very large research studies, for example assessing fracture outcomes for the entire population or assessing secular trends in fractures, it may be that misclassification will not introduce differential bias for most analyses and so ACC fracture claims data could be a very valuable data source for analyses.

This research has limitations. This was a single clinical trial carried out in a single centre in a highly motivated population of early postmenopausal women. Results may be different in different populations. It is possible that some women did not self-report fractures during the trial, despite the multiple prompts to do so. We did not contact participants to find out more information about the ACC fracture claims that lacked a matching fracture event and so it is possible that some of these claims were indeed fractures that were missed. However, we do not think it is plausible that 105 women (10% of the study population) failed to report 117 fractures.

In summary, while using routinely gathered data for clinical trials has recently been promoted enthusiastically, the use of ACC fracture claims data alone for clinical trials is probably not wise, unless there is substantial tolerance for misclas-

sification of events in the study design. On the other hand, when precise individual data are not essential, such as in very large non-randomised clinical studies, ACC fracture claims data could be very useful since about 60% of ACC fracture claims had a verified fracture event. For “major”

fractures, such as wrist, shoulder, pelvis, hip and femur, the proportions were higher still, but for some of these categories there were few events, and confirmation of the high concordance in different populations would be useful.

**COMPETING INTERESTS**

Nil.

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**AUTHOR INFORMATION**

Mark J Bolland, MBChB, DSc: Bone and Joint Research Group, Department of Medicine, The University of Auckland, Auckland, New Zealand.

Zaynah Nisa, BNurs: Department of Medicine, The University of Auckland, Auckland, New Zealand.

Anna Mellar, BSc: Department of Medicine, The University of Auckland, Auckland, New Zealand.

Chiara Gasteiger, PhD: Department of Medicine, The University of Auckland, Auckland, New Zealand; Department of Psychology, Stanford University, Stanford, United States of America.

Veronica Pinel, MD: Department of Medicine, The University of Auckland, Auckland, New Zealand.

Borislav Mihov, BPhy: Department of Medicine, The University of Auckland, Auckland, New Zealand.

Andrew Grey, MD: Department of Medicine, The University of Auckland, Auckland, New Zealand.

Greg Gamble, MSc: Department of Medicine, The University of Auckland, Auckland, New Zealand.

Anne Horne, MBChB: Department of Medicine, The University of Auckland, Auckland, New Zealand.

**CORRESPONDING AUTHOR**

Mark J Bolland, MBChB, DSc: Bone and Joint Research Group, Department of Medicine, Faculty of Medical and Health Sciences, The University of Auckland, Private Bag 92019, Auckland, New Zealand. Tel: (+64 9) 3737 599 extn 83004. E: m.bolland@auckland.ac.nz

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# Paediatric periorbital and orbital infections: a decade of experience at Christchurch Hospital

Samuel Tomkins, Tony Walls, Hayleigh Miller

## ABSTRACT

**AIM:** This study aims to describe the epidemiology, clinical features, microbiology and management of paediatric patients (<18 years) admitted to Christchurch Hospital with periorbital or orbital infections over a 10-year period.

**METHODS:** A retrospective review was conducted of all patients under 18 years admitted with periorbital and orbital infections between 2013 and 2023. Cases were identified using surgical theatre records and discharge coding, with data extracted from electronic medical records. Clinical, demographic, microbiological and management data were analysed descriptively.

**RESULTS:** A total of 495 paediatric cases were identified, with 93% presenting with periorbital cellulitis and 7% with orbital cellulitis. Sinusitis was the predominant predisposing factor for postseptal disease, present in 83% of those cases. Orbital signs such as proptosis, pain with eye movement, reduced visual acuity and ophthalmoplegia were more frequent in orbital cellulitis. Orbital cases had longer hospital stays with a median of 4.5 days (range 2–33 days) compared to periorbital disease with a median of 1 day (range 0–8 days). Orbital cases also had a higher rate of surgical intervention (47%), most commonly functional endoscopic sinus surgery. *Staphylococcus aureus* was the most frequently isolated organism in both groups (45% periorbital, 42% orbital). Māori and Pacific children were disproportionately affected (comprising 20% and 10% respectively of periorbital cases and 17% and 19% of orbital cases).

**CONCLUSIONS:** The presence of orbital signs should prompt urgent imaging to exclude orbital disease. Sinusitis remains a key risk factor for orbital cellulitis, and Māori and Pacific children are disproportionately affected.

Periorbital and orbital infections are serious, potentially life-threatening conditions that predominantly affect children.<sup>1</sup> Historically, before the widespread use of antibiotics, these infections carried a high risk of morbidity and mortality, including permanent visual loss.<sup>2</sup> The introduction of vaccines against *Haemophilus influenzae* type B and *Streptococcus pneumoniae* led to a marked decline in invasive infections.<sup>3,4</sup> Periorbital and orbital infections are anatomically classified as preseptal (anterior to the orbital septum) or postseptal (posterior to the orbital septum).<sup>5</sup> Some literature uses periorbital cellulitis to describe preseptal disease, and orbital cellulitis for postseptal disease. Others use periorbital infections as a broad term for both. To avoid confusion, this article will use periorbital/preseptal cellulitis for disease anterior to the orbital septum and orbital/postseptal cellulitis for disease posterior to the orbital septum. The distinction between preseptal and postseptal cases is clinically significant, as the two entities differ in pathogenesis, management and prognosis.<sup>6</sup> Preseptal cellulitis typically arises from local trauma or contiguous spread from surrounding infections, while

postseptal cellulitis is more often secondary to sinusitis or infection of adjacent structures such as the lacrimal sac.<sup>7</sup> Postseptal disease is associated with a higher risk of complications, including visual impairment and intracranial spread. This study aims to characterise the clinical and microbiological features, management and outcomes of paediatric periorbital and orbital infections admitted to Christchurch Hospital over a 10-year period, with particular attention to differences between preseptal and postseptal disease.

## Methods

A retrospective review was performed of all patients under 18 years admitted to Christchurch Hospital with a diagnosis of periorbital or orbital cellulitis from 1 January 2013 to 31 December 2022. Cases were identified through International Classification of Diseases (ICD) codes for periorbital cellulitis of the eyelid, cellulitis of the face, acute inflammation of the orbit including abscess, cellulitis, osteomyelitis, periostitis, tenonitis and acute sinusitis (L03.2, H00.0, H05.0, J01.0, J01.1, J01.2, J01.3, J01.8, J01.9).

Theatre records were also searched for “functional endoscopic sinus surgery ± middle meatal antrostomy ± ethmoidectomy”, “drainage subperiosteal abscess orbit” and “drainage intraorbital abscess”. These records were cross-checked against the ICD codes. The records were assessed for the following: ethnicity (prioritised ethnicity recorded as per the Ministry of Health – Manatū Hauora ethnicity data protocols), sex (at birth), age, diagnosis, season, length of admission, duration of symptoms prior to admission, potential source of infection (i.e., trauma to skin, sinus infection, dental infection, upper respiratory tract infection, no cause identified), vaccination status (patients were deemed up to date with vaccinations if they had received all of the vaccinations available [for their age] according to the New Zealand National Immunisation Schedule), clinical findings, white blood cells and C-reactive protein count within 24 hours of presentation, whether any oral or topical antibiotics had been administered prior to hospital, if any local microbial culture was taken during admission (microbial swabs from any source), microbial culture and sensitivity/resistance, radiology (including computed tomography [CT] and/or magnetic resonance imaging [MRI]), type and route of antibiotic, whether steroids had been administered, surgical intervention and follow-up plan.<sup>8</sup> Descriptive statistics were used to analyse

the results. The commonly used Chandler classification system was used to separate preseptal and postseptal infections into type I (inflammatory oedema), type II (orbital cellulitis), type III (subperiosteal abscess), type IV (orbital abscess) and type V (cavernous sinus thrombosis).<sup>9</sup>

## Ethics

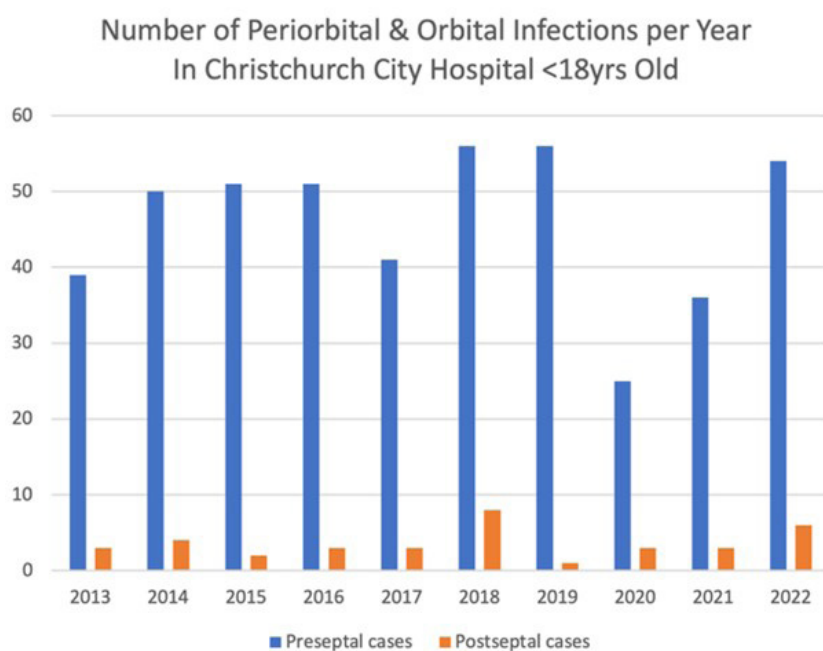
This study was out of scope for a Health and Disability Ethics Committee review. It was authorised by Health New Zealand – Te Whatu Ora Canterbury (locality authorisation number RO#23214).

## Results

### Demographics and clinical presentation

Over the 10-year period, 495 children were admitted with either periorbital or orbital cellulitis: 459 (93%) with preseptal and 36 (7%) with postseptal cellulitis (Figure 1). The male-to-female ratio was higher in both groups (1.4:1 preseptal, 1.8:1 postseptal). Preseptal cellulitis patients were younger (median age 3 years) compared to postseptal cases (median age 9.5 years). Those with postseptal disease had a longer length of admission with a median of 4.5 days (range 2–33 days) compared to preseptal disease with a median of 1 day (range 0–8 days). Ethnic distribution showed that nearly half of preseptal cases were

**Figure 1:** Number of periorbital and orbital infections (<18 years old) admitted to Christchurch Hospital between 1 January 2013 and 31 December 2022.



New Zealand European (49%), with Māori and Pacific children comprising 20% and 10% respectively. Among postseptal cases, 61% were NZ European, 17% Māori and 19% Pacific peoples.

### Clinical features and predisposing factors

Tables 1–3 describe the demographics and clinical features of the study participants. The majority of both preseptal and postseptal cases were unilateral (Table 2). Trauma (26%) and oculolacrimal infections (16%) were the most common predisposing factors for preseptal cellulitis. In contrast, sinusitis was the leading risk factor for postseptal disease, present in 83% of cases.

Key clinical features distinguishing postseptal from preseptal cellulitis included proptosis, pain on eye movement, ophthalmoplegia and reduced visual acuity. However, even among postseptal cases, proptosis was present in only 56%. The Chandler classification of all cases is displayed in Table 4.<sup>9</sup>

### Laboratory and imaging findings

Children with postseptal cellulitis had higher white cell counts and C-reactive protein at presentation, reflecting more severe infection. Imaging of the orbits was performed in 66 patients considered to be at high risk of postseptal infection. Sixty-three patients received CT imaging and three patients

received MRI. Twelve patients underwent both MRI and CT imaging. A sinus X-ray was performed in one case in 2013. Forty-five percent of patients who received imaging did not show any features of postseptal cellulitis.

### Microbiology

Microbiological cultures were obtained in 228 cases, predominantly from eye swabs, with additional specimens including superficial swabs, abscess swabs and intraoperative samples. In postseptal cases, *Staphylococcus aureus* (42%) and *Streptococcus milleri* group (27%) were the most commonly isolated organisms, with no methicillin-resistant strains (MRSA) identified. In preseptal cellulitis, sampling was most often from superficial swabs. *Staphylococcus aureus* was the predominant pathogen (45%), including four children with MRSA. Other organisms isolated included *Haemophilus influenzae* (10%; typing information not available), Group A *Streptococcus* (9%) and *Streptococcus pneumoniae* (7%).

### Management

All patients received antibiotics. Amoxicillin clavulanate was the most common empiric therapy. Sixty-eight percent of preseptal cases received intravenous antibiotics, compared with 100% of postseptal cases. In those with postseptal disease, 19 patients (53%) were treated

**Table 1:** Patient demographic information for patients with preseptal vs postseptal cellulitis.

Demographics		
	Preseptal, n=459	Postseptal, n=36
New Zealand European	226 (49%)	22 (61%)
Māori	93 (20%)	6 (17%)
Pacific people	46 (10%)	7 (19%)
Asian/Southeast Asian/Chinese/ Other Asian	47 (10%)	0 (0%)
European /Other European	31 (7%)	1 (3%)
Other (Latin American/Hispanic/ African/Middle Eastern/Indian)	16 (4%)	0 (0%)
Male	267 (58%)	23 (64%)
Female	192 (42%)	13 (36%)
Median age (interquartile range)	3 (6)	9.5 (6.25)

**Table 2:** Patient clinical features with preseptal vs postseptal cellulitis.

<b>Clinical features</b>		
	<b>Preseptal, n=459</b>	<b>Postseptal, n=36</b>
Eye (right, left or bilateral)	R: 219 (48%), L: 227 (49%), Bi: 12 (3%)	R: 20 (55%), L: 15 (42%), Bi: 1 (3%)
Oculolacrimal infection (conjunctivitis, chalazion, dacryocystitis, hordeolum)	72 (16%)	0 (0%)
Sinusitis	22 (5%)	30 (83%)
Trauma	120 (26%)	3 (8%)
Eyelid swelling	451 (98%)	35 (97%)
Periorbital erythema	447 (97%)	35 (97%)
Fever (on/during admission)	43 (9%)	17 (47%)
Proptosis	7 (2%)	20 (56%)
Pain on eye movements	31 (7%)	18 (50%)
Reduced visual acuity	19 (4%)	11 (31%)
Ophthalmoplegia	5 (1%)	17 (47%)

**Table 3:** Additional information regarding patients with preseptal vs postseptal cellulitis.

<b>Other</b>		
	<b>Preseptal, n=459</b>	<b>Postseptal, n=36</b>
Median white blood cells cells/L (interquartile range)	10 (5.1)	14 (7)
Median C-reactive protein mg/L (interquartile range)	7 (17.25)	70 (127)
Season: summer/autumn/winter/spring	120 (26%)/96 (21%)/109 (24%)/134 (29%)	6 (17%)/7 (19%)/13 (36%)/10 (28%)
Median length of symptoms prior to admission (days) (interquartile range)	1 (1)	2 (3)
Median length admission (days) (interquartile range)	1 (2)	4.5 (4)
Not up to date with vaccines	28 (6%)	3 (8%)

**Table 4:** Chandler classification of orbital infections.

Chandler classification	n	% overall	% of postseptal disease
Type I	459	92.7%	/
Type II	11	2.2%	30.6%
Type III	22	4.4%	61.1%
Type IV	1	0.2%	2.8%
Type V	2	0.4%	5.6%

conservatively with intravenous antibiotics alone, while 17 patients (47%) required operative management. Surgical interventions included: functional endoscopic sinus surgery (n=14, 58%), external (non-endoscopic) subperiosteal incision and drainage (n=9, 38%) and frontal sinus trephine (n=1, 4%). Three patients required multiple operations. Of the preseptal group, 14 (3%) patients also required incision and drainage, mainly due to abscess formation. There was no apparent association between prior antibiotic use and positive culture yield.

## Discussion

This study provides the largest single-centre dataset to date on paediatric periorbital infections in New Zealand. The proportion of postseptal cases (7%) was lower than reported in international series (13–21%), potentially reflecting local admission practices and early intervention.<sup>6,10,11</sup>

Sinusitis was a major risk factor for postseptal disease, supporting the need for vigilance in children with acute sinusitis and orbital symptoms. The finding that Māori and Pacific children are disproportionately affected echoes broader patterns of infectious disease inequity in New Zealand.<sup>12</sup> Addressing social determinants of health and improving access to timely care remain priorities.

The COVID-19 pandemic and associated public health measures coincided with a marked reduction in preseptal cellulitis admissions in 2020, likely reflecting decreased transmission of respiratory and oculolacrimal pathogens during lockdown periods.<sup>13</sup>

Microbiological findings were consistent with international literature, with *Staphylococcus aureus* the predominant organism in both preseptal and postseptal disease.<sup>14</sup> MRSA remained uncommon. The frequent use of amoxicillin clavulanate as

empiric therapy may reflect its perceived suitability for coverage of the organisms identified.

The study highlights the importance of thorough clinical assessment, with orbital signs (proptosis, ophthalmoplegia, pain on eye movement, reduced visual acuity) prompting urgent imaging to exclude postseptal involvement. Early surgical intervention was required in nearly half of postseptal cases, underscoring the potential severity of this condition.

## Limitations

The retrospective design may have led to misclassification or incomplete data capture, particularly with respect to microbiological data, where incomplete clinical documentation precluded accurate classification of swab sampling sites. Ethnicity data were based on prioritised ethnicity and may not fully reflect the paediatric population. The inability to calculate population-based incidence rates limits the ability to make broader epidemiological inferences.

## Conclusions

Paediatric periorbital and orbital infections display distinct differences in terms of risk factors, clinical features and outcomes. Sinusitis is a key risk factor for orbital cellulitis, which is often associated with greater morbidity and need for surgical intervention. Māori and Pacific children are over-represented, highlighting ongoing health inequities.

Clinicians should maintain a high index of suspicion for postseptal disease in children presenting with orbital signs, and prompt imaging is recommended. Empiric antibiotic therapy with amoxicillin clavulanate remains appropriate for most cases.

**COMPETING INTERESTS**

Nil.

**AUTHOR INFORMATION**

Samuel Tomkins: University of Otago Christchurch.  
 Tony Walls: University of Otago Christchurch; Health  
 New Zealand – Te Whatu Ora Waitaha.  
 Hayleigh Miller: Health New Zealand – Te Whatu Ora  
 Waitaha.

**CORRESPONDING AUTHOR**

Samuel Tomkins: Auckland City Hospital, 2 Park Road,  
 Grafton, Auckland 1023. E: stomkins@adhb.govt.nz

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# What legal protections are available to paramedics to prevent suicide? A review of case law concerning Section 41 of the Crimes Act 1961 (New Zealand)

Dylan A Mordaunt, Nicole Jones

## ABSTRACT

**AIM:** With the reduction in police involvement in front-line mental health responses in New Zealand (implemented November 2024), this study evaluates the primary legal justification supporting paramedics in using force to prevent suicide: Section 41 of the *Crimes Act 1961*.

**METHODS:** We conducted a qualitative analysis of 20 legal cases (1986–2023) identified through a systematic search. The analysis was structured thematically, focussing on the legal criteria for intervention, the role of de-escalation, the threshold for “reasonable force” and the unresolved conflict between intervention and patient autonomy. Cases were included if Section 41 was central to the legal reasoning or as a justification; cases where Section 41 was cited in passing without substantive discussion were excluded.

**RESULTS:** Case review suggests that while Section 41 can provide a legal justification, its application is highly context dependent. Courts have held that force is justifiable only to prevent immediate and unlawful harm and that it should be proportionate to the threat. Failing to attempt viable, less-restrictive alternatives can render even minimal force unreasonable. Cases involving excessive force demonstrate judicial focus on proportionality and the availability of other options. The analysis highlights a legal and ethical “grey area” concerning patient capacity and the limits of intervention.

**CONCLUSION:** There is limited case law interpreting Section 41 (20 substantive cases identified between 1986 and 2023). To improve safety for patients and practitioners, we suggest clearer operational guidance, multidisciplinary education and consideration of legislative options that would better support healthcare-led responses to mental health emergencies.

Suicide remains a leading cause of death in New Zealand, putting substantial pressure on emergency services to effectively respond to crises.<sup>1</sup> Mental health emergencies carry a considerable societal and individual burden, and paramedics are often the first healthcare professionals on scene. In New Zealand, paramedics, like all citizens, operate under a general duty of care to prevent harm, and a key legal tool for intervention in such situations is Section 41 of the *Crimes Act 1961*. This section provides a legal justification for the use of force to prevent suicide or serious harm, stating:

*“Everyone is justified in using such force as may be reasonably necessary in order to prevent the commission of suicide, or the commission of an offence which would be likely to cause immediate and serious injury to the person or property*

*of any one, or in order to prevent any act being done which he or she believes, on reasonable grounds, would, if committed, amount to suicide or to any such offence.”<sup>2</sup>*

This provision has become even more important for paramedics due to a major policy shift: from November 2024, New Zealand Police began phasing in higher thresholds for mental health callouts, prioritising events involving immediate risk to life and safety and directing lower-threshold events to more appropriate services.<sup>3</sup> This shift, driven by a “right person, right care” model,<sup>4</sup> aims to provide health-led interventions for those in mental health emergencies. However, it also places a substantial burden on paramedics, who are increasingly the primary responders to acute mental health events, often without direct police support or explicit legal authority.

Unlike police or designated mental health

clinicians, paramedics lack explicit powers under the *Mental Health (Compulsory Assessment and Treatment) Act 1992 (MHA)* to detain or compel individuals for assessment or treatment. The *MHA* grants specific powers to other health professionals (e.g., psychiatrists, medical practitioners) and police (under Section 109) for compulsory assessment and treatment. Paramedics, however, are not designated under this *Act*, leaving Section 41 as their primary legal protection when intervening with force. The application of Section 41 during complex, rapidly evolving pre-hospital mental health emergencies is characterised by significant legal ambiguity. This ambiguity stems from multiple sources: a paucity of case law (only 20 cases substantively interpreting Section 41 over 37 years), widespread misunderstanding of the scope of legislation across all professions (including psychiatrists, lawyers and police) and frequent real-world scenarios where Section 41's applicability is unclear (e.g., serious but non-immediate threats, patients with apparent capacity, situations where emergency teams are unavailable and police decline involvement). This creates a significant gap, leaving paramedics vulnerable to legal and ethical dilemmas, especially regarding patient autonomy and restrictive practices.

This paper critically evaluates the practical application and limitations of Section 41 of the *Crimes Act 1961* through a comprehensive analysis of New Zealand case law. By systematically examining how courts interpret “reasonably necessary” force, we aim to:

1. illuminate legal and ethical complexities for paramedics in mental health emergency intervention;
2. identify criteria and boundaries for justifiable force under Section 41;
3. provide evidence-based recommendations for policy, training and legislative reform to support paramedics in their expanding role.

## Methods

We conducted a qualitative study involving a systematic search and thematic analysis of New Zealand legal cases. We searched the Westlaw database for all reported and unreported New Zealand legal cases citing Section 41 of the *Crimes Act 1961* (1986–2023). This yielded 20 relevant cases from 1986 to 2023. Cases were included if Section 41 was central to the legal reasoning or as

a justification; cases where Section 41 was merely cited in passing without substantive discussion were excluded. The overall structure of the study is summarised in Figure 1.

We analysed the full texts of these cases to extract key legal principles, factual contexts and judicial reasoning. Our analysis focussed on four primary themes, which emerged from the case law and were refined through peer-review feedback:

1. *The threshold for intervention*: immediacy and lawfulness; legal grounds for initial force.
2. *The role of alternatives and de-escalation*: how less-restrictive options influence reasonableness.
3. *Proportionality and excessive force*: cases where force was disproportionate.
4. *Patient autonomy vs the duty to intervene*: conflict between self-determination and preventing self-harm.

Each case was reviewed to identify the operative facts, the specific force used, the court's reasoning for its decision and the direct relevance of the ruling to paramedic practice. This detailed thematic analysis forms the basis of the results. The conceptual relationships underpinning Section 41 are illustrated in Figure 2.

## Results

Our analysis of the 20 cases shows that Section 41 is applied in a highly contextual and often narrow way. Although no cases directly involved paramedics, the principles from cases involving police, nurses and civilians offer an analogous framework. These cases define the boundaries of “reasonable force” and highlight critical considerations for front-line healthcare providers. A summary of key judicial interpretations is presented in Table 1.

### Theme 1—the threshold for intervention

Courts consistently rule that Section 41 can only be used to prevent immediate and unlawful harm. This foundational principle is important for understanding when Section 41 can provide a justification for force, particularly where actions might otherwise be considered assault. Section 41 offers a *justification* for an act that would otherwise be a criminal offence (e.g., assault); it does not impose a positive duty to intervene.

This is evident in cases where individuals tried to justify their actions on moral or ethical grounds, rather than a legal basis. For instance, in a series of cases involving anti-abortion protestors trespassing at medical clinics (*Bayer v Police* [1991], *Wilcox v Police* [1993]), the courts firmly rejected the argument that Section 41 justified their actions.<sup>5,6</sup> The reasoning was twofold: first, the act (a lawful abortion) was not unlawful, and second, the court in *Wilcox* clarified that an unborn child is not legally considered a “person” under the *Act*. This sets a salient boundary: Section 41 cannot be used to interfere with lawful medical procedures or to impose moral judgments. The harm prevented should be a legally recognised harm, like suicide or an offence causing serious injury, not a lawful act.

Conversely, courts have justified intervention when there is a reasonable belief of imminent self-harm. In *R v Kissling* (2005), an officer’s “jaw grab” to prevent swallowing suspected methamphetamine was reasonable and necessary to prevent airway obstruction or overdose.<sup>7</sup> Similarly in *R v Roulston* (1998), the belief of harm should be reasonable, but certainty is not required.<sup>8</sup> The phrase “believes, on reasonable grounds” in Section 41 (1) combines a subjective belief with an objective test (reasonable grounds), like the *mens rea* requirement in criminal law. For paramedics, intervention to prevent ingestion of harmful substances or physical self-harm may be justifiable under Section 41, provided the belief of harm is genuinely held and reasonable. The focus is on preventing the *act* that would lead to harm.

### Theme 2—the role of alternatives and de-escalation

A key finding for paramedics is that force is often deemed reasonable only if less-restrictive alternatives were available and attempted. This aligns with the least restrictive environment principle, a cornerstone of modern mental health law. Failure to de-escalate or explore other options is a recurring theme in cases where force has been deemed unreasonable, even with protective intent.

The case illustrating this is *Re Shepherd* (2010), a Health Practitioners Disciplinary Tribunal decision involving a registered nurse in an acute mental health unit.<sup>9</sup> The nurse, Mr Shepherd, observed a large, agitated patient with a known history of violence verbally threatening a female colleague. Without warning, Mr Shepherd approached the patient from behind

and applied a “bear hug” to move him away. This led to a struggle where the patient kned the nurse, who then struck the patient’s face in self-defence. The Tribunal made an important distinction: the initial “bear hug” was deemed unreasonable. Not because of the minimal force, but because the nurse failed to attempt readily available alternatives. He did not use his personal alarm, call out to the patient to distract or de-escalate, or ask his colleague to move away. The surprise, from-behind physical approach was deemed unsafe and unnecessarily provocative, almost certain to provoke an adverse reaction from an unwell patient. In contrast, the subsequent jab to the face was deemed reasonable self-defence under Section 48 of the *Crimes Act*, as by that point the nurse was in pain, actively being assaulted, and needed to extricate himself. This case establishes a principle: de-escalation or other safer, less-intrusive options should be considered and, where appropriate, attempted before physical force. For paramedics, this underscores the importance of verbal de-escalation, tactical positioning and calling for backup before resorting to physical restraint. The *process* of intervention matters as much as the outcome.

This principle was reinforced in *Wallace v Abbott* (2002), where a police officer shot and killed Mr Wallace, who was on a violent rampage with a baseball bat.<sup>10</sup> The chief justice, in allowing a jury trial, highlighted the officer’s alternatives *before* confrontation: waiting for a dog handler, using the patrol car’s public address system or maintaining observation. Engaging in an armed, on-foot confrontation was presented as a choice that recklessly led to lethal force. For paramedics, choices leading to intervention are as legally significant as the intervention itself. Failure to de-escalate, contain or call for appropriate resources can undermine a claim of justified force, even in high-stakes situations.

### Theme 3—proportionality and excessive force

Even when justified, force needs to be proportionate to the actual threat. The *Crimes Act* offers several justifications for force, including Section 41, Section 39 (force in arrest) and Section 48 (self-defence). Proportionality and reasonableness are common principles across these. Cases show where this line is crossed, leading to findings of excessive and unlawful force. For any of these justifications, the defendant bears the burden of raising it, and the Crown must then prove it

beyond a reasonable doubt.

In *Police v Marshall* (2023), a police sergeant knelt on the cheekbone of a handcuffed, non-compliant man, causing a fracture.<sup>11</sup> The man was face-down, naked and surrounded by six officers and a police dog. Despite struggling, he posed no realistic threat. The judge found the force excessive, unnecessary and punitive. Safer alternatives existed (e.g., other officers controlling limbs), and the judge inferred the force was punitive, not necessary restraint. This shows disproportionate force: even in chaos, force must be minimal and lawful. It highlights the need for continuous threat assessment and adapting force levels.

Similarly, in *Duncan v Police* (2011), a civilian's act of dragging a woman by her hair to prevent self-harm was found unreasonable.<sup>12</sup> Despite protective intent, the action was disproportionate. These cases demonstrate that good intentions do not justify disproportionate force. Force is judged against context, including vulnerability and available resources. Courts consistently scrutinise whether force was truly "reasonably necessary", emphasising that the intervention method must align with the threat level.

#### Theme 4—patient autonomy vs the duty to intervene

Case law reveals a deep, unresolved tension between Section 41 justification and a competent patient's right to refuse medical treatment. This is a challenging and ethically complex area for paramedics, who often encounter individuals with fluctuating capacity or those refusing life-saving interventions. The *New Zealand Bill of Rights Act 1990 (NZBORA)* further complicates this, particularly regarding the right not to be arbitrarily detained (Section 22) and the right to refuse medical treatment (Section 11).

Courts have drawn limits. In *Seales v Attorney-General* (2015), Lecretia Seales, a competent woman with terminal brain cancer, sought a declaration that her doctor could lawfully assist her to end her life without facing prosecution under Section 179 (aiding and abetting suicide).<sup>13</sup> The High Court held that Section 41 could not provide a legal justification for voluntary-assisted dying, as its purpose is to *prevent* suicide, not assist it. This case clarifies that Section 41 is strictly preventative in nature and cannot be invoked to justify active assistance in ending life, regardless of the circumstances or the person's competence and wishes. Following this case, New Zealand enacted the *End of Life Choice Act*

2019, which now provides a specific legal framework for assisted dying in limited circumstances, further underscoring that Section 41 was never intended for such situations.

More complex for paramedic practice is the ruling in *Chief Executive of the Department of Corrections v All Means All* (2014), which found a hunger strike not legally equivalent to suicide.<sup>14</sup> Since death was not the prisoner's primary purpose (the hunger strike was a political protest), Section 41 could not justify force-feeding. The court upheld the competent individual's right to refuse treatment, even if fatal. Unlike *Seales*, which concerned active assistance to end life, *All Means All* involved passive refusal of life-sustaining intervention. The distinction is critical: Section 41 may justify preventing active self-harm (e.g., physically stopping someone from jumping), but not compelling treatment against a competent person's refusal (e.g., force-feeding, forced transport).

For paramedics, this creates a significant legal and practical challenge. They must discern, in high-pressure situations, whether they face a genuine suicide attempt (where Section 41 may justify intervention) or a competent refusal of care (where intervention may not be justified). The presence or absence of decision-making capacity becomes central, yet paramedics lack formal authority and specialised training to make definitive capacity determinations. This grey area is further complicated when encountering patients with advance directives declining life-sustaining treatment, or those at end-of-life who refuse transport to hospital—scenarios where the boundary between preventing suicide and respecting autonomy is contested and uncertain.

This raises a key question for paramedics: what is their legal standing when using force to treat a patient who has, for example, taken a survivable overdose but is now conscious and competently refusing hospital transport?<sup>15</sup> Case law offers no definitive answer, suggesting Section 41 justification may weaken or vanish if a patient has capacity—an assessment paramedics are not formally trained nor legally empowered for, yet are expected to undertake daily. This leaves field capacity assessment as a significant legal and ethical grey area. It is important to note that paramedics are not qualified to undertake *formal* capacity assessments, which require specialised clinical expertise typically provided by psychiatrists or designated health practitioners. Unlike

police officers (Section 109 *MHA*) or designated medical practitioners (compulsory treatment orders), paramedics lack explicit *MHA* authority to detain or compel individuals.

Their interventions are primarily justified by Section 41, which provides a justification for what would otherwise be assault, not a positive power to compel. Without guidance, paramedics are in an unenviable position, forced to make rapid, high-stakes judgments about a patient's capacity without formal legal or clinical frameworks. While paramedics cannot perform formal capacity assessments, field-appropriate training could help them recognise when capacity may be impaired and when expert assessment is needed. This training could focus on recognising key indicators (e.g., understanding information, appreciating consequences, reasoning with information) and the limitations of field-based assessment, as well as documentation for legal defensibility. This is a critical gap needing policy and training.

## Discussion

Our analysis shows that the legal framework protecting paramedics in mental health emergency interventions is uncertain and significantly limited. While Section 41 offers a justification, case law interprets it narrowly, emphasising immediacy, proportionality and exhausting alternatives. With police withdrawing from many front-line mental health calls, paramedics will increasingly navigate this complex legal terrain alone, making high-stakes decisions without guidance.

### Limitations of Section 41 for paramedic practice

Case law reveals three key limitations of Section 41 for paramedics:

1. *Imperative of de-escalation and alternatives:* As *Re Shepherd* demonstrates, failing to de-escalate or use non-physical options can render even minimal force unreasonable. This places a significant burden on paramedics to show that physical intervention was a true last resort, undertaken only after exhausting all other reasonable alternatives or deeming them unsafe. This requires training in communication, de-escalation techniques and tactical decision making in dynamic environments. Current rapid intervention

training may inadvertently conflict with this legal imperative, requiring a re-evaluation of training priorities to align with the least restrictive means principle.

2. *Mandate of proportionality:* *Police v Marshall* demonstrates that punitive, excessive or unnecessary force, particularly when other resources (e.g., additional personnel, less-lethal options) are available, are not legally protected. Force should be strictly proportionate to the immediate threat. This requires a nuanced understanding of threat assessment and the ability to apply only the minimum necessary force, even under pressure. The potential for criminal liability under Section 62 of the *Crimes Act* (“*Everyone authorised by law to use force is criminally responsible for any excess.*”<sup>22</sup>) further compounds this risk, putting individual paramedics in a precarious position where a split-second decision can have life-altering legal consequences. This highlights the need for guidelines on appropriate force escalation and de-escalation, and a deeper understanding of how Section 41 interacts with other criminal law defences like self-defence (Section 48) or force in arrest (Section 39).
3. *Unresolved question of patient capacity:* Capacity assessment is perhaps the most significant legal and ethical grey area. Cases like *All Means All* suggest Section 41 may not justify intervention if a patient has capacity to refuse life-saving treatment, even if it leads to self-harm. Paramedics are not qualified to undertake formal capacity assessments, which are complex determinations requiring specialised expertise typically provided by psychiatrists or other designated medical practitioners. This limitation leaves paramedics vulnerable to legal challenges when they intervene with force against the wishes of a patient whose capacity is unclear. The ongoing review of the *MHA* and its alignment with the Convention on the Rights of Persons with Disabilities could further complicate this area. This may shift the legal landscape towards greater emphasis on capacity-based decision making, requiring a framework that helps paramedics recognise when capacity may be impaired and when expert

assessment is needed, while balancing individual autonomy with the duty to prevent harm.

### The nature and sources of legal uncertainty

While Section 41 provides a legal justification for preventing suicide, its practical application in pre-hospital mental health emergencies is characterised by substantial uncertainty. This uncertainty arises from several interconnected sources. First, there is a marked paucity of case law: only 20 cases over 37 years (1986–2023) have substantively interpreted Section 41, with most addressing police or psychiatric contexts rather than paramedic practice specifically. This limited jurisprudence leaves many practical scenarios without clear legal guidance.

Second, misunderstanding of Section 41's scope extends across professions. Discussions with psychiatrists, lawyers, police officers and paramedics reveal inconsistent interpretations of when force is justified, what constitutes “reasonably necessary” force and how patient capacity affects the legal analysis. Indeed, the term *capacity* itself seems to create uncertainty, with some practitioners conflating the specialised capacity assessment undertaken by subspecialists with the more general capacity assessments routinely undertaken by a range of medical and non-medical health practitioners. This is not a paramedic training issue—it reflects a broader lack of clarity on how the law itself is applied, or that we are using an instrument (criminal law) that is not the best tool for the intended application.

Third, paramedics regularly encounter scenarios where Section 41's applicability is unclear. These include situations involving serious but not immediately life-threatening self-harm, as the *Crimes Act* does not cover non-immediate threats (where the “immediate” requirement may not be met), patients who appear to have capacity to refuse treatment (where *All Means All* suggests intervention may be unjustified), cases where mental health emergency teams are unavailable and police decline to attend (leaving paramedics as the only responders without explicit authority) and situations involving advance directives or end-of-life wishes (where the boundary between preventing suicide and respecting autonomy is contested). This uncertainty forces paramedics to choose between unlawful but ethical action (intervening without legal justification) versus abandoning the patient to potential harm.

Noting this ambiguity, other jurisdictions have moved away from relying on crimes legislation for mental health emergency response.<sup>16</sup> Victoria and the Australian Capital Territory, for example, have shifted to health-centred statutory frameworks under their respective mental health acts, providing explicit powers and protections for paramedics and other health professionals. New Zealand's continued reliance on Section 41—a provision within the *Crimes Act* designed for general citizen intervention—reflects the absence of a comprehensive, health-focussed legal framework for pre-hospital mental health emergency response. A comparative legal overview of New Zealand and Australian jurisdictions is provided in Figure 3.

### Broader implications for mental health emergency response

This review highlights a broader systemic issue in New Zealand's mental health emergency response. Paramedics' reliance on Section 41 is a symptom of a fragmented system lacking comprehensive, integrated legal and operational frameworks. The “right person, right care” model, while well intentioned, needs robust legal protections and practical guidelines for all front-line responders.<sup>17</sup> Without these, the shift in police involvement risks transferring the burden and legal uncertainty (without any additional resourcing), rather than resolving underlying systemic challenges. An integrated response warrants inter-agency protocols, a shared understanding of legal authorities and limitations and a collaborative approach that prioritises patient safety and wellbeing while protecting clinicians from legal risks from undertaking their usual duties.

### Recommendations

The current legal framework, particularly the reliance on Section 41 of the *Crimes Act*, is insufficient for supporting paramedics in their expanding and important role in mental health emergency intervention. To ensure the safety of both clinicians and patients, co-ordinated action is needed across legislative, policy and training domains.

We recommend the following specific actions:

1. *Legislative reform:* The new *Mental Health Bill* is needed to explicitly include paramedics.<sup>16</sup> This reform should grant paramedics clear, context-appropriate

legal authority and protection to assess, detain, treat and transport individuals in acute mental health emergencies, like powers given to police and other designated clinicians. This was the subject of a joint submission to the select committee by New Zealand's national ambulance services, advocating for their inclusion within the *Act's* framework to ensure seamless and legally sound care.<sup>18</sup> Such clarity would reduce paramedics' current legal ambiguity, providing a more robust foundation for their interventions and aligning legal powers with operational responsibilities.

2. Development of national, integrated guidelines: Health New Zealand – Te Whatu Ora, in collaboration with national ambulance services, the New Zealand Police and mental health advocacy groups, could develop and implement national clinical practice guidelines for mental health emergency response. These guidelines could provide a robust, evidence-based framework for:
  - a. rapid and accurate risk assessment in dynamic pre-hospital environments, including tools for assessing immediate danger and escalation potential;
  - b. advanced de-escalation techniques, drawing directly from *Re Shepherd* principles and incorporating evidence-based communication strategies to reduce the need for physical intervention;
  - c. determining when and how force is “reasonably necessary”, incorporating lessons from proportionality cases (*Police v Marshall*, *Duncan v Police*) and available alternatives, and providing practical examples and decision-making trees to guide paramedics in complex scenarios;
  - d. clear protocols for inter-agency collaboration, explicitly defining roles and responsibilities between ambulance, police and mental health services to ensure a co-ordinated, effective and legally compliant response.

3. *Multidisciplinary training*: All health professionals would benefit from regular, realistic simulation-based training in de-escalation techniques, recognising when capacity may be impaired, and the legal and ethical application of restrictive practices. This training could be:
  - a. *scenario-based*—using realistic simulations of mental health emergencies to build practical skills and decision making under pressure, allowing paramedics to practice applying legal principles in real-time scenarios and receive constructive feedback;
  - b. *multidisciplinary*—co-designed and co-delivered with mental health professionals, police and, crucially, people with lived experience of mental health emergencies to ensure comprehensive, empathetic and realistic training, fostering a shared understanding and collaborative approach;
  - c. *legally informed*—explicitly integrating the nuances of Section 41, Section 62 and relevant aspects of the *MHA* and the *NZBORA*, ensuring all relevant professionals understand their respective powers, limitations and potential legal consequences, which includes training on documentation to support legal defensibility.

## Conclusion

While Section 41 of the *Crimes Act 1961* is an important legal tool, it is not a sufficient tool for paramedics operating in complex mental health emergency interventions. The current framework requires clarification and places a burden on individual pre-hospital practitioners. Legislative reform, clear national guidelines and robust multidisciplinary training are needed to better support paramedics and ensure the safety and wellbeing of both clinicians and the vulnerable patients they serve. Comprehensive reform would help ensure a safe, effective and legally sound mental health emergency response system.

**Table 1:** Summary of case law interpreting Section 41 of the *Crimes Act 1961* (1986–2023).

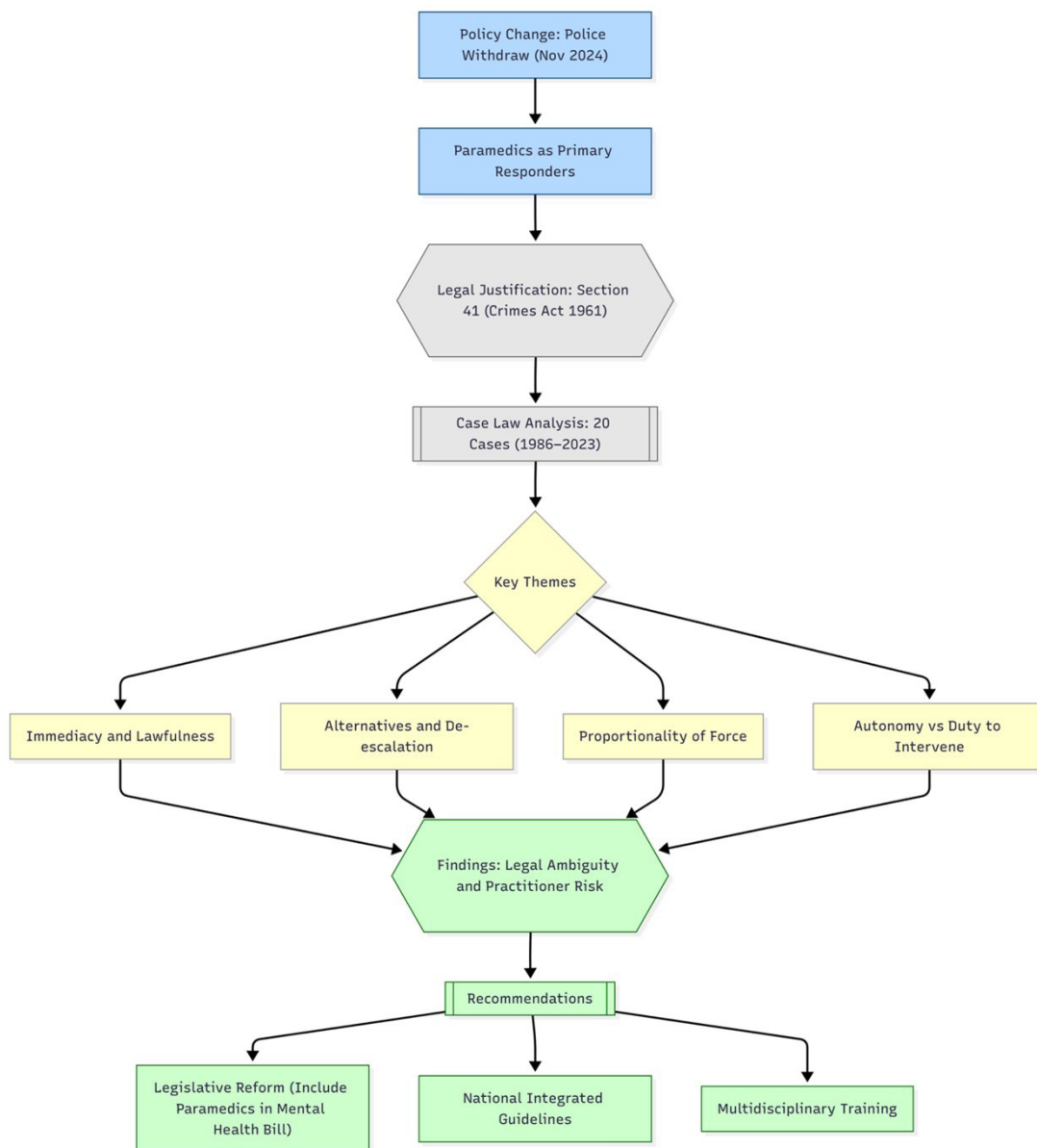
Case & citation	Brief summary of relevance
<i>Ashby v R</i> <sup>19</sup>	Distinguishes between lawful police entry to prevent harm under the <i>Search and Surveillance Act</i> and the specific justification of force under Section 41.
<i>Bayer v Police</i> <sup>6</sup>	The court held that Section 41 cannot justify actions taken to prevent a <i>lawful</i> act (in this case, abortion).
<i>Bayer v Police</i> <sup>6</sup>	The court affirmed the High Court decision in <i>Bayer</i> and that an unborn child is not legally considered a “person” for the purposes of Section 41.
<i>Chief Executive of the Department of Corrections v All Means All</i> <sup>14</sup>	The court ruled that a hunger strike is not legally considered suicide, and therefore Section 41 cannot be used to justify forced medical treatment against a competent person’s will.
<i>Duncan v Police</i> <sup>12</sup>	In this case, even with a protective intent, the specific force used (dragging someone by the hair) was deemed unreasonable and disproportionate.
<i>Gordon v Attorney-General</i> <sup>20</sup>	Addresses the intersection of the <i>Mental Health Act</i> and the right to refuse treatment, highlighting the ongoing legislative debate around compulsory care.
<i>Jenkins v Police</i> <sup>21</sup>	The court found that a civilian’s unconventional but necessary use of force (throwing a milk bottle at attackers) was justified to prevent harm to another person.
<i>Police v Marshall</i> <sup>11</sup>	In this case of excessive force, a police officer’s knee-strike to an already restrained person’s head was deemed punitive and unnecessary.
<i>R v Haddon</i> <sup>22</sup>	The court found that the use of a firearm in defence of property was excessive and disproportionate to the threat posed.
<i>R v Kissling</i> <sup>7</sup>	Justifies the use of force (a jaw grab) to prevent a person from swallowing a dangerous substance based on a reasonable belief of imminent self-harm.
<i>R v Roulston</i> <sup>8</sup>	Reinforces that police are justified in using force to prevent a person from swallowing drugs that could cause serious injury.
<i>R v Russo</i> <sup>23</sup>	Upholds the use of force, including a taser, as reasonable to prevent self-harm in a volatile situation involving drugs and weapons.
<i>Re Shepherd</i> <sup>9</sup>	The tribunal held that readily available alternatives (like using an alarm or de-escalation) should be attempted before physical restraint is considered reasonable.
<i>Russo v R</i> <sup>24</sup>	The court upheld the High Court decision in <i>Russo</i> , finding the use of a taser and a pat-down search were justified preventative actions under Section 41.
<i>S v Attorney-General</i> <sup>25</sup>	Underscores that any use of force should comply with the human rights of vulnerable individuals, particularly those with intellectual disabilities detained under the <i>Mental Health Act</i> .
<i>Seales v Attorney-General</i> <sup>13</sup>	The court held that Section 41 justifies force to <i>prevent</i> suicide but does not provide a defence for <i>assisting</i> in a person’s death.
<i>Slater v Attorney-General</i> <sup>26</sup>	The court found that the use of force (pepper spray) was excessive as there was no immediate threat of harm that justified it.

**Table 1 (continued):** Summary of case law interpreting Section 41 of the *Crimes Act 1961* (1986–2023).

<i>Wallace v Abbott</i> <sup>10</sup>	The court held that the reasonableness of lethal force is a question for a jury, especially when less violent alternatives may have been available to police.
<i>Wilcox v Police</i> <sup>5</sup>	The court affirmed that Section 41 cannot be used to protest lawful medical procedures and that an unborn child is not a “person” under the Act.
<i>Young v Attorney-General</i> <sup>27</sup>	The court found that forceful actions by police during an arrest of an aggressive person were justified and proportionate to the resistance offered.

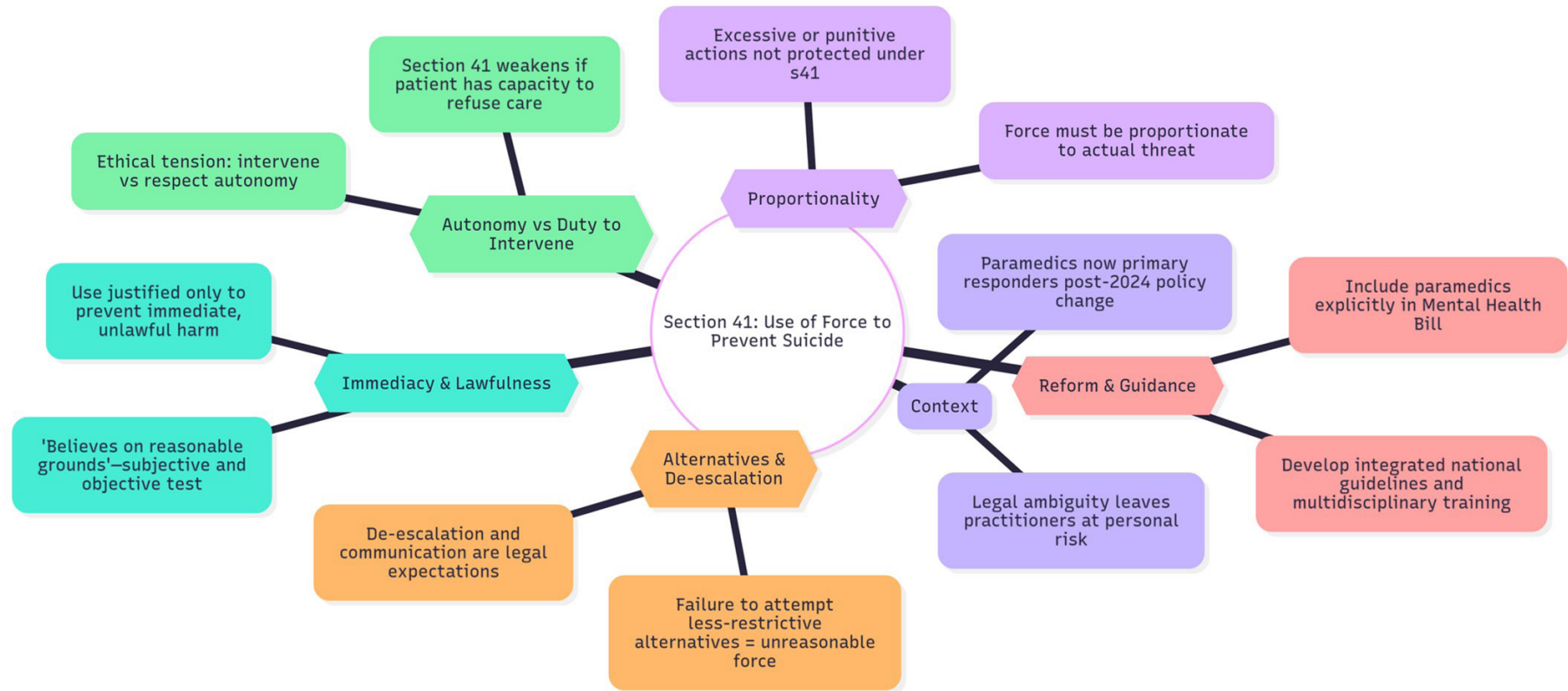
Overview of New Zealand case law concerning the application of Section 41 (use of force to prevent suicide), highlighting the year, case name, type of intervention, key legal issue and outcome. The table demonstrates the evolution from early emphasis on reasonable force and immediacy toward more nuanced consideration of mental health context, proportionality and the practitioner role. It also shows the growing ambiguity surrounding paramedic interventions in suicide prevention following the 2024 operational shift removing police from front-line mental health responses.

Figure 1: Graphical abstract—legal protections for paramedics preventing suicide.



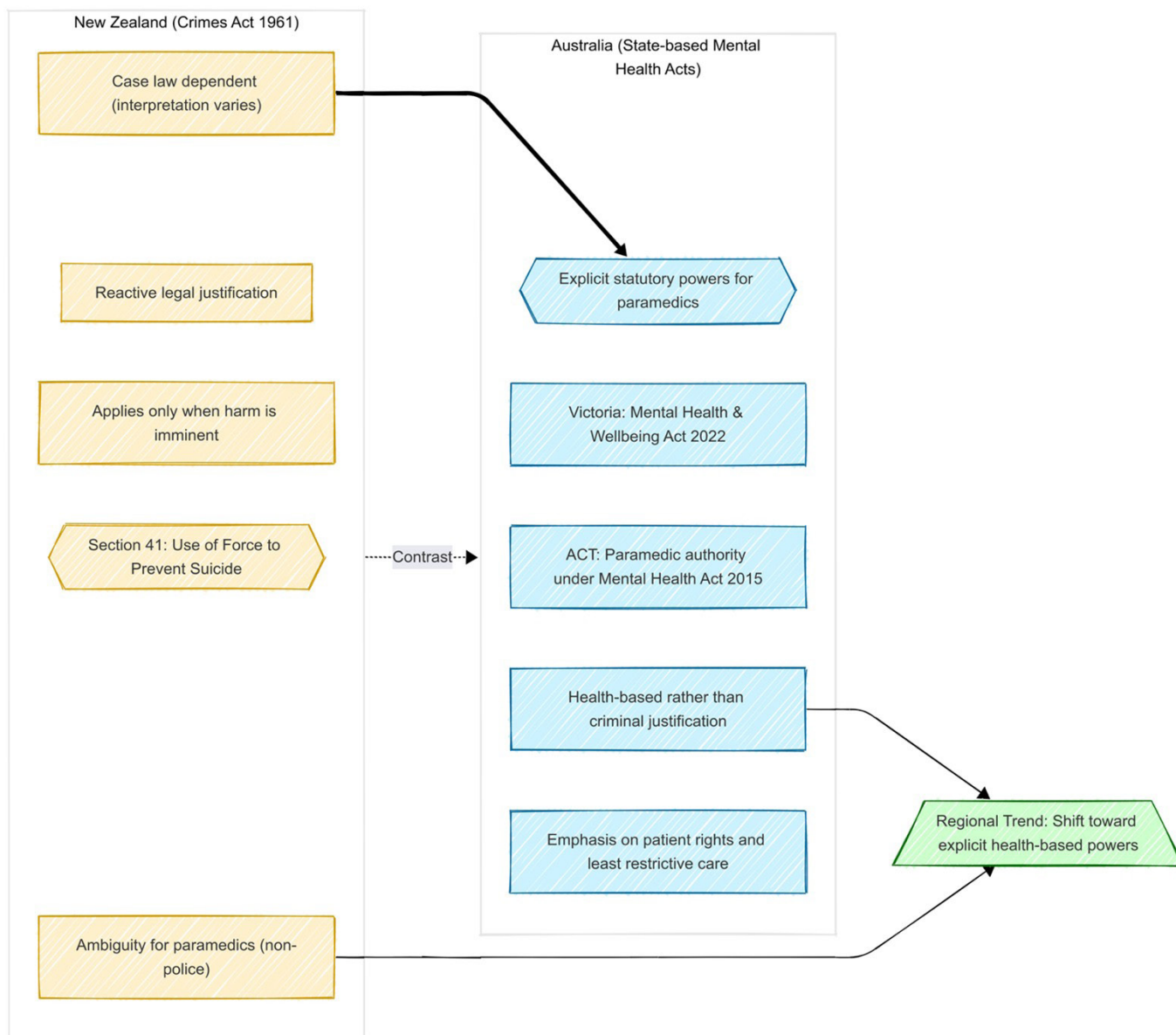
Visual summary of the research exploring the use of Section 41 of the *Crimes Act 1961* as the legal justification for paramedics using force to prevent suicide. The diagram traces the policy context following police withdrawal from mental health emergencies, outlines key case law themes—immediacy and lawfulness, alternatives and de-escalation, proportionality and autonomy versus duty to intervene—and highlights findings of legal ambiguity and practitioner risk. The final tier summarises recommendations for legislative reform, integrated national guidelines and multidisciplinary training.

Figure 2: Conceptual framework—Section 41 and paramedic practice.



Conceptual mind map illustrating the legal–ethical dimensions of Section 41 of the *Crimes Act 1961* as applied to paramedic intervention in suicidal crises. The central node represents Section 41’s “use of force to prevent suicide” provision, surrounded by four key interpretive pillars: threshold of intervention (immediacy), alternatives and de-escalation, proportionality and autonomy versus duty to intervene. Contextual nodes emphasise the removal of police support and associated legal uncertainty, leading to proposed reform through legislative clarification and interprofessional guidance.

**Figure 3:** Comparative legal context—New Zealand and Australian jurisdictions.



Comparative framework contrasting New Zealand’s reliance on Section 41 of the *Crimes Act 1961* with Australian jurisdictions that provide explicit statutory powers for paramedics under mental health legislation. While New Zealand’s approach remains reactive, ambiguous and reliant on case law, states such as Victoria and the Australian Capital Territory employ health-based legal frameworks that prioritise patient rights and proportional intervention.

**COMPETING INTERESTS**

The authors are employed by ambulance organisations that employ paramedics.

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**AUTHOR INFORMATION**

Dylan A Mordaunt: Faculty of Health, Te Herenga Waka—Victoria University of Wellington, New Zealand; Wellington Free Ambulance, New Zealand.  
Nicole Jones: Hato Hone St John, New Zealand.

**CORRESPONDING AUTHOR**

Dylan A Mordaunt: Faculty of Health, Te Herenga Waka—Victoria University of Wellington, New Zealand; Wellington Free Ambulance, New Zealand.  
E: dylan.mordaunt@vuw.ac.nz

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# Regional and ethnic projections of gastric cancer incidence in Aotearoa New Zealand to 2045: identifying opportunities for targeted action

Michael Walsh, Karen Bartholomew, Jonathan Koea, Clarence Kerrison, Nina Bevin, Maryann Heather

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## ABSTRACT

**BACKGROUND:** Gastric cancer (stomach cancer) is an important contributor to morbidity and mortality in Aotearoa New Zealand, with marked ethnic inequities. Although national incidence rates are declining, Māori and Pacific peoples continue to experience higher rates than other groups. Demographic change and regional population growth are expected to influence future burden, yet no published projections provide estimates disaggregated by ethnicity and region.

**METHODS:** Gastric cancer registrations from 2001 to 2022 from the New Zealand Cancer Registry were linked to population estimates and projections stratified by age, sex, prioritised ethnicity and Health New Zealand – Te Whatu Ora region. Incidence was modelled using an age-period-cohort approach with time-based weighting to emphasise recent trends. Projections to 2045 were generated, and uncertainty was quantified using 1,000 non-parametric bootstrap iterations incorporating perturbation of population denominators.

**RESULTS:** Gastric cancer cases are projected to increase by 47.7% to approximately 725 per year by 2045, despite a decline in the age-standardised rate from 5.9 to 5.3 per 100,000. All regions show increasing absolute numbers, with the Northern Region experiencing the largest rise. Māori and Pacific peoples have the highest current incidence and a large proportional increase in projected cases, although incidence rates decline modestly for all ethnic groups. Future case growth is driven mainly by demographic expansion and an ageing population.

**CONCLUSION:** Absolute gastric cancer cases are projected to increase, particularly among Māori and Pacific populations and in regions experiencing rapid population growth. This has implications for early diagnosis and specialist service delivery. These projections support equity-focussed prevention and service planning, including *Helicobacter pylori* control, timely diagnostic pathways, and regional planning for specialist cancer services.

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Gastric cancer (stomach cancer) is an important contributor to cancer morbidity and mortality in Aotearoa New Zealand.<sup>1–3</sup> It is a top 10 cause of cancer death among Māori, with 5-year survival rates of around 27%.<sup>4</sup> Although national incidence has declined over recent decades, substantial differences persist between population groups. Māori and Pacific peoples experience higher incidence than the European/Other group, with some reports indicating three to six times higher rates.<sup>2,5</sup> These differences reflect variation in exposure to *Helicobacter pylori* (*H. pylori*), dietary and environmental factors, and broader structural conditions that influence access to timely diagnosis and treatment.<sup>6,7</sup> Although gastric cancer represents a smaller proportion of total cancer burden, its high case fatality, marked ethnic inequities and the presence of a well-established and modifiable causal

pathway through *H. pylori* make it a priority for targeted prevention and service planning.<sup>2,5,6,8,9</sup>

*H. pylori* infection is typically acquired in childhood, and household crowding, which is more prevalent in Pacific communities, is an important driver of transmission, contributing to the high infection prevalence observed in this population.<sup>10</sup> In addition, inherited cancer susceptibility plays a role in a subset of cases. Pathogenic germline mutations in the *CDH1* gene, which cause hereditary diffuse gastric cancer, are over-represented among Māori whānau and contribute to early onset diffuse gastric cancer and elevated lifetime risk.<sup>11,12</sup> Recognition of both acquired and inherited risk factors is therefore important for understanding the observed burden of gastric cancer and its unequal distribution in the New Zealand population.

The distribution of tumour sub-types differs

across population groups. Diffuse-type gastric cancer, often associated with *H. pylori*, is more common among Māori and Pacific peoples than among New Zealand Europeans.<sup>6,7</sup> Māori and Pacific populations are also diagnosed at a younger age and experience poorer survival outcomes that are shaped by structural inequities including socio-economic deprivation and inequitable access to care.<sup>2,5,6,9,13</sup> Although gastric cancer carries high case fatality and generally poor prognosis,<sup>6</sup> it is often overlooked in national cancer control discussions due to the relatively low annual case numbers compared to other cancers. These low annual case numbers, geographic dispersal and regional variation in surgical volumes also create unique challenges for care delivery and outcomes.<sup>14,15</sup>

Gastric cancer often requires intensive treatment, including surgery, chemotherapy and prolonged follow-up.<sup>16</sup> Even a modest increase in absolute case numbers has implications for diagnostic pathways, endoscopy services, surgical oncology and supportive care. Regional variation in population growth and demographic ageing will also influence future demand.

Age-period-cohort (APC) modelling provides a method for projecting future cancer incidence by drawing on historical trends and future population projections.<sup>17</sup> There are no published projections of gastric cancer incidence in New Zealand that present results disaggregated by ethnicity and region, and existing work is limited to national-level estimates without ethnic or regional breakdown.<sup>18</sup> This paper contributes new insights by presenting national and regional projections of gastric cancer incidence in New Zealand through to 2045. Incidence is stratified by ethnicity, sex and Health New Zealand – Te Whatu Ora region to provide a more detailed picture of expected trends to support planning and wider cancer control activities.

## Methods

### Data sources

National cancer registry data for New Zealand were used to model trends in gastric cancer incidence from 2001 to 2022 and to generate projections through to 2045. The dataset comprised all primary registrations of gastric cancer (International Classification of Diseases, 10th revision [ICD-10] code C16), stratified by calendar year, 5-year age group, sex, prioritised ethnicity (Māori, Pacific peoples, Asian and European/Other) and Health

New Zealand – Te Whatu Ora region. Population estimates and projections were sourced from Statistics New Zealand and aligned to the same demographic and geographic groupings (Statistics New Zealand, customised report, licensed for re-use under the Creative Commons Attribution 4.0 International licence).

### Modelling approach

Incidence was projected using a generalised linear modelling framework with a Poisson distribution and log link. The outcome variable was the count of incident gastric cancer cases within strata defined by calendar year, 5-year age group, sex, prioritised ethnicity and Health New Zealand – Te Whatu Ora region. The natural logarithm of the corresponding population denominator was included as an offset, such that the model estimates stratum-specific incidence rates on the log scale.

Age group was included as a categorical variable. Calendar year and birth cohort were included as linear terms to provide a simplified APC structure. Birth cohort was defined as calendar year minus the start age of the relevant 5-year age group. Sex, prioritised ethnicity and region were included as categorical main-effect covariates. No interaction terms were included between age, period, cohort, sex, ethnicity or region. As such, the groups share a common underlying linear temporal pattern, while differences between groups represent multiplicative shifts in baseline incidence on the log scale. Projected differences in age-standardised rates (ASRs) and case numbers over time therefore arise primarily from differences in baseline risk and from changes in population size and age structure, rather than from group-specific temporal trend effects.

The modelling framework draws on APC principles used in cancer incidence projections and is conceptually aligned with the approach applied in the Nordpred model.<sup>17</sup> In contrast to the Nordpred model, which estimates a separate drift parameter representing the overall log-linear trend and applies attenuation to this component in future periods, the present model incorporated calendar year directly as a linear term within a Poisson regression framework. Under this specification, the linear period term captures the overall temporal trend without estimating a distinct drift parameter. No explicit trend dampening was applied. This approach was selected to provide a simplified and internally consistent representation of temporal change across demographic and regional strata where some counts can be small.

To place greater emphasis on recent incidence patterns while retaining information from earlier years, time-based recency weights were applied. Calendar years were assigned increasing weights across the observed period, such that more recent years contributed more strongly to parameter estimation. Weights were normalised to have mean 1 across the observed period and were incorporated directly into model fitting. All analyses were undertaken in R (version 4.4.3, R Core Team, 2024, R Foundation for Statistical Computing).

### Bootstrap procedure and projection uncertainty

Uncertainty in projections was quantified using non-parametric bootstrapping with 1,000 iterations. Within each iteration, strata defined by age group, sex, ethnicity and region were resampled with replacement separately within each calendar year. This stratified resampling preserves the overall period structure while allowing sampling variability across demographic and regional strata within year.

Within each bootstrap replicate, historical population denominators were perturbed multiplicatively to represent uncertainty in population estimates. Specifically, observed population counts were multiplied by a normally distributed random variable with mean 1 and standard deviation 0.01. Resulting values were constrained to be at least 1 to avoid non-positive denominators. The Poisson model was refitted to each bootstrap sample using the recency weights described above.

Future population denominators were similarly perturbed multiplicatively using normally distributed random noise with mean 1 and year-specific standard deviations to reflect increasing uncertainty over the projection range. Standard deviations were set to 0.005 for 2023 to 2025, 0.010 for 2026 to 2030, 0.015 for 2031 to 2035, 0.020 for 2036 to 2040 and 0.025 for 2041 to 2045.

Projections were generated through to 2045. For each bootstrap replicate, predicted log incidence was obtained from the fitted model, including the population offset, and transformed to predicted case counts on the original scale. Projected case numbers were summarised across bootstrap replicates using the median as the point estimate. Ninety-five percent uncertainty intervals (UIs) were defined by the 2.5th and 97.5th percentiles of the bootstrap distribution.

### Age-standardised rates (ASRs)

ASRs were calculated for both observed and

projected data for the periods 2020–2022, 2035 and 2045, stratified by Health New Zealand – Te Whatu Ora region, sex and prioritised ethnicity, using the 2001 World Health Organization world standard population. For observed data, 95% confidence intervals (CIs) were calculated using standard methods for directly standardised rates, while for projected data, 95% UIs were derived from the distribution of ASRs across bootstrap replicates.

### Study approval

This study was considered low risk and was out of scope for Health and Disability Ethics committee review as it used de-identified administrative health data. Locality authorisation including Māori research review was granted by Health New Zealand – Te Whatu Ora Waitematā District, Research & Knowledge Centre (approval code: WAI20420).

## Results

### National and regional projections

Nationally, gastric cancer cases are projected to increase from around 492 per year in 2020–2022 to 725 by 2045 (95% UI 612–860), a 48% rise. The ASR is projected to decrease from 5.9 per 100,000 (95% CI 5.6–6.2) to 5.3 (95% UI 4.3–6.5), a 10% reduction. Female cases increase from 185 to 263 and male cases from 307 to 461, with ASRs declining in both groups. Cases among those aged  $\geq 75$  years accounted for 30% of all cases (159 per year) in 2020–2022, increasing to around 43% (270 cases per year; 95% UI 235–311) by 2035 and nearly 50% (354 cases per year; 95% UI 294–427) by 2045.

In the Northern Region, cases are projected to rise from 195 to 306 by 2045 (95% UI 257–364), a 57% increase. The ASR decreases from 6.9 (95% CI 6.3–7.5) to 6.0 (95% UI 4.9–7.4). Female cases rise from 77 to 112 and male cases from 118 to 194, with ASRs declining in both groups.

In Te Manawa Taki, cases increase from 103 to 150 by 2045 (95% UI 126–180), a 46% rise. The ASR falls from 6.2 (95% CI 5.5–6.9) to 5.3 (95% UI 4.3–6.6). Female cases rise from 40 to 55 and male cases from 64 to 95, with ASR reductions for both sexes.

In the Central Region, cases are projected to grow from 83 to 118 by 2045 (95% UI 99–142), a 42% increase. The ASR declines slightly from 4.9 (95% CI 4.3–5.6) to 4.8 (95% UI 3.9–6.0). Female cases rise from 31 to 43 and male cases from 53 to 75, with stable or declining ASRs.

In Te Waipounamu, cases rise from 110 to 150

by 2045 (95% UI 125–178), a 36% increase. The ASR decreases from 5.1 (95% CI 4.6–5.8) to 4.4 (95% UI 3.6–5.5). Female cases rise from 38 to 53 and male cases from 72 to 96, with reductions in ASRs for both groups.

### Ethnic-specific projections

Among Māori, gastric cancer cases are projected to increase from 84 in 2020–2022 to 165 by 2045 (95% UI 141–198), a 96% rise. The ASR is projected to decline from 10.7 (95% CI 9.4–12.1) to 9.8 (95% UI 8.0–12.0). In both sexes, case numbers increase but ASRs decrease, and Māori continue to experience among the highest rates across all ethnic groups.

For Pacific peoples, cases are projected to rise from 45 to 87 by 2045 (95% UI 71–104), a 93% increase. The ASR declines from 14.4 (95% CI 12.1–17.1) to 12.2 (95% UI 9.6–14.9). Female and male case numbers both increase, although projected rates remain higher for males.

Among those identified in the Asian ethnic group, case numbers rise from 54 to 161 by 2045 (95% UI 133–196), a 198% increase. The ASR declines from 6.7 (95% CI 5.7–7.8) to 5.1 (95% UI 4.1–6.4). Increases in cases for both sexes are driven largely by demographic growth rather than rising underlying risk.

For European/Other populations, case numbers remain stable, from 309 in 2020–2022 to 311 by 2045 (95% UI 261–370). The ASR declines from 4.6 (95% CI 4.3–5.0) to 3.6 (95% UI 2.9–4.4). Patterns for females and males are consistent with future demographic growth.

## Discussion

This study provides national and regional projections of gastric cancer incidence in New Zealand through to 2045, disaggregated by sex, prioritised ethnicity and Health New Zealand – Te Whatu Ora region. Although ASRs are projected to decline, absolute case numbers are expected to rise across most population groups over the next two decades, driven primarily by demographic change, particularly population ageing. The projections therefore largely reflect underlying demographic processes; however, these processes interact with existing inequities in incidence and population structure to shape the future distribution of disease burden.

The projected trends show a persistent and unequal burden across ethnic groups. Māori and Pacific peoples have both the highest current incidence and a large proportional increase in

projected case numbers by 2045, reflecting higher baseline risk alongside more rapid population growth and ageing. Although ASRs decline for all groups, these reductions are insufficient to offset demographic pressures for Māori, Pacific and Asian populations. In contrast, the European/Other population shows relatively stable case numbers and lower rates, although the absolute burden remains higher due to population size. Regional variation reflects population growth and demographic composition, with the Northern Region experiencing the largest increase in case numbers.

### H. pylori testing, treatment and opportunities for prevention

*H. pylori* infection is a major causal factor for non-cardia gastric cancer and is a key contributor to the higher incidence observed among Māori and Pacific peoples in New Zealand.<sup>1,19,20</sup> International evidence indicates that long-term declines in *H. pylori* prevalence have been central to reducing incidence in many settings.<sup>21,22</sup> However, in New Zealand, in addition to barriers to accessing primary care, access to symptomatic *H. pylori* testing and treatment is inequitable. Local research has demonstrated higher infection prevalence among Māori, Pacific peoples and some Asian populations, and has also reported lower treatment and post-treatment clearance among Māori and Pacific peoples.<sup>10,23,24</sup>

Global modelling suggests that a substantial proportion of future gastric cancer cases may be attributable to persistent *H. pylori* infection and therefore potentially preventable through effective detection and eradication strategies.<sup>21</sup> These findings are consistent with the patterns observed in New Zealand and reinforce the relevance of population-based or targeted *H. pylori* test-and-treat approaches,<sup>1</sup> as articulated in the new International Agency for Research on Cancer (IARC) *H. pylori* test-and-treat recommendations.<sup>25</sup> A national *H. pylori* seroprevalence study has recently been completed<sup>26</sup> and will provide an updated evidence base to inform the development of targeted prevention strategies in the New Zealand context.<sup>6,27</sup>

While *H. pylori* is a large driver of population-level risk, inherited susceptibility contributes to a subset of cases. Pathogenic *CDH1* variants, which are over-represented among some Māori whānau, are associated with early-onset diffuse gastric cancer.<sup>11,12</sup> Evidence suggests that *H. pylori* infection may further increase risk among genetically

**Table 1:** National and regional gastric cancer incidence for 2020–2022 and projections for 2035 and 2045.

	National	Northern	Te Manawa Taki	Central	Te Waipounamu
<b>Total</b>					
2020–2022					
Observed <sup>a</sup>	492	195	103	83	110
ASR <sup>b</sup>	5.9 (5.6–6.2)	6.9 (6.3–7.5)	6.2 (5.5–6.9)	4.9 (4.3–5.6)	5.1 (4.6–5.8)
Population <sup>h</sup>	5,110,975	1,923,710	1,012,335	970,830	1,204,100
2035					
Projected <sup>c</sup>	630 (563–709)	258 (229–290)	133 (117–151)	106 (93–121)	134 (118–151)
ASR <sup>d</sup>	5.4 (4.6–6.4)	6.2 (5.3–7.3)	5.5 (4.6–6.5)	4.9 (4.2–5.9)	4.6 (3.9–5.4)
% Change in cases <sup>e</sup>	28.3%	32.3%	29.1%	27.7%	21.8%
Population <sup>h</sup>	5,852,415	2,289,580	1,160,290	1,048,910	1,353,635
2045					
Projected <sup>c</sup>	725 (612–860)	306 (257–364)	150 (126–180)	118 (99–142)	150 (125–178)
ASR <sup>d</sup>	5.3 (4.3–6.5)	6.0 (4.9–7.4)	5.3 (4.3–6.6)	4.8 (3.9–6.0)	4.4 (3.6–5.5)
% Change in cases <sup>e</sup>	47.7%	56.9%	45.6%	42.2%	36.4%
% Annual change cases <sup>f</sup>	1.7%	2.0%	1.6%	1.5%	1.4%
% Change ASR <sup>g</sup>	–10.2%	–13.0%	–14.5%	–2.0%	–13.7%
Population <sup>h</sup>	6,208,355	2,488,585	1,227,125	1,082,925	1,409,720
<b>Female</b>					
2020–2022					
Observed <sup>a</sup>	185	77	40	31	38
ASR <sup>b</sup>	4.4 (4.0–4.8)	5.3 (4.6–6.0)	4.6 (3.8–5.6)	3.5 (2.8–4.4)	3.6 (2.9–4.5)
Population <sup>h</sup>	2,570,115	968,540	510,070	493,290	598,215
2035					
Projected <sup>c</sup>	228 (201–258)	94 (82–107)	48 (42–55)	39 (34–44)	47 (41–54)
ASR <sup>d</sup>	3.7 (3.1–4.4)	4.2 (3.6–5.0)	3.7 (3.1–4.5)	3.4 (2.8–4.0)	3.1 (2.6–3.6)
% Change in cases <sup>e</sup>	23.2%	22.1%	20.0%	25.8%	23.7%
Population <sup>h</sup>	2,938,795	1,152,260	583,410	532,370	670,755
2045					
Projected <sup>c</sup>	263 (221–314)	112 (93–133)	55 (46–66)	43 (36–52)	53 (44–64)
ASR <sup>d</sup>	3.6 (2.9–4.4)	4.1 (3.3–5.1)	3.6 (2.9–4.5)	3.3 (2.6–4.1)	3.0 (2.4–3.7)

**Table 1 (continued):** National and regional gastric cancer incidence for 2020–2022 and projections for 2035 and 2045.

	National	Northern	Te Manawa Taki	Central	Te Waipounamu
% Change in cases <sup>e</sup>	42.2%	45.5%	37.5%	38.7%	39.5%
% Annual change cases <sup>f</sup>	1.5%	1.6%	1.4%	1.4%	1.5%
% Change ASR <sup>g</sup>	-18.2%	-22.6%	-21.7%	-5.7%	-16.7%
Population <sup>h</sup>	3,113,315	1,251,260	615,865	548,600	697,590
<b>Male</b>					
2020–2022					
Observed <sup>a</sup>	307	118	64	53	72
ASR <sup>b</sup>	7.6 (7.1–8.2)	8.7 (7.8–9.7)	7.9 (6.7–9.1)	6.5 (5.5–7.7)	6.8 (5.9–7.8)
Population <sup>h</sup>	2,540,860	955,170	502,265	477,540	605,885
2035					
Projected <sup>c</sup>	402 (358–451)	164 (145–185)	84 (74–95)	67 (59–77)	86 (76–98)
ASR <sup>d</sup>	7.3 (6.3–8.6)	8.4 (7.1–9.9)	7.4 (6.2–8.8)	6.7 (5.7–8.0)	6.2 (5.2–7.3)
% Change in cases <sup>e</sup>	30.9%	39.0%	31.3%	26.4%	19.4%
Population <sup>h</sup>	2,913,620	1,137,320	576,880	516,540	682,880
2045					
Projected <sup>c</sup>	461 (389–546)	194 (163–231)	95 (80–114)	75 (63–90)	96 (81–115)
ASR <sup>d</sup>	7.1 (5.8–8.8)	8.1 (6.6–10.0)	7.2 (5.8–8.9)	6.5 (5.3–8.1)	6.0 (4.8–7.4)
% Change in cases <sup>e</sup>	50.2%	64.4%	48.4%	41.5%	33.3%
% Annual change cases <sup>f</sup>	1.8%	2.2%	1.7%	1.5%	1.3%
% Change ASR <sup>g</sup>	-6.6%	-6.9%	-8.9%	0.0%	-11.8%
Population <sup>h</sup>	3,095,035	1,237,325	611,260	534,325	712,125

<sup>a</sup> Average observed cases per year over the period.

<sup>b</sup> Age-standardised rate (ASR) over the three-year period with 95% confidence intervals.

<sup>c</sup> Projected cases with 95% uncertainty intervals.

<sup>d</sup> ASR of projected cases with 95% uncertainty intervals.

<sup>e</sup> Total percentage change in cases from observed 2020–2022 average.

<sup>f</sup> Annual percentage change represents the compound annual growth rate (CAGR) between the 2020–2022 average and 2045.

<sup>g</sup> Total percentage change in the ASR from observed 2020–2022.

<sup>h</sup> 2021 estimated resident population, 2035 and 2045 population projection.

**Table 2:** National incidence of gastric cancer 2020–2022 and projections for 2035 and 2045 by ethnicity and sex.

	Māori	Pacific peoples	Asian	European/Other
<b>Total</b>				
2020–2022				
Observed <sup>a</sup>	84	45	54	309
ASR <sup>b</sup>	10.7 (9.4–12.1)	14.4 (12.1–17.1)	6.7 (5.7–7.8)	4.6 (4.3–5.0)
Population <sup>h</sup>	872,710	354,160	817,725	3,066,380
2035				
Projected <sup>c</sup>	134 (119–152)	70 (60–80)	110 (95–128)	317 (282–355)
ASR <sup>d</sup>	10.6 (9.0–12.4)	13.0 (10.7–15.4)	5.5 (4.6–6.6)	3.8 (3.3–4.5)
% Change in cases <sup>e</sup>	59.5%	55.6%	103.7%	2.6%
Population <sup>h</sup>	1,083,520	436,565	1,439,590	2,892,740
2045				
Projected <sup>c</sup>	165 (141–198)	87 (71–104)	161 (133–196)	311 (261–370)
ASR <sup>d</sup>	9.8 (8.0–12.0)	12.2 (9.6–14.9)	5.1 (4.1–6.4)	3.6 (2.9–4.4)
% Change in cases <sup>e</sup>	96.4%	93.3%	198.1%	0.6%
% Annual change cases <sup>f</sup>	3.0%	2.9%	4.9%	0.0%
% Change ASR <sup>g</sup>	–8.4%	–16.0%	–23.9%	–21.7%
Population <sup>h</sup>	1,250,820	479,535	1,755,565	2,722,430
<b>Female</b>				
2020–2022				
Observed <sup>a</sup>	34	19	21	111
ASR <sup>b</sup>	8.1 (6.6–9.9)	11.5 (8.7–15.0)	4.9 (3.7–6.2)	3.3 (2.9–3.7)
Population <sup>h</sup>	438,630	175,435	414,190	1,541,860
2035				
Projected <sup>c</sup>	49 (43–56)	24 (21–28)	41 (35–47)	114 (101–130)
ASR <sup>d</sup>	7.2 (6.1–8.5)	8.7 (7.2–10.5)	3.8 (3.1–4.5)	2.6 (2.2–3.0)
% Change in cases <sup>e</sup>	44.1%	26.3%	95.2%	2.7%
Population <sup>h</sup>	543,550	216,575	725,800	1,452,870
2045				
Projected <sup>c</sup>	61 (51–73)	30 (25–37)	59 (48–72)	113 (94–136)
ASR <sup>d</sup>	6.7 (5.4–8.3)	8.1 (6.4–10.1)	3.5 (2.8–4.4)	2.4 (1.9–3.0)
% Change in cases <sup>e</sup>	79.4%	57.9%	181.0%	1.8%
% Annual change cases <sup>f</sup>	2.6%	3.2%	4.6%	0.1%

**Table 2 (continued):** National incidence of gastric cancer 2020–2022 and projections for 2035 and 2045 by ethnicity and sex.

	Māori	Pacific peoples	Asian	European/Other
% Change ASR <sup>g</sup>	-17.3%	-29.6%	-28.6%	-27.3%
Population <sup>h</sup>	626,225	238,430	881,000	1,367,655
<b>Male</b>				
2020–2022				
Observed <sup>a</sup>	50	26	32	198
ASR <sup>b</sup>	13.6 (11.5–16.1)	18.1 (14.2–22.7)	8.8 (7.1–10.8)	6.1 (5.6–6.6)
Population <sup>h</sup>	434,080	178,725	403,535	1,524,520
2035				
Projected <sup>c</sup>	85 (75–96)	45 (39–52)	70 (60–81)	202 (179–229)
ASR <sup>d</sup>	14.4 (12.3–17.0)	17.5 (14.5–20.8)	7.5 (6.3–9.0)	5.2 (4.4–6.1)
% Change in cases <sup>e</sup>	70.0%	73.1%	118.8%	2.0%
Population <sup>h</sup>	539,970	219,990	713,790	1,439,870
2045				
Projected <sup>c</sup>	104 (89–125)	56 (46–68)	102 (84–124)	198 (166–236)
ASR <sup>d</sup>	13.4 (10.9–16.4)	16.3 (12.9–20.1)	7.0 (5.6–8.7)	4.8 (3.9–5.9)
% Change in cases <sup>e</sup>	108.0%	115.4%	218.8%	0.0%
% Annual change cases <sup>f</sup>	3.2%	3.4%	5.2%	0.0%
% Change ASR <sup>g</sup>	-1.5%	-9.9%	-20.5%	-21.3%
Population <sup>h</sup>	624,495	241,105	874,560	1,354,775

<sup>a</sup> Average observed cases per year over the period.

<sup>b</sup> Age-standardised rate (ASR) over the three-year period with 95% confidence intervals.

<sup>c</sup> Projected cases with 95% uncertainty intervals.

<sup>d</sup> ASR of projected cases with 95% uncertainty intervals.

<sup>e</sup> Total percentage change in cases from observed 2020–2022 average.

<sup>f</sup> Annual percentage change represents the compound annual growth rate (CAGR) between the 2020–2022 average and 2045.

<sup>g</sup> Total percentage change in the ASR from observed 2020–2022.

<sup>h</sup> 2021 estimated resident population, 2035 and 2045 population projection.

susceptible individuals.<sup>28</sup> Recognition of hereditary diffuse gastric cancer is relevant for targeted genetic testing and management and reinforces the importance of *H. pylori* detection and eradication in high-risk individuals. However, this does not alter the central role of *H. pylori*-focussed prevention strategies at the population level.

Test-and-treat strategies represent an opportunity to reduce future incidence and are likely to be cost effective, particularly in higher-risk populations.<sup>29</sup> Development of a test-and-treat programme, as recommended in the *New Zealand Cancer Action Plan 2019–2029*,<sup>30</sup> should consider appropriate test modalities, culturally safe delivery and clear pathways to diagnosis and treatment.<sup>31</sup> An equity-focussed approach is required to address system-level barriers including cost, access and the delivery of culturally appropriate care. Antimicrobial stewardship, including antibiotic resistance, also requires consideration, particularly in higher-prevalence populations where prior treatment exposure may affect success.<sup>32</sup>

Given that most Māori and Pacific peoples access care through general practice, rather than through Māori- or Pacific-specific providers, equitable delivery will require that all primary care services are supported to provide effective and culturally appropriate *H. pylori* testing and treatment. Existing programmes such as the National Bowel Screening Programme may offer future opportunities for integrated stool-based testing, as trialled in Taiwan,<sup>33</sup> although this would require careful consideration given current inequities in screening uptake.

### Implications for service planning

The projected increase in gastric cancers will place additional demand on diagnostic and treatment services. In addition, the increasing proportion and number of cases among those aged ≥75 years has important implications for clinical management and service delivery, given the greater complexity of care and higher burden of comorbidity in older populations. Despite declining incidence rates, rising absolute case numbers are expected to increase demand for gastroscopy, pathology, imaging, surgical care and peri-operative support. Ensuring adequate regional diagnostic capacity is important given existing constraints in endoscopy services. Increased use of diagnostic endoscopy may also lead to greater detection of early-stage disease, creating opportunities for minimally invasive treatment. For some

adenocarcinomas, endoscopic resection is considered curative and may reduce the need for formal gastrectomy.<sup>34</sup> An increase in early-stage diagnoses may therefore shift aspects of treatment demand from major surgery towards advanced therapeutic endoscopy. This will have corresponding workforce and training implications.

New Zealand is a low-volume setting for gastric cancer surgery, with variation in resection volumes across centres.<sup>15</sup> Low case numbers create challenges for maintaining specialist expertise and consistent access to advanced operative techniques. As case numbers increase, strengthening referral pathways, improving co-ordination between primary and secondary care, and ensuring timely access to diagnosis and treatment will be increasingly important. Improving access to evaluation for dyspeptic symptoms and reducing referral delays may support earlier diagnosis and improved outcomes. Implementation of updated guidance on post-treatment *H. pylori* clearance testing will also support appropriate antimicrobial stewardship and treatment selection.

Recent commentary has called for New Zealand to adopt the internationally recognised model of comprehensive cancer centres, integrating multidisciplinary clinical care, research, education and regional networks.<sup>35</sup> This approach has been proposed in response to rising demand, capacity constraints and workforce pressures, and may offer advantages in low-volume settings by promoting consistent clinical pathways and consolidating specialist expertise. Such models may reduce unwarranted variation in care and strengthen regional service integration. However, international evidence, largely from the United States of America, indicates that centralised specialist cancer care can exacerbate inequities when access is uneven, with lower utilisation among rural populations and people living in areas of high socio-economic deprivation.<sup>36–39</sup> These patterns have been linked to factors such as travel distance, referral pathways and access to specialist navigation, and may contribute to later stage at diagnosis.<sup>40</sup> In the context of New Zealand's publicly funded and geographically dispersed health system, comprehensive cancer centres would require substantial investment and careful design. If pursued, equity would need to be embedded in design and implementation to ensure that centralisation improves, rather than widens, access to high-quality cancer care for populations already facing barriers in access to care.

## Equity and system alignment

The projected increases among Māori and Pacific peoples highlight the importance of equity in designing appropriate solutions. Previous work has identified persistent barriers to timely diagnosis and treatment for Māori, including delays in referral, fragmented pathways, limited cultural safety and experiences of racism within the health system.<sup>41,42</sup> As with other cancers, strengthened navigation roles, improved communication and whānau-centred care models may support earlier engagement and reduce avoidable delays.

Alongside *H. pylori*-focussed prevention, population-level action to reduce exposure to other established gastric cancer risk factors including tobacco use,<sup>43</sup> harmful alcohol consumption<sup>44</sup> and excess body weight<sup>45</sup> remains relevant, particularly where these exposures are socially patterned and contribute to inequitable risk. Addressing these determinants requires sustained public health and regulatory approaches rather than reliance on individual behaviour change alone.

These findings should be interpreted within the broader context of health system reform in New Zealand. As regional and district service networks are strengthened, planning for future gastric cancer care must acknowledge the differential burden and ensure appropriately tailored responses that adequately meet the needs of populations experiencing the highest incidence and mortality. Embedding equity considerations within prevention, diagnostic pathways and specialist services is essential to avoid perpetuating or widening existing disparities.

## Strengths

This study provides the first projections of gastric cancer incidence in New Zealand incorporating APC effects, with results presented by sex, prioritised ethnicity and region. The use of a bootstrap approach allows clear representation of statistical uncertainty. Producing disaggregated projections offers value for both national and regional planning and supports equity-focussed prioritisation.

## Limitations

Interpretation of the projections should consider several limitations. The modelling assumes continuation of recent incidence trends and does not incorporate potential future changes in *H. pylori* prevalence, antibiotic resistance, dietary exposures or improvements in early diagnosis

pathways, including screening. Although historical changes in risk factors are reflected within the APC components, future shifts in exposure or policy are not captured. The model includes main effects for sex, prioritised ethnicity and region, such that all groups share a common underlying temporal pattern. As a result, projected differences between groups arise from baseline incidence and population structure, rather than group-specific temporal trends.

The analysis was conducted at the level of total gastric cancer (ICD-10 C16) and did not distinguish between anatomical subsites, such as proximal and distal cancers, which have differing aetiologies and risk factor profiles. Subsite-specific modelling was not undertaken due to data structure and small numbers within stratified groups but represents an area for future work.

Use of prioritised ethnicity, while consistent with national reporting standards, may underestimate burden for some groups, particularly Pacific peoples, and does not capture multi-ethnic identification. Broad level 1 ethnic groupings may also mask important heterogeneity, and known misclassification and undercounting, including under-representation of Māori in health datasets, may contribute to under-estimation.<sup>46,47</sup>

Population denominators were derived from official Statistics New Zealand projections, with uncertainty increasing over time. While the bootstrap approach incorporated perturbation of population estimates, structural changes such as migration, differential ageing and future policy or behavioural shifts are not fully captured. The reported uncertainty intervals reflect statistical variation within the modelling framework but do not encompass all sources of uncertainty, including model specification or alternative future scenarios. These estimates should therefore be interpreted as indicative trends to support planning, rather than precise forecasts.

## Conclusion

These projections indicate that gastric cancer will remain an important and unequally distributed cancer in Aotearoa New Zealand through to 2045, with declining age-standardised incidence but increasing absolute case numbers driven by demographic change. The highest ongoing burden remains among Māori and Pacific peoples, while substantial future growth in case numbers is also projected for Asian populations and in regions experiencing rapid population growth. This rein-

forces the need for equity-focussed prevention and service planning. Strengthened *H. pylori* control, including targeted and accessible test-and-treat approaches, offers a key opportunity

to reduce future incidence. These national and regional projections can support alignment of prevention, diagnostic pathways and specialist service capacity with projected need.

**COMPETING INTERESTS**

Nil.

**AUTHOR INFORMATION**

Michael Walsh: Epidemiologist, Planning, Funding and Outcomes, Health New Zealand – Te Whatu Ora, Auckland, Aotearoa New Zealand.

Karen Bartholomew: Director of Health Gain Development, Planning, Funding and Outcomes, Health New Zealand – Te Whatu Ora, Auckland, Aotearoa New Zealand.

Jonathan Koea: Surgeon, Health New Zealand – Te Whatu Ora, Auckland, Aotearoa New Zealand.

Clarence Kerrison: Gastroenterologist, Health New Zealand – Te Whatu Ora, Auckland, Aotearoa New Zealand.

Nina Bevin: Clinical Director and General Practitioner, National Hauora Coalition, Auckland, Aotearoa New Zealand.

Maryann Heather: Senior Lecturer and General Practitioner, Section of Pacific Health, The University of Auckland, Auckland, Aotearoa New Zealand.

**CORRESPONDING AUTHOR**

Michael Walsh: Epidemiologist, Planning, Funding and Outcomes, Health New Zealand – Te Whatu Ora, Level 4, North Tower, 68–76 Taharoto Road, Smales Farm, Takapuna, 0622.  
E: michael.walsh@tewhatauora.govt.nz

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# The impact of cultural concordance between health professionals and patients: a narrative review

Belinda Loring, Papaarangi Reid

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## ABSTRACT

**AIM:** The aim of this article is to summarise international evidence on the impacts of cultural/ethnic concordance between patients and health professionals and to discuss the implications for New Zealand.

**METHOD:** Database searches were conducted from August to September 2025 using Scopus, Embase and PubMed, using key terms related to health outcomes and cultural/ethnic concordance.

**RESULTS:** A total of 25 relevant systematic reviews, meta-analyses and research studies were included for analysis. Overall, evidence is predominately from the United States of America and findings are variable. Cultural concordance is associated with improved communication quality, trust, satisfaction and perceived respect. Concordance is also associated with improved healthcare utilisation, medication adherence and uptake of preventative interventions. Some studies found concordance was associated with differences in clinical decision-making. Impact on clinical outcomes is mixed, with some studies finding concordance has a positive impact on caesarean section rates, diabetes management, surgical outcomes and addiction treatment, while others found no impact.

**CONCLUSION:** Cultural concordance between patients and their health professionals matters, with evidence of impact on patient experience, communication quality, engagement and adherence, clinical decision-making and some clinical outcomes. Findings are inconsistent: the strength of association and groups which see the greatest benefit vary between studies. To reduce health inequities, we need to increase the diversity of the workforce and train all health professionals to provide non-racist, equitable care.

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Significant ethnic health inequities exist in New Zealand. Māori and Pacific peoples experience a life expectancy gap compared to other ethnic groups of 6.6 years and 6.1 years, respectively.<sup>1</sup> Multiple complex factors drive Indigenous and ethnic health inequities including colonisation, historical and contemporary power imbalances, differential exposure to the social determinants of health<sup>2,3</sup> and inequities in access to and quality of healthcare. Independent of arguments related to higher health needs, Māori also have Indigenous rights to equitable access to education and to good health outcomes. The New Zealand government has obligations to achieve equity for Māori, reaffirmed by Te Tiriti o Waitangi and the United Nations Declaration on the Rights of Indigenous Peoples.

The health sector plays a causal role in ethnic health inequities. For example, Māori receive less access to, and poorer care throughout, the full spectrum of health services from preventative to tertiary care.<sup>4-6</sup> Māori are more likely to experience racism from health professionals,<sup>5</sup> receive less preventive care such as immunisations,<sup>7</sup> antenatal care<sup>8</sup> and cancer screening,<sup>9</sup> report unmet need

for primary care and medicines,<sup>5</sup> and are less likely to receive appropriate monitoring for chronic conditions.<sup>8</sup>

The cultural safety and cultural competence of health workers<sup>10</sup> is an important contributing factor, and this is harder to achieve when there is cultural mismatch or discordance between patients and providers. A previous systematic review into Indigenous health inequities identified miscommunication, discrimination, culturally insensitive care and mistrust in the health system as important contributing factors.<sup>11</sup> A 2024 New Zealand-led systematic review into cardiovascular care for Māori and Pacific peoples also found that cultural appropriateness and safety were important factors identified by a number of qualitative studies, with patient-provider ethnicity matching important for Māori and Pacific peoples.<sup>6</sup> Despite this, Māori and Pacific patients in New Zealand are unlikely to receive ethnically concordant care. In 2023, Māori made up 17.3% of the population yet only 8.5% of the overall health workforce.<sup>12</sup> Pacific peoples made up 4.9% of the health workforce, compared to 8.9% of the New Zealand population.<sup>12</sup> Māori and Pacific students remain

under-represented in New Zealand universities' health professional programmes.<sup>13</sup> Increasing the Māori and Pacific health workforce is a key action identified in the government's 2024 New Zealand Health Workforce Plan to achieve a culturally competent and equitable health “*workforce that reflects community need*”.<sup>14</sup>

This narrative review examines how cultural concordance contributes to health inequities. We synthesise international evidence on the impacts of cultural/ethnic concordance between patients and clinicians on health outcomes. Cultural concordance denotes a shared identity (e.g., ethnicity, language, Indigenous affiliation) or shared cultural understanding between patient and clinician.<sup>15</sup> “Cultural concordance” is used in this paper synonymously with terms used in other research/jurisdictions, including racial concordance and ethnic concordance. Potential mechanisms linking cultural concordance to better outcomes include:

- Trust and cultural safety—promoting better disclosure, higher care utilisation and engagement.
- Improved communication—enabling clearer explanations and shared decision-making.
- Reduced bias/stereotyping—enhancing clinical decision-making and quality of care.

If cultural concordance improves patient engagement, clinical decision-making and treatment, it could play a significant role in improving health outcomes and reducing health inequities for Indigenous peoples and marginalised ethnic groups.

## Methods

We searched Scopus, Embase and PubMed databases (August 2025 to September 2025). The query combined health outcome terms (“health”, “wellbeing”, “health outcomes”, “patient outcomes”, “treatment outcomes”, “healthcare experience”, “patient experience”) with concordance terms (“cultural concordance”, “ethnic concordance”, “ethnic matching”, “racial concordance”, “racial matching”). Searches were first limited to review articles, then to original research published since 2015. No additional limits were applied. We did not include grey literature in this review, as we were focussed on peer-reviewed academic literature. Reference lists of relevant review articles were manually screened. Studies focussing exclusively on gender or language concordance were excluded, but studies that examined gender/

language concordance in addition to cultural/ethnic concordance were retained.

## Results

Database searching yielded 99 systematic reviews, and after abstract screening and removing duplicates a total of 11 systematic reviews and meta-analyses were included for full analysis. The original research papers of five individual studies included in these systematic reviews were also analysed in full. A further nine original studies published in 2025 identified through the database search, which offered a particular focus on health outcomes, were also analysed, as these were too recent to be included in any of the published systematic reviews. A summary table of the 25 systematic reviews, meta-analyses and research studies identified from the database referenced in this paper can be found in Table 1.

The studies analysed investigated the relationship between cultural concordance and a range of outcomes, which can be categorised into the following four areas:

1. Communication and patient experience
2. Healthcare utilisation and engagement
3. Clinical decision-making
4. Health outcomes

### 1. Communication and patient experience

There is a strong body of evidence, including from meta-analyses, that cultural concordance improves communication, cultural safety and patient satisfaction.<sup>16-19</sup>

A 2018 systematic review of racial concordance literature in the United States of America (USA) found that racial discordance almost always predicted poorer communication (11 of 12 studies) in the communication domains of: satisfaction, information-giving, partnership building, participatory decision-making, visit length and supportiveness/respectfulness of conversations.<sup>19</sup> A meta-analysis of 154 studies relating to mental health<sup>17</sup> found that patients preferred, and rated more positively, a mental health provider of their own race/ethnicity, and this impact was statistically significant. As discussed later, this review also noted that these average findings do not convey the more marked differences found for some sub-groups. A meta-analysis of the effect of racial concordance for Black patients in addiction treatment found that while overall concordance

was not associated with treatment access or engagement, it was associated with positive outcomes including increased perceived provider empathy.<sup>16</sup>

Not all reviews found a consistent association.<sup>18,20</sup> For example, a 2024 systematic review of 33 studies<sup>18</sup> found that for most patients, cultural concordance with their physician did not result in higher-quality communication; however, patient-provider concordance may improve trust and overall experience in healthcare. One observational study found a small negative association between racial and gender concordance with communication quality.<sup>21</sup>

## 2. Healthcare utilisation and engagement

There is evidence, including from meta-analyses, that cultural concordance is associated with improved treatment engagement, adherence, retention and preventive service uptake,<sup>22-25</sup> although not all studies have found a relationship.<sup>20</sup>

### *Medication adherence*

A 2025 systematic review of the impact of racial concordance on medication adherence concluded that concordance was associated with higher adherence rates for non-white patients.<sup>25</sup> Of the five studies that met their review criteria, four studies found that patient-provider race concordance was associated with higher adherence rates. Three studies included in the review documented significant findings for Black patients only. One study found significant associations between patient-provider concordance and adherence across Black, Hispanic, Asian, Hawaiian and Pacific groups, for aspirin, cardiovascular medications and smoking cessation.<sup>26</sup>

Another USA study of 129 adults<sup>27</sup> found racial concordance was not associated with any significant impact on medication adherence or blood pressure control after 1 month, but the small sample size is a limiting factor. Another USA study of 597 Black adult patients in primary care suggests a more nuanced relationship between concordance and medication adherence.<sup>28</sup> While there was no impact of racial concordance on medication adherence directly, racial concordance did relate to a significant effect modification of the association between communication quality and medication adherence. They found that when Black patients had Black doctors, medication adherence remained the same regardless of how the patient rated the doctor's communication style. However, when Black patients had white

doctors, there was a significant decrease in adherence if the patient rated the communication style as non-collaborative.

### *Treatment engagement*

A 2002 meta-analysis pooling effects across seven studies investigating ethnic concordance in psychotherapy<sup>24</sup> found that clients who were matched with therapists of the same ethnicity were significantly less likely to drop out of therapy and attended more psychotherapy sessions than clients without concordant therapists. However, a 2005 meta-analysis of 10 studies (only three of which were included in the 2002 analysis) found no overall benefit of client-clinician racial matching for African American and Caucasian American mental health clients, in terms of treatment retention or post-treatment functioning.<sup>29</sup>

A longitudinal analysis of leukaemia patients in the USA<sup>30</sup> found that concordance between patients and their oncologist was associated with better adherence to treatment after 5 years. Racial concordance alone was associated with a small, but statistically insignificant, increase in adherence; gender concordance alone was associated with a small but significant increase and combined race and gender concordance was associated with a larger statistically significant increase in treatment adherence. These findings further suggest that multiple dimensions of concordance are important and synergistic.

Again, there is evidence that cultural concordance may have greater impacts for particular sub-groups. For example, one review found that a therapist-patient ethnic match decreased the likelihood of young people's mental health therapy dropout differently for different ethnic groups, especially for adolescents.<sup>22</sup>

### *Uptake of preventative interventions*

An analysis of health utilisation data for Asian American sub-groups in the USA<sup>23</sup> found that patient-provider concordance is associated with statistically significant increases in seeking preventive care, seeking care for a new problem and for an ongoing problem, relative to Asian American patients with non-Asian American providers. They also found the association was not equal across all Asian sub-groups. A similar observational study of USA national survey and utilisation data found no statistically significant impact of racial concordance on uptake of mammography, colorectal screening or immunisation.<sup>21</sup>

The fact that patient-provider cultural con-

cordance for non-white patients is generally low complicates the research, because it means the sample sizes are insufficient in most studies to assess the impact. For example, a 2025 analysis of over 20,000 patients investigating the impact of gender or cultural concordance on the uptake of preventative interventions found that while gender concordance was positively associated with increased uptake, no significant impact of racial concordance was found.<sup>31</sup> The authors note that racial concordance for the non-white patients in this sample was very low (<25%) which limited their analyses.

### 3. Clinical decision-making

Some studies have specifically examined whether cultural concordance makes a difference to clinical decision-making.

A retrospective analysis of orthopaedic surgeons' recommendations for patients with knee arthritis found that racial concordance was an independent predictor of being recommended for a total knee replacement, after controlling for patient factors and individual surgeon differences.<sup>32</sup> Again, this study found the impact of racial concordance was more important for non-white patients. Black patients who received racially concordant care were more likely to be offered surgery compared to those who received racially discordant care (55.1% versus 23.0%,  $p=0.0001$ ). For non-Hispanic white patients there was no significant difference in surgery offers between patients who received concordant versus discordant care ( $p=0.18$ ).

Another USA analysis of cardiologists found when there was patient–physician race concordance, patients were 1.93 times more likely to be referred to cardiac rehabilitation (1.35–2.78,  $p<0.001$ ) and 1.89 times more likely to participate (0.98–3.90,  $p=0.06$ ).<sup>33</sup>

### 4. Health outcomes

In terms of healthcare outcomes, there is mixed evidence of the impact of cultural concordance, with some positive findings in specific contexts. Compared to the body of research investigating cultural concordance and patient experience or communication, there is a smaller evidence-base looking at treatment outcomes.

In an analysis of 1.8 million hospital births in the USA between 1992 and 2015, Greenwood et al.<sup>34</sup> found that physician–patient racial concordance made a robust difference to the survival of Black babies but made no difference to white babies.

Under the care of white physicians, Black newborns experienced 430 more deaths/100,000 births than white newborns, but under the care of Black physicians, Black newborns experienced only 173 deaths/100,000 births above white newborns—a 58% reduction in the racial mortality difference. The Greenwood et al. analysis has been criticised for omitting to include the impact of very low birth weight (VLBW) babies, who are disproportionately Black, and independently associated with poor outcomes. Borgas and VerBruggen<sup>35</sup> re-ran Greenwood et al.'s analysis to include VLBW in the model and found that the effect of racial concordance on mortality became statistically insignificant after controlling for the impact of VLBW.

Another recent analysis of birth outcomes in the USA<sup>36</sup> found that racial concordance was significantly associated with lower caesarean section rates (23.1% versus 33.6%;  $p=0.04$ ), and this association persisted after adjusting for maternal comorbidities ( $p=0.003$ ). Also, when outcomes were stratified by patient race, significant differences in caesarean rates were observed for white providers ( $p=0.02$ ). No significant differences between races were observed for Asian or Black providers.

A USA analysis of surgical outcomes for 1,858 Black and 4,146 Hispanic adults<sup>37</sup> found that Hispanic patients treated by racially concordant surgeons had a statistically significant lower 30-day readmission and length of stay than those treated by discordant surgeons. No significant impact was found for Black patients. The sample size of Black patients in this study was much smaller than the sample of Hispanic patients.

Sánchez-Bahillo et al.<sup>38</sup> found that ethnic matching improved the outcome of family therapy with drug-abusing adolescents in some ethnic minorities. A meta-analysis of the effect of racial concordance for Black patients in addiction treatment found that patients with a racially concordant provider were less likely to have legal problems at follow-up.<sup>16</sup>

There is some evidence that the impact of cultural concordance on health outcomes may differ for different groups. For example, in their 2011 meta-analysis, Cabral and Smith<sup>17</sup> found mental health treatment outcomes do not substantively differ based on therapist cultural concordance, except in studies involving Black participants, where effect sizes were the highest across all outcomes of interest. Beaugard et al.<sup>16</sup> also found that Black women in addiction treatment with a racially concordant provider were more likely to be abstinent at follow-up, suggesting that the

effects of racial concordance may differ by gender and perhaps other intersections as well.

Multiple dimensions of concordance also appear to make a greater impact than single dimensions. For example, Jerant et al.<sup>21</sup> found that dual race and gender concordance was significantly associated with higher self-rated health status after 2 years and racial concordance alone was associated with higher self-rated health after 1 year. In some studies cultural concordance also involved language concordance, making the impact of cultural concordance alone difficult to assess.<sup>39,40</sup> A 2025 analysis of 8,979 consultations found that Hispanic diabetes patients in California treated by a Mexican physician were 1.62 times more likely to have better diabetes control compared to those treated by non-Mexican physicians, and were 2.69 times more likely to be referred to a kidney specialist.<sup>40</sup>

## Discussion

Overall the evidence indicates that cultural concordance between patients and health professionals matters, with evidence of improved patient experience, communication, engagement and adherence, clinical decision-making and some clinical outcomes. This suggests that measures to improve health workforce ethnic diversity are necessary, alongside measures to improve outcomes from culturally discordant care.

The strength of the association and the groups which see the greatest benefit vary between studies, suggesting that the impact of cultural concordance is influenced by a range of other contextual factors. These findings are important for a New Zealand context, because ethnic inequities in factors such as medication adherence<sup>41</sup> and the uptake of preventative services<sup>42,43</sup> make a significant contribution to health inequities.

An important theme from the literature is that the impact from cultural concordance is not the same across all population groups. Depending on the type of disaggregation, studies variously found that cultural concordance had a stronger impact for certain ethnic groups (especially Black patients) and that the impact sometimes varied by gender and age. Cultural concordance seems to make the least difference for white patients (who are currently overwhelmingly more likely to experience concordant care) indicating that concordance may be most important for more marginalised groups, who currently experience the poorest outcomes. Similarly, some studies

found that patient outcomes differed by race for patients of white providers but did not differ for non-white providers.

There are several challenges with the evidence base which make it difficult to draw firmer conclusions. The available research investigates heterogeneous populations and outcomes, e.g., the use of disparate instruments to measure communication variables. As already mentioned, patient-provider cultural concordance for non-white groups is generally very low, and this means the sample sizes for these groups are often insufficient to properly assess the impact.

There is a strong geographic bias in the literature, with most studies coming from the USA, so the evidence is strongly biased towards that country's cultural context and approach to categorising racial groups, which is different to New Zealand's approach of self-identified ethnicity. Very little research comes specifically from New Zealand or from Indigenous populations. A 2008 qualitative New Zealand study found Māori participants frequently expressed a perception that non-Māori health providers were biased against Māori patients, and participants felt that doctors from a similar cultural background to patients would provide better healthcare.<sup>44</sup> There is a large, well-documented body of research that Māori experience discriminatory treatment by health providers, although very little examines whether this varies by provider ethnicity. Earlier New Zealand research found that non-Māori doctors themselves reported a lower rapport with Māori patients,<sup>45</sup> blamed Māori for their own condition or lower healthcare access,<sup>46</sup> as well as believed that Māori were biologically or genetically more predisposed than others to mental illness.<sup>47</sup>

Racial or ethnic categories are imperfect proxies for cultural concordance and can unintentionally biologise a more complex concept.<sup>48</sup> Factors such as gender, social status and other competencies may have influence but are infrequently assessed.<sup>15,49</sup> Some commonly used ethnic groupings are also highly heterogeneous, e.g., "Asian". Studies relying on broad ethnic/racial categorisations may not be sensitive enough to measure a true cultural match between patients and providers. Furthermore, cultural concordance alone does not guarantee that health services are culturally safe. In New Zealand, the Waitangi Tribunal review into Māori health inequities<sup>50</sup> found that the model of care was also critically important. The tribunal emphasised the need for Māori self-determination and *mana motuhake* in the design, delivery and

monitoring of healthcare services, as well as ensuring that all healthcare services are provided in a culturally appropriate way that recognises and supports the expression of Hauora Māori models of care.<sup>50</sup> Assessing the impact of models of care and governance on health outcomes is beyond the scope of this review, but is highly relevant to achieving equitable health outcomes.

## Summary

Cultural concordance appears to influence a range of important measures related to improving health outcomes and health inequities. Findings are inconsistent and show variability by subgroup. However, meta-analyses link concordance with improved communication quality, trust, satisfaction and perceived respect. Cultural concordance is associated with improved healthcare utilisation, medication adherence and uptake of preventative interventions. Cultural concordance is also associated with differences in clinical decision-making and health outcomes, including

caesarean section rates, diabetes management, surgical outcomes and addiction treatment.

Evidence quality is a limiting factor, with few studies powered to evaluate health outcomes, in part due to low levels of patient–provider cultural concordance for non-white patients. Cultural concordance appears to have a greater benefit for certain groups, highlighting the importance of examining intersectionality. Multiple dimensions of concordance (e.g., culture, gender, language) seem important and synergistic. Local research evidence is needed to understand how cultural concordance impacts health equity in New Zealand. However, Indigenous and ethnic health equity requires culturally competent and culturally safe health workforces and systems, and cultural concordance is only one aspect of this. Alongside efforts to improve ethnic workforce diversity and increase the possibility of culturally concordant care, actions are also needed to ensure that culturally discordant care results in better health outcomes.

**Table 1:** Cultural concordance evidence summary table.

Study	Region	Population	Outcomes studied	Patient experience	Healthcare utilisation	Clinical decisions and outcomes	Key findings
<b>Meta-analyses and systematic reviews</b>							
<b>1. Beaugard et al. 2025<sup>16</sup></b>	USA	Black patients	Addiction treatment	Positive impact		Positive impact for sub-groups (Black women)	Systematic review of 11 studies. Concordance improved empathy and improved abstinence for some groups.
<b>2. Cabral, Smith 2011<sup>17</sup></b>	Global	Mental health clients	Preferences, perceptions, outcomes	Positive impact		No significant difference	Meta-analysis of 154 studies. Cultural concordance associated with better satisfaction, no significant difference in mental health outcomes.
<b>3. Cervantes et al. 2024<sup>39</sup></b>	USA	Latino kidney patients	Renal transplant receipt and outcomes			Positive impact	Narrative review. Social/cultural/linguistic concordance can improve engagement and outcomes.
<b>4. de Haan et al. 2018<sup>22</sup></b>	Global	Youth mental health patients	Associations with treatment dropout		Mixed impact		Systematic review of six studies that looked at ethnic concordance. Concordance reduced dropout in some studies, but not all.
<b>5. Fabian et al. 2025<sup>25</sup></b>	USA	Adult patients	Medication adherence			Positive impact	Systematic review of five studies. Four out of five studies found patient-provider race concordance was associated with higher cardiovascular and dermatological medication-adherence rates in BIPOC patients.
<b>6. Maramba et al. 2002<sup>24</sup></b>	USA	Mental health clients	Dropout, utilisation, functioning		Positive impact		Meta-analysis of seven studies. Concordance reduced dropout, improved utilisation.
<b>7. Miller et al. 2024<sup>18</sup></b>	Global	Multiple, physician-patient concordance	Communication and patient preferences	No impact on communication. Some positive impact on trust and patient experience.			Systematic review of 33 studies. Overall, no significant impact between concordance and communication quality. Some evidence that concordance may improve trust and patient experience.

**Table 1 (continued):** Cultural concordance evidence summary table.

Study	Region	Population	Outcomes studied	Patient experience	Healthcare utilisation	Clinical decisions and outcomes	Key findings
<b>Meta-analyses and systematic reviews</b>							
<b>8. Sánchez-Bahillo et al. 2014<sup>38</sup></b>	Global	Psychotherapy patients	Therapist factors associated with psychotherapy outcomes			Positive impact for some sub-groups	Systematic review of 17 studies. Ethnic matching improves outcome of family therapy with drug-abusing adolescents in some ethnic groups.
<b>9. Shen et al. 2018<sup>19</sup></b>	USA	Black and white patients	Communication	Positive impact			Eleven out of 12 studies found racial concordance was associated with improved communication.
<b>10. Shin et al. 2005<sup>29</sup></b>	USA	Mental health clients	Treatment retention, post-treatment functioning		No significant impact	No significant impact	Meta-analysis of 10 studies. Found no overall effects of client–clinician racial/ethnic matching for African American and Caucasian American clients.
<b>11. Zhao et al. 2019<sup>20</sup></b>	USA	Adult surgical patients	Patient preferences, communication, adherence, screening	Positive impact on patient preference, mixed impact on communication quality.	No significant impact	No significant impact	Systematic review of PubMed only, six studies on racial concordance. Mixed association with communication quality. Three studies looked at adherence/outcomes, with no impact.
<b>Empirical research</b>							
<b>12. Ajayi et al. 2025<sup>36</sup></b>	USA	315 deliveries	Caesarean section			Significant impact on caesarean section rates	Racial concordance was significantly associated with lower caesarean section rates. When stratified by patient race, significant differences in caesarean delivery rates by were observed for white providers (p=0.02). No significant differences between races were observed for Asian (p=0.93) or Black providers (p=0.82).
<b>13. Borjas, VerBruggen 2024<sup>35</sup></b>	USA	1.8 million hospital births in Florida	Neonatal mortality			No significant impact	Re-ran Greenwood et al. 2020 analysis (see below) to include very low birth weight and found that racial concordance no longer had a statistically significant impact.

**Table 1 (continued):** Cultural concordance evidence summary table.

Study	Region	Population	Outcomes studied	Patient experience	Healthcare utilisation	Clinical decisions and outcomes	Key findings
<b>Empirical research</b>							
<b>14. Fernández-Ortega et al. 2025<sup>40</sup></b>	USA	8,979 Hispanic diabetes patient consultations in California	Diabetes outcomes			Positive impact	Retrospective review of 8,979 consultations, showing significant associations with better diabetes control and specialist referral. Cultural concordance also included language concordance.
<b>15. Green et al. 2025<sup>31</sup></b>	USA	20,423 adults	Adherence to preventive services guidelines (immunisation, cancer and CVD screening)		No significant impact		Statistically significant impact found from gender concordance, but not from racial concordance—authors note racial concordance for non-white patients was very low in the sample (<25%).
<b>16. Greenwood et al. 2020<sup>34</sup></b>	USA	1.8 million hospital births in Florida	Neonatal mortality			Positive impact	Black:white newborn mortality gap was smaller when Black doctors provided care for Black newborns than when white doctors provided care.
<b>17. Jackson et al. 2022<sup>27</sup></b>	USA	129 Black and white adults	Communication quality, shared decision-making, medication adherence and blood pressure	No significant impact		No significant impact	Small study, but racial concordance associated with no significant differences in outcomes.
<b>18. Jansen et al. 2008<sup>44</sup></b>	New Zealand	Qualitative survey of Māori adults (86 face-to-face, 651 survey respondents)	Patient experience and preferences	Positive impact			Negative experiences and perceived bias from non-Māori providers.

**Table 1 (continued):** Cultural concordance evidence summary table.

Study	Region	Population	Outcomes studied	Patient experience	Healthcare utilisation	Clinical decisions and outcomes	Key findings
<b>Empirical research</b>							
<b>19. Jerant et al. 2011<sup>21</sup></b>	USA	22,440 adult respondents of national healthcare utilisation survey 2002–2007	Communication measures, utilisation and clinical outcomes (BP, diabetes, mental health)	Negative impact	No impact for racial concordance alone, but some impact with both race and sex concordance	Racial concordance associated with higher self-rated health after 1 year	Impact of racial concordance alone in this study was small and inconsistent.
<b>20. Ma et al. 2025<sup>23</sup></b>	USA	61,667 instances of care from national health expenditure data for Asian American sub-groups	Healthcare engagement and utilisation and preventive care		Positive impact on healthcare utilisation and preventive care		Concordance associated with higher uptake of preventive care, care for chronic conditions and care for new problems.
<b>21. Montano-Campos et al. 2025<sup>30</sup></b>	USA	443 chronic myeloid leukaemia patients	Treatment adherence over 5 years			Positive impact	Positive (non-significant) impact for race concordance alone, larger positive (significant) impact for race and gender concordance.
<b>22. Schoenthaler et al. 2012<sup>28</sup></b>	USA	597 Black adults, community health clinic patients	Whether concordance modified relationship between communication quality and medication adherence			Protective impact	Poor communication reduced medication adherence only when there was not racial concordance.
<b>23. Shannon et al. 2025<sup>37</sup></b>	USA	1,858 Black and 4,146 Hispanic surgical patients aged 65–99 years	Surgical outcomes (readmission, mortality, length of stay)			Positive impact	Hispanic patients treated by concordant surgeons had lower 30-day readmission and length of stay than those treated by discordant surgeons. No impact for Black patients (smaller sample size) or on mortality.

**Table 1 (continued):** Cultural concordance evidence summary table.

Study	Region	Population	Outcomes studied	Patient experience	Healthcare utilisation	Clinical decisions and outcomes	Key findings
<b>Empirical research</b>							
<b>24. Suleiman et al. 2025<sup>32</sup></b>	USA	402 patients with knee osteoarthritis	Whether surgeon recommended them for TKA			Positive impact	Racial concordance was found to be an independent predictor of TKA recommendation while controlling for patient factors and individual differences by the surgeon.
<b>25. Yang et al. 2025<sup>33</sup></b>	USA	653 cardiology patients in California	Referral to, and participation in, cardiac rehabilitation		Positive impact (non-significant)	Positive impact (significant)	Racial concordance was significantly positively associated with cardiologist referral to cardiac rehabilitation and non-significantly positively associated with participation.

BIPOC = Black, Indigenous and People of Colour; BP = blood pressure; CVD = cardiovascular disease; TKA = total knee arthroplasty; USA = United States of America.

**COMPETING INTERESTS**

The authors declare no conflict of interests.

**AUTHOR INFORMATION**

Dr Belinda Loring: Public Health Physician and Senior Research Fellow, Te Kupenga Hauora Māori, Faculty of Medical and Health Sciences, The University of Auckland, Auckland, New Zealand.

Professor Papaarangi Reid: Tumuaki Deputy Dean Māori and Public Health Physician, Te Kupenga Hauora Māori, Faculty of Medical and Health Sciences, The University of Auckland, Auckland, New Zealand.

**CORRESPONDING AUTHOR**

Dr Belinda Loring: Public Health Physician and Senior Research Fellow, Te Kupenga Hauora Māori, Faculty of Medical and Health Sciences, The University of Auckland, Private Bag 92019, Auckland 1142, New Zealand. E: b.loring@auckland.ac.nz

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# Equity, regulation and Te Tiriti o Waitangi: a rapid review of Putting Patients First

Heather Came, Clive Aspin, Alex Barnes, Maria Baker

## ABSTRACT

The Crown's health workforce reforms, *Putting Patients First: Modernising health workforce regulation (PPF)*,<sup>1</sup> emerge in a political climate that is actively dismantling Māori health gains, undermining tino rangatiratanga and reframing equity as “needs not race”. Using rapid Tiriti review—an adaptation of critical Tiriti analysis—we assessed the proposal's alignment with Te Tiriti o Waitangi. We found that *PPF* did not align well with the preamble or the articles of Te Tiriti. There was no equity analysis; no acknowledgement of hauora as taonga, limited Māori involvement in decision making, erasure of tino rangatiratanga and entrenched health inequities were disregarded. These findings highlight systemic silences and risk embedding monocultural practice, weakening accountability and further marginalising kaupapa Māori health models. We recommend that genuine patient-centred regulation must embed Te Tiriti, cultural safety and antiracism into regulatory standards and governance. Without these commitments, health workforce regulation perpetuates rather than remedies inequities, failing Māori and the wider population.

New Zealand's health system continues the legacies of colonisation, intergenerational trauma and sustained breaches of Te Tiriti o Waitangi. Normalised institutional racism produces inequitable health outcomes. Health practitioners—regulated and unregulated—are pivotal to addressing these inequities. Their collective clinical, community and cultural expertise significantly shape health outcomes.

The Waitangi Tribunal is unequivocal. Its Hauora<sup>2</sup> and Haumarū COVID-19<sup>3</sup> inquiries condemned successive governments for chronic under-investment in Māori health, neglecting equity and disregarding tino rangatiratanga in policy and service design. WAI 2575 concluded that the entire Ministry of Health – Manatū Hauora policy corpus was non-compliant with Te Tiriti o Waitangi.

From November 2023, the National-led Coalition intensified this neglect. In a blitzkrieg of reforms, it dismantled Te Aka Whai Ora – Māori Health Authority,<sup>4</sup> introduced the divisive *Treaty Principles* and *Regulatory Standards Bills* and advanced Cabinet Circular CO(24)5,<sup>5</sup> which imposed a “needs not race” framing across government. Came et al.<sup>6</sup> argued this framing mischaracterises equality as sameness, displaces Indigenous rights and entrenches inequities. By treating ethnicity as irrelevant, it denies structural racism underpinning disparities in health, educa-

tion and social outcomes. So-called “needs-based” approaches cloak neoliberal ideology in language of neutrality, eroding Māori self-determination.

In this hostile policy environment, the Coalition released *Putting Patients First: Modernising health workforce regulation (PPF)*.<sup>1</sup> We apply rapid Tiriti review—a critical tool responding quickly in the current environment—assessing the implications of *PPF* for equity, Tiriti justice, the future of health workforce regulation and cultural responsiveness to health and wellbeing of everyone living in New Zealand.

## Method

A rapid Tiriti review is adapted from critical Tiriti analysis (CTA),<sup>7</sup> a desk-based method designed to monitor Crown performance against the five elements of Te Tiriti o Waitangi, expressed in the authoritative Māori text. CTA contributes to critical policy scholarship aimed at addressing systemic inequities and follows five stages: i) orienting how policies engage with Te Ao Māori, Te Tiriti and equity; ii) close analysis of alignment with the preamble, three written articles and an oral article; iii) independent and collective ratings; iv) constructive recommendations; and v) he whakaaro Māori—a final determination by Māori authors.

A rapid Tiriti review retains these five steps but

streamlines them, merging orientation and close reading, offering holistic assessment of engagement with the preamble and oral and written articles, guided by adapted prompting questions.<sup>8</sup> As with CTA, suggestions to strengthen practice are central, as is he whakaaro Māori.

Crucially, substantive Māori involvement and leadership is essential; without these, it is not a rapid Tiriti review. As a desktop exercise, it analyses only written text, not author intent or context, while acknowledging the challenging environment faced by Crown policy writers.

The authors of this paper are: HC, a Pākehā activist scholar; CA (Ngāti Maru, Ngāti Whanaunga, Ngāti Tamaterā), a researcher focussed on Māori health, HIV, Indigenous wellbeing and equity; AB, a Pākehā researcher working with a Kaupapa Māori health and social sector workforce development organisation; and MB (Ngāpuhi, Te Rarawa), a Kaupapa Māori researcher specialising in Māori health, equity and Tiriti-based practice.

## Findings: PPF

PPF<sup>1</sup> proposed reforms addressing health workforce shortages, inefficiencies and barriers to timely care, outlining four themes: patient-centred regulation, streamlined processes, right-sized frameworks and future-proofed approaches. Patient-centred reforms include stronger public input, more diverse regulator boards, greater attention to choice and access, streamlining aims to cut duplication across regulatory authorities through shared systems or potential mergers, and seeking a more efficient, equitable regulatory framework.

### Preamble: what relationships does this policy describe with Māori, Māori organisations and/or hapū or whānau?

PPF proposals fail to acknowledge important Tiriti relationships between hapū and the Crown, breaching the expressed Tiriti preamble intention of good faith and mutual benefit. This is starkly evident on page 1 where Māori are not listed among groups the Crown wishes to hear from.<sup>1</sup> Allowing submissions only through the Ministry of Health – Manatū Hauora's website limits abilities of communities to engage kanohi ki te kanohi, rangatira ki te rangatira (face to face, leader to leader).

The Waitangi Tribunal, legal jurisprudence and public policy affirm that health is a taonga protected

by Te Tiriti, obliging the Crown to promote and protect Hauora Māori. PPF is silent on this duty, ignoring systemic inequities and complex whānau needs. By treating Kaupapa Māori services as optional, it sidelines effective, evidence-based workforces. Models such as Te Whare Tapa Whā, Te Wheke and Rongoā Māori are not alternatives but proven systems delivering better outcomes for Māori and non-Māori alike.<sup>9</sup>

### Article 1: how were Māori involved in kāwanatanga decision making about PPF?

We note (page 3) Crown officials engaging with unnamed Māori professional associations in forming PPF.<sup>1</sup> Feedback from Māori groups is invisible in the document, so it is unclear whether they supported PPF. We welcome the practice of publishing consultation feedback and encourage ethnic analysis making Māori aspirations transparent in relation to particular kaupapa. Neglecting this is another “downgrade” of equity expertise in the workforce, signalling a retreat from measurable, enforceable commitments to Māori health equity. Such changes hinder progress tracking, holding institutions accountable or addressing systemic racism in health.<sup>10</sup>

By assuming unitary parliamentary sovereignty in 1852, the Crown accepted responsibilities for providing health and disability services for *all* New Zealanders. Under international human rights conventions and declarations, all citizens have rights to healthcare and freedom from discrimination.<sup>11</sup> Indigenous peoples have additional rights and protections, in acknowledgement of the global harm of colonisation.<sup>12,13</sup> The Crown must therefore address the needs of “everybody”, and specifically Māori, under Te Tiriti and international human rights instruments. These Māori whānau needs are not addressed in PPF in any way approaching Te Tiriti compliance.

### Article 2: how does PPF acknowledge or foster tino rangatiratanga and/or advance Māori aspirations?

PPF demonstrates no consideration of tino rangatiratanga as expressed in He Whakaputanga o te Rangatiratanga o Nu Tireni or Te Tiriti. Instead, emphasis is placed exclusively on clinical safety rather than on both competencies, which are fundamental to holistic health outcomes. The submission questions about this, presented on page 5, are blatantly biased and misleading.<sup>1</sup>

*“Do you agree that regulators should focus on factors beyond clinical safety, for example mandating cultural requirements, or solely on ensuring that the most qualified professionals provide care for patients?”<sup>1</sup>*

Obviously Māori need both culturally and clinically safe care, enjoying the same quality and quantity of life as other New Zealanders. This needs to be foremost and central in workforce reform.

We recommend at least 50% Māori membership on all health regulatory boards. To honour Te Tiriti and address whānau health needs, boards require expertise in cultural safety, Te Tiriti, anti-racism and Te Ao Māori. We support Māori oversight of Māori practitioners, professional peer regulation and autonomous, resourced Māori leadership. A dedicated Māori Health Authority is essential to uphold tino rangatiratanga, ensure equity and deliver culturally grounded care.

### **Article 3: how will *PPF* achieve ōritetanga—equitable health outcomes for Māori?**

The executive summary on page 2 fails to acknowledge the long-standing ethnic health inequities that harm economic, social and ethical vitality.<sup>1</sup> Our health system is not delivering equally well to all New Zealanders.<sup>14</sup> *PPF* statements presented are withholding key information and are therefore misleading. Nowhere in the *PPF* are issues of racism, privilege, equity and inequities addressed.

We note institutional racism remains widespread within the colonial health system.<sup>15</sup> There is overwhelming evidence that Māori experience racism through the public system, receiving less quality and quantity of care, resulting in poorer health outcomes. These inequities need to be addressed within health workforce regulations. Addressing health inequities will result in considerable direct and indirect cost savings to the health sector.<sup>16</sup>

*PPF* proposals increase austerity and rationing, further exacerbating existing interpersonal racism. All practitioners working in this country (whether from Australia, Asia, the United Kingdom or Africa) need to be both clinically and culturally safe regardless of where they trained. Quality holistic health care involves more than clinical excellence. Any clinician unable to pronounce your name, breaching tikanga and/or

being racist contributes to poorer health outcomes. Māori have a fundamental right to clinically and culturally safe practitioners that should not be compromised because of the Crown’s aspiration for less regulation.

### **Oral article: how is tikanga normalised within *PPF*?**

In *PPF*, tikanga is noted by some regulators but dismissed in favour of clinical requirements. The document fails to recognise that health is culturally constructed, and Māori models differ from Western ones.<sup>17</sup> Mason Durie<sup>18</sup> emphasises wairua and hinengaro as fundamental to hauora.

## **Discussion**

*PPF* promises more efficient, patient-centred regulation but fails to honour the Tiriti relationships that must underpin health governance. Māori are omitted from the preamble’s stakeholders, consultation is limited to online submissions and the Crown’s duty to protect Hauora Māori as a taonga is absent. *PPF* provides no clear account of Māori involvement in decision making, sidelines Kaupapa Māori services and falsely positions cultural safety as competing with clinical competence. By ignoring racism, long-standing inequities and tino rangatiratanga, it risks deepening rather than reducing harm. A Tiriti-aligned system requires meaningful engagement with Māori, at least 50% Māori representation on regulatory boards, mandated cultural safety and anti-racism competencies and recognition of tikanga and Kaupapa Māori as essential to safe, effective practice. Without this, *PPF* cannot deliver equitable or culturally grounded workforce reform.

*PPF* implies that policy reforms are driven by patient-centred approaches to care and support within the health system, a concept gaining currency recently but which health professionals struggle to implement.<sup>1</sup> If reforms proposed by *PPF* serve the entire population of New Zealand, they must give due recognition to its diversity, acknowledging levels of need varying across population groups. Truly patient-centred approaches to health reform potentially address disparate needs of population groups, particularly those that traditionally experience disadvantage caused by inequitable access to services.<sup>19</sup>

Our rapid Tiriti review provides substantial evidence that *PPF* is unlikely to overcome barriers

to equitable health provision or address the challenges of health professionals who for decades have struggled to apply genuine patient-centred care. We assert healthcare is a public good and right, not a commercial enterprise. The system is not “bloated” (page 12) but chronically underfunded, with austerity hitting Māori providers hardest.<sup>1</sup> The proposed changes deepen non-compliance with Te Tiriti, further undermine culturally safe practice and fail to address entrenched systemic racism.<sup>20</sup>

The importance of culture in healthcare is well established.<sup>21</sup> In 2021, Came et al.<sup>22</sup> reviewed all regulatory health competency documents in response to ethnic health inequities and the legal requirement for cultural competency. Using the knowledge-action-integration (KAI) framework,<sup>23</sup> they found significant variation across disciplines. Knowledge components, such as addressing stereotypes and bias, were most explicit, while action and integration were less evident. Five regulatory bodies provided no definition of cultural competency or safety, and confusion persisted between Te Tiriti and the Treaty.

Came et al.<sup>22</sup> found poor Te Tiriti compliance in regulatory competency documents, and therefore proposed strengthening political, cultural and equity competencies. Political competencies include knowledge of local hapū/iwi, recognising existing white privilege and practising whakawhanaungatanga. Kāwanatanga requires familiarity with Te Tiriti and He Whakaputanga, reflective practice and support for Māori leadership. Tino rangatiratanga emphasises Māori health aspirations, Kaupapa Māori approaches and advocacy. Ōritetanga calls for equity analysis and awareness of determinants and intergenerational trauma, while wairuatanga highlights te reo, tikanga, Māori models, whakapapa, humility and embodying manaakitanga, aroha, tika and pono.

We recommend that changes to the consultation requirements of regulatory authorities specifically include expectations about engagement with Māori organisations and whānau. Establishing a ministerial review and occupational tribunal increases rather than decreases bureaucracy. This tribunal could include mandatory expertise in Te Tiriti, equity and Kaupapa Māori health practices benefiting public health,<sup>16</sup> essential for culturally safe, antiracist and effective health services.

We call for greater investment in Māori public health to improve whānau outcomes.

Public health is cost effective, prevents illness and lifts population wellbeing, yet *PPF* overlooks its potential. While patient safety matters, collective safety is equally vital. Regulatory bodies should be mandated to work with Māori organisations to identify ethnic inequities and take corrective action.

We believe whānau can only receive appropriate care as equal citizens when changes to health workforce regulation explicitly address Te Tiriti, cultural safety and antiracism. We recommend the introduction of standard Te Tiriti, cultural safety and antiracism competencies across all regulated professions developed with Māori input. This would create useful synergies in terms of regulation, training and monitoring and would strengthen multidisciplinary collaboration. Practitioners need at least a base-level understanding of te reo me ōna tikanga to provide appropriate care for whānau, regardless of training background.

## He whakaaro Māori

The Māori co-authors of this paper see deliberate and unrelenting condemnation of all things Māori by the National-led Coalition Government, which we describe as political cancel culture. The immediate and overt cancelling out of Māori—by silencing Māori voices, excluding Māori contributions and ignoring Māori perspectives—is attempting to render Māori invisible and less influential in our own country. This political movement alienates Te Tiriti o Waitangi and the obligations of the Crown that were established in partnership with Māori. It is a movement eradicating the distinct tangata whenua status of Māori through the Government’s fierce attempts to marginalise Māori via dominant colonial powers.

Our analysis of *PPF* provides confirmation that current inequities will become progressively entrenched and further disadvantage Māori. A genuinely patient-centred approach to policy reform must acknowledge disparities and set out Tiriti-based strategies to address and overcome them. Such an approach will go some way towards achieving equitable health and social outcomes for Māori, as promised by article three of Te Tiriti, while ensuring social justice for everybody living in New Zealand.

**COMPETING INTERESTS**

HC is director for Heather Came & Associates, a consultancy specialising in Tiriti and racial justice, and co-chair of STIR: Stop Institutional Racism.

CA used a Marsden Grant Royal Society Te Aparangi for this manuscript. CA provided expert advice to the inquest into suspected suicide of six rangatahi in Te Tai Tokerau in 2024. CA is chair, Te Urungi, Malaghan Institute of Medical Research, and member, Māori Advisory Board, Medical Research Institute of New Zealand.

**AUTHOR INFORMATION**

Heather Came: Te Puna Hauora, Te Herenga Waka—Victoria University of Wellington.

Clive Aspin: Te Puna Hauora, Te Herenga Waka—Victoria University of Wellington.

Alex Barnes: Te Rau Ora.

Maria Baker: Te Hiku Hauora.

**CORRESPONDING AUTHOR**

Heather Came: Te Puna Hauora, Te Herenga Waka—Victoria University of Wellington.

E: heather.came@vuw.ac.nz

**URL**

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## Appendix: glossary

Aroha—love  
Hapū—sub-tribe/nation  
Hauora Māori—Māori health and wellbeing  
Hauora—health  
He whakaaro Māori—Māori final viewpoint  
Hinengaro—intellect  
Iwi—tribe  
Kaupapa Māori—a Māori philosophical approach  
Kaupapa—as above  
Kāwanatanga—governance  
Manaakitanga—kindness, caring for others  
Ōritetanga—equity  
Pono—sincere  
Rangatahi—youth  
Tangata whenua—people of the land  
Taonga—treasure, something precious  
Te Ao Māori—Māori world view  
Te reo me ōna tikanga—language and customs  
Tika—reliability  
Tikanga—customary system of values  
Tino rangatiratanga—self-determination, sovereignty  
Wairua—spirit  
Wairuatanga—spirituality  
Whakapapa—ancestry  
Whakawhanaungatanga—active relationship building  
Whānau—extended family

# Reluctant victims: healthcare workers and workplace violence

Wendy Strawbridge, Ruth Money, Lillian Ng

## ABSTRACT

In this viewpoint we describe two lived experiences of workplace violence. These provide context to introducing the concept of the victim-survivor landscape for frontline healthcare workers. The viewpoint aims to: invite reflection on psychic shifts and disruptions to a healthcare worker's life after experiencing violence; explore consequences of workplace violence; and provoke dialogue on optimal care practices for people who survive violence after such incidents. We acknowledge individual responsibilities and discuss an organisation's role in protecting healthcare workers who experience workplace violence. We emphasise protection of staff, with policies and practices that promote safety within the healthcare system.

Workplace violence may be defined as “*violent acts, including physical assaults and threats of assaults, directed toward persons at work or on duty*”.<sup>1</sup> Violence may pose an implicit or explicit challenge to a person's safety, wellbeing or health.<sup>2</sup> In the healthcare sector, violence can have significant physical, psychological and emotional consequences, and delayed and longer-term impacts on functioning.<sup>3</sup> Globally, pressure on healthcare services and increased demand for services is exacerbated by difficulties in recruiting and retaining staff. This rings particularly true for mental health, addiction and intellectual disability services,<sup>4</sup> but we refrain from focussing on the specialty of psychiatry as an increasing number and variety of healthcare staff experience occupational violence.<sup>5</sup> The rates of non-physical violence are reported to be between two- to ten-fold higher than physical violence. However, the prevalence of physical violence is reported to be as high as 65% and has risen significantly in the past three decades relative to the change in non-physical violence.<sup>6</sup>

The most at-risk services for violence are emergency departments, mental health units, drug and alcohol clinics, ambulance services and remote health locations.<sup>7</sup> Factors underlying violence include delay in receiving care, frustration with long waits leading to emotional escalation, understaffing, emotional or mental stress of patients or visitors, insufficient security and lack of preventative measures.<sup>8</sup>

We are a registered nurse, a victims advocate and a psychiatrist. We care and advocate for people who are both victims and perpetrators of violence, and have helped many withstand

the conflicting and incomprehensible nature of violence. Together, we have taught healthcare professionals about victim-survivors' perspectives. Victim-survivor is the preferred term; in this article, we use the term “victim”, the technical term used in Aotearoa New Zealand legislation.

Violent acts can occur suddenly and unexpectedly to anyone, and cause trauma to victims. The neurobiology of trauma—connecting mind, body and trauma—goes some way to explaining the actions and behaviours of victims.<sup>9,10</sup> In this viewpoint, we focus on healthcare workers as a category of victims who experience workplace violence. We describe two of the authors' experiences within a healthcare context as case studies to demonstrate the challenges in navigating recovery after violence. This has several aims: to introduce the concept of the victim landscape; to reflect on the psychic shifts and disruptions to a healthcare worker's life after experiencing violence; to explore the relationship between workplace violence and negative consequences such as post-traumatic stress; and to provoke dialogue on optimal care practices for people who experience workplace violence. Workplace violence is not an isolated, individual problem; it is a structural, strategic problem involving relational, environmental, organisational and cultural factors.<sup>11</sup> Therefore, we take a broad, integrative view, emphasising the systematic role of organisations to support and protect healthcare workers who experience workplace violence.

## Living experiences of violence

Nils Christie, writing on factors that shape our

understanding of victimisation,<sup>12</sup> often invites people to scribble down a few words from their own personal histories as a victim, noting that memories prove valuable in prompting discussion. He posed the following questions: Have you ever been a victim? When was that? Where was it? What characterised the situation? How did you react? How did your surroundings react? We use some of these prompts to present our lived experience of violence.

Case 1—surviving attempted murder while on duty as a health professional: While working as a registered nurse in the community I visited a patient in respite care. I was attacked and held captive for 30 minutes before I managed to escape. I survived because I was fit and used the skills I learned in calming and restraint training. I sustained severe physical injuries that included facial fractures, severe bruising, nerve damage, stab wounds to my face, neck and back, and burns to 30% of my body. The assailant threatened to kill me. Unfortunately, this was just the beginning of my trauma experience.

Case 2—physical assault while assessing a psychiatric patient: I assessed a young woman in the intensive care unit at a women's prison, in an interview room, with my nurse, a student and three corrections officers present. The patient walked calmly into the room and sat across a desk opposite us. Suddenly she lunged across the desk. Her fist contacted my head before she was restrained by the custodial staff. I did not lose consciousness nor was I severely injured. This was my first and only incident of violence.

The descriptions above demonstrate a spectrum of experienced violence. Violence is antisocial and confronting. It can be difficult to predict and breathtaking in the intensity and speed at which it can occur. It may be a split-second decision that separates survival from disaster and minor injury from serious disability. We should not normalise nor minimise a violent act, yet it may be tolerated or expected by healthcare staff when working with disturbed or distressed patients.

## Navigating the victim landscape

The concept of the victim landscape is relevant as the healthcare worker who survives any form of violence navigates the immediate aftermath and beyond. They may report the incident and complete necessary documentation. They may or may not attend to personal injuries or take time off work to recover. They may recount and

repeat events to different agencies such as police, occupational health and rehabilitation providers and they may enter the criminal justice system.

Case 1: Alongside personal and professional challenges, navigating the criminal justice system added another layer of distress. Conflicting protocols and practices between the Ministry of Justice and the Ministry of Health left me in a no man's land of uncertainty, without clear rights or protections. I completed a victim impact statement with special permission—not as a right. The lack of procedural clarity and recognition compounded my sense of invisibility and disempowerment. Regular counselling could not keep pace with the evolving traumas. In order to access deeper psychological intervention, I was obliged to accept a diagnosis of post-traumatic stress disorder/response (PTSD/PTSR). The unintended consequence was discrimination: because of my mental (ill) health diagnosis I was not able to access certain work options, income protection insurance or travel insurance.

Case 2: Immediately after the incident I continued working. Shortly after, the patient was transferred to a medium-secure psychiatric unit. They subsequently assaulted multiple staff members in separate incidents. No charges were laid by the police. Weeks later, I took advice from the occupational safety advisor for a work-related injury (personal communication in: email, 4 December 2025). I eventually made an insurance claim for latent symptoms of a concussion.

The term “victim” can be considered an unwanted technical descriptor; for what healthcare professional wants to be termed a victim? Societal narratives and unconscious biases shape the response to victims.<sup>12</sup> The interfaces of “justice” and “health” do not intersect well, and victims often discover a clunky process that consumes time and energy and generates a significant amount of paperwork. The needs and rights of victims are fundamental: to be informed about access to services that address their needs, to utilise these services, to get help to understand reactions to their experience of a crime committed against them and the need for safety, which can only be held by well-constructed processes.

## Disruptions to a healthcare worker's life after experiencing violence

Individuals bear direct and indirect costs of workplace violence: physical illness, psychological repercussions, stigma, financial loss and

time-consuming efforts to process and recover from the incident. They may find they have little control over the unfolding process. The imprint of violence returns in unconscious and unexpected ways, in memory and in body.<sup>10</sup> They may experience latent and extended trauma, emergent on return to the workplace and other post-traumatic phenomena such as avoidance or hypervigilance.

Case 1: Before the attack, I worked full time, I loved my role and was regarded as competent and innovative. The aftermath of the attempt on my life was catastrophic. Ten weeks after the incident, I returned to part-time work despite still recovering from burns and experiencing pain. The trauma extended far beyond the obvious physical injuries—it dismantled the very fabric of my life. It contributed to the breakdown of my 25-year marriage, the loss of my job and my home, and—most painfully—my sense of self. That sense of self was deeply shaken but not destroyed. I went from being a respected colleague and clinician to being defined as a victim. The ripple effect was devastating and widespread; it deeply affected my friends, colleagues and whānau, especially my sons. My husband, also a registered nurse in mental health, never recovered from the secondary trauma.

Case 2: In retrospect, my initial reluctance to take action was to minimise the incident; after all, I wasn't severely injured and the patient received treatment. I did not wish to waste my or anyone else's time or energy and I did not view myself as a victim. I found the incident very disturbing, especially as I learned that several colleagues had sustained serious injuries from violent patients at work, requiring substantial periods of time off. I also learned that the patient had struck multiple staff previously under the care of adolescent health services.

Victims' lives are disrupted by violence. It is a criminal act, and victims may endure crime as an extended process along a continuum of pain and discomfort.<sup>9,10</sup>

## The relationship between workplace violence, post-traumatic stress and moral injury

Often the onus is on the healthcare worker to be proactive and follow-up. Any violent incident is a salient reminder of the paramount importance of self-care. Recovery from workplace violence may involve a long period of rehabilitation. Staff require

support during the entire period of rehabilitation and to be allowed necessary time to recover and supported to return to work.<sup>2</sup>

Case 1: My wellbeing was not always prioritised. Basic safety measures to monitor staff movements and implement staff alarms took many months. I was invited by my managers to share my thoughts about what contributed to the attack. I emailed my feedback but I received no reply. Many colleagues were supportive while others responded with avoidance (unconscious bias) and judgement (secondary trauma). Finally, deciding a highly stressful workplace environment was not worth the toll on my health, I resigned. This resulted in a loss of thousands of dollars in wages, as non-government roles pay significantly less. Over the next few years, I rebuilt my life and career and was employed as a mental health promoter for a non-government organisation dedicated to improving community and workplace mental health and wellbeing. My rebuild was shaken and significantly affected by the return of the assailant (who tried to kill me) to the vicinity as a patient. I became seriously concerned for my safety and wellbeing and that of secondary victims. My request for a restorative justice meeting was never progressed, and my concerns were often met with platitudes—*“no system is perfect”*—exemplifying systemic complacency and inflicting moral injury. I was eventually released from the stress and harm of the assailant's return when he passed away in care.

Case 2: Being assaulted at work led to reflection—in retrospect, I should have left the workplace immediately and sent my affected team members home. My questions: How do we model self-care? How many of my colleagues had sustained injuries and not sought care for themselves? Who took time off work to recover? How many consulted their general practitioner to complete an insurance claim? What environmental protections are in place to protect workers? The interview room had a blind corner, observed on previous occasions as a place to be entrapped. After the incident, our team ceased using this room to see patients and, soon after, construction for a new interview room was approved. We got lucky that day: no one was severely injured.

It is unfortunate when a serious incident prompts action on ensuring a secure working space to assess patients. Workplace context is important,<sup>4</sup> as violence is associated with understaffing, burn-out, restructuring, insufficient resources and a culture that is tolerant of violence.<sup>2</sup> There can be

longer-term disruptions to interpersonal relationships and development of a deeper type of distress. There may be a more enduring disruption in one's sense of self and in team cohesion.<sup>13</sup> Moral distress or injury may be amplified when managerial decision making disregards the impact on staff already affected, undermining trust in the organisation.<sup>14</sup>

### Optimal care practices for employees who experience workplace violence

Victims often need medical care, emotional support and financial help for serious injuries. From an organisational perspective, there are extra considerations in protecting healthcare staff from workplace violence and its impacts.

Case 1: I considered my return to work and managing 32 hours per week only 6 months after a near fatal attack to be a major achievement. However, my rehabilitation case manager told me reduced hours “*can't go on forever*”. She admitted she had not taken the time to read my notes and understand what had happened to me, citing workload pressures. Support from the acting manager of my workplace was limited, which compounded the sense of not being heard, invisibility and disempowerment during an already traumatic time as I was working through the legal process as a victim. Six months after my return to work my usual manager resumed her role. The difference was stark, resulting in real support and action, including a transfer to another (*safer*) unit. My lived experiences have shaped both my values and my voice, enabling me to be truly authentic within my mental health promotion role. They have taught me that well-being is not theoretical—it's personal, lived and deeply connected to how we treat one another. It is therefore deeply concerning that workplace assaults remain widespread and, for many, are still part of daily working life in New Zealand. I have rebuilt my life, found a new career path, mana and purpose, and I am grateful for the unwavering support from whānau, friends and colleagues, both present and past.

Case 2: I learned much about optimal responses to being assaulted at work and the process after a work-related injury. I especially valued cultural support, reflecting on the head as tapu (sacred) and the disruption to wairua (spirit) when the head is struck. Support from occupational safety and health was not forthcoming, which meant I delayed seeking help.

When I did, I received a comprehensive rehabilitation package due in part to self-advocacy. Stoic colleagues may not seek or get help, instead suffering consequences by minimising the impacts of violence.

Institutions have an obligation to ensure employees are aware of their right to receive support for recovery and return to meaningful employment.<sup>15</sup> Healthcare organisations can do much to avoid compounding trauma through an active desire to understand, non-judgemental enquiry and putting in place positive, sustainable measures to prevent violence.

### Discussion

These experiences illustrate gaps in system care of staff after violence in a healthcare setting. The scaling back of New Zealand Police involvement in mental health-related emergencies places health staff at an increased risk of harm when they are exposed to violence at work. We suggest there is a need to more accurately capture the incidence, extent and consequences of violence directed towards healthcare professionals at work. It is important that incidents of violence are reported in a timely manner and actions taken to proactively educate and care for staff. We recommend written information be provided by occupational health and safety services to all staff in orientation about work-related injuries and rehabilitation policies, and this information should also be readily available following an incident of workplace violence. This would operationalise Health New Zealand – Te Whatu Ora's values in “*recognising, supporting and valuing our people*”.<sup>15</sup> A compassionate healthcare system must work together with victims and other systems to intervene with support, solutions and justice. Including victims in redressing omissions or integrating recommendations for measures may protect workers from future harm.

The *Health and Safety at Work Act 2015*<sup>16</sup> requires New Zealand employers and employees to actively identify and manage risks, with the aims of decreasing serious workplace injuries and deaths. One proposed amendment to this legislation would focus regulatory attention on critical risks associated with a hazard of any kind that is likely to result in a death, a notifiable injury, illness or incident. At Health New Zealand – Te Whatu Ora, the organisational values that emphasise safety and wellbeing are described

under *Te Mauri o Rongo – The New Zealand Health Charter*. This emphasises caring for people who care for people<sup>15</sup> under Te Korowai Āhuru, the cloak that seeks to provide safety and comfort to the workforce. The principle of *do no harm* applies to patient care and the health workforce, yet reports suggest hundreds of health workers in New Zealand experience occupational harm, including serious physical and verbal assault.<sup>5</sup> If employees are injured or take time from work, they are more likely to formally report a violent event.<sup>17</sup> Understanding the magnitude of under-reporting and characteristics of healthcare workers who are less likely to report may assist healthcare organisations to determine where to focus efforts in violence education and prevention.

When violence occurs we may ask what lessons have been learned and what sustained actions have been taken. Despite legislative frameworks and organisational values that emphasise safety and wellbeing, harm persists. Under-reporting of incidents aids no one—neither the victim nor the perpetrator. When violence towards staff is not reported, interventions that otherwise may prevent violence are not put in place. This may result in worse harm and more serious outcomes down the track.

The principle of “*cause no harm*” applies not only to patient care but also to the health workforce. Health New Zealand – Te Whatu Ora includes “*caring for people who care for people*”<sup>15</sup> in its values and principles. The first case demonstrates missed opportunities to learn from and mitigate harm and the harmful impacts on staff, whānau, colleagues, patients and the wider community. The second case highlights delayed consequences of violence and the need for holistic, high-quality care to process a work-related injury. Victims become experts in contributing to preventing violence within the healthcare system. This knowledge can be harnessed, as each of us has a duty to identify what can be improved and to advocate for change. Victims need to know they and their experiences are valued and that their suggestions are considered and integrated in the healthcare system. This includes practical care of victims. Currently, there is limited provision to reimburse Health New Zealand – Te Whatu Ora employees when they pay a surcharge to a treatment provider to make an initial insurance claim (not reimbursed) or lose a percentage of their salary during their recovery (personal communication in: email, 4 December 2025). Documents outlining the process to support

employees with investigations and rehabilitation should be made readily available (personal communication in: email, 4 December 2025). Staff may defer seeking help due to cost, contributing to inequitable access to care, and not be compensated adequately for recovery from work-related injuries. These disadvantages affect junior colleagues, health assistants, casual staff and those with other pressing family and financial commitments.

We encourage and recommend research that examines workplace violence and its associations with burnout, patient safety and adverse events.<sup>18</sup> Impacts of workplace violence are feelings of anger, reduced work enthusiasm and the intention to quit work. An important longer-term consequence is poor job satisfaction contributing to staff turnover.<sup>19</sup> Detrimental organisational effects include reduced work effectiveness, burnout and decreased wellbeing.<sup>20</sup> Special attention should be paid where there is high absence due to sickness or staff leaving, and recurring violence. Notably, the effects of workplace violence can remain active for up to 8 years, and arguably longer, after an incident.<sup>20</sup> An engaged, effective and culturally safe workforce contributes to a health system that learns, is responsive and equitable.<sup>21</sup> A just culture is open to suggestions that improve safety.<sup>18</sup> The onus is on healthcare organisations to proactively work to educate and support staff and develop policies and systemic improvements where violence is a recurring phenomenon in the workplace. Care practices that support staff recovery and reflection after work-related harm include timely debriefing and follow-up to build team capacity to manage violence and minimise harm.<sup>22</sup> Organisations can carefully consider safety precautions,<sup>23</sup> security of the built environment, security presence, restricted areas, cameras, panic buttons and regular, compulsory Safe Practice Effective Communication (SPEC) training that needs to be passed as a core requirement. Innovative ideas to develop health workforce safety could be drawn together in a summit that includes WorkSafe, Health Quality & Safety Commission – Te Tāhū Hauoro,<sup>24</sup> Health New Zealand – Te Whatu Ora, Māori health and other health providers and people with lived experience. There must be a clear expectation that violence and mistreatment of staff will not be tolerated and will be reported.<sup>22</sup> Healthcare organisations are obligated to flag risk(s) and injustice, and advocate for timely improvements. Workplace violence must never be accepted and simply

attributed to *the system*.

## Conclusion

Health professionals are key responders to victims of violence but also need sensitive and expert assistance and aftercare when they become victims. Workplace violence is consequential and effects may be delayed. Organisations can proactively promote optimal care for healthcare workers who survive violence by responding to incidents promptly, strongly encouraging staff to seek post-incident support as early as possible and providing practical support, initially and in the long term. There is an obligation to genuinely assess and re-assess the risks posed to staff. Staff should expect a safe return home from work. We emphasise protection of staff, with ongoing review and sharing of policies and practices that promote

safety and wellbeing within the healthcare system.

## Summary of recommendations

- A nationwide unified approach to collecting, analysing and reporting data on workplace violence across the health sector would assist with sharing information on findings.
- Commissioning research on the consequences of workplace violence, particularly psychosocial impacts, would enable further understanding on productivity, retention, burnout and organisational culture.
- Strengthening health and safety legislation would assist with clarifying responsibilities of individuals and organisations in identifying and managing risks and monitoring violence.

**COMPETING INTERESTS**

RM has received payment or honoraria for presentations from the University of Canterbury, The University of Auckland, RMIT (Melbourne) and community groups (e.g., Shine, Women's Refuge, SASS). RM is the chief victims advisor to the New Zealand Government—paid role.

LN has received consulting fees for contracted clinical work at Health New Zealand – Te Whatu Ora, payment for forensic psychiatry expert testimony and support for attending meetings and/or travel from The University of Auckland continuing medical education funding.

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**AUTHOR INFORMATION**

Wendy Strawbridge: Registered Nurse and Health Promoter, Te Mana Taki Hauora – Health Action Trust, Nelson, New Zealand.

Ruth Money: Government Chief Victims Advisor, Ministry of Justice, Wellington, New Zealand.

Lillian Ng: Psychiatrist, Health New Zealand – Te Whatu Ora Waitematā, Auckland, New Zealand; Senior Lecturer, Faculty of Medical and Health Sciences, The University of Auckland, Auckland, New Zealand.

**CORRESPONDING AUTHOR**

Lillian Ng: Psychiatrist, Health New Zealand – Te Whatu Ora Waitematā, Auckland, New Zealand; Senior Lecturer, Faculty of Medical and Health Sciences, The University of Auckland, Auckland, New Zealand. Private Bag 92019, Auckland 1143.  
E: lillian.ng@auckland.ac.nz

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# Subcutaneous gallstone: a case report

Georgia Butt, Rana Alsadat, Universe Leung

**C**holecystocutaneous fistula (CCF) is a rare presentation of gallbladder pathology, wherein an abnormal connection forms between the gallbladder and the skin, often with an associated abscess.<sup>1-3</sup>

## Case report

A comorbid, frail 93-year-old woman presented with a 6-week history of a red lump in her right upper quadrant. She had no previously reported cholecystitis, biliary symptoms or right upper quadrant incisions.

Initially presumed to be a simple skin infection, she was treated with oral antibiotics. However, due to minimal improvement, she was referred for an ultrasound; this found an area of increased vascularity around mineralisation deep to the dermis, with an unclear relationship to the peritoneum. The gallbladder and distal common bile duct were not well visualised, and there was suspicion for a porcelain gallbladder.

Her liver function tests (LFTs) were normal,

except for a bilirubin of 32—this appeared to be her baseline level. She previously had mildly raised LFTs—6 months earlier—thought secondary to fluid overload, which had improved with treatment.

Her computed tomography (CT) scan showed findings consistent with a subcutaneous calcified gallbladder containing a 1cm calculus, with a cystic duct traversing the anterior abdominal wall which could be traced back to the common bile duct; it was postulated this was secondary to previous cholecystitis with associated cholecystocutaneous fistulation. A previous CT scan 18 months prior had shown an intra-abdominal contracted gallbladder with wall calcification and a calculus.

After discussion with a hepatobiliary surgeon, the decision was made to treat with a simple incision and drainage procedure under local anaesthetic and sedation, given her age and comorbidities. A 4cm gallstone was removed, with minimal pus, no bile, no calcifications or obvious gallbladder wall tissue, and no appreciable fistula or duct.

**Figure 1:** Axial section from computed tomography (CT) scan.

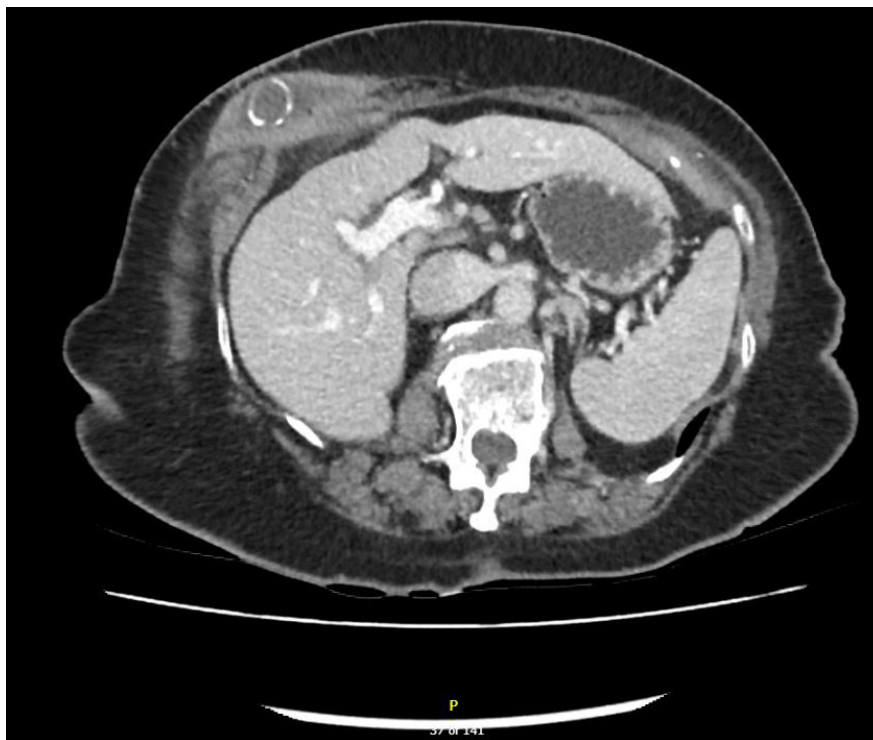


Figure 2: Sagittal section from computed tomography (CT) scan.



Figure 3: Gallstone.



After washing out with saline, an Aquacel® wick was placed and was removed after 24 hours. No bile was ever noted coming from the wound. She received a further 24 hours of intravenous antibiotics and was discharged home to complete a 5-day oral antibiotic course.

## Discussion

This was an unusual presentation of CCF—an already rare presentation with fewer than 25 cases reported in the last 50 years, with a significant reduction in cases since the increased availability of antibiotics and cholecystectomies.<sup>1-3</sup> Most presentations tend to be associated with recurrent episodes of cholecystitis or chronic biliary tract disease, or complications of cholecystostomies, though there are also suggestions that steroids, trauma, typhoid, and bacterial dissemination may predispose towards CCF formation.<sup>2-4</sup> CCF tends to present in women older than 50, like our patient, though her lack of previous abdominal pain was

very unusual, despite her prior CT scan suggesting biliary pathology.<sup>3,4</sup> Although her stone was in the subcutaneous tissue, no fistula was identified—an exceedingly rare occurrence.

Due to its rarity, there is not a clear consensus on the most appropriate management of CCF.<sup>1,2</sup> Generally, immediate drainage of the abscess and treatment with antibiotics seems to be standard practice, though often there is either an immediate open cholecystectomy and excision of fistula tract or an interval laparoscopic cholecystectomy; in the case of our comorbid patient, this definitive treatment was not indicated.<sup>1,2</sup>

## Conclusion

This case highlights the importance of considering a cholecystocutaneous fistula in right upper quadrant abscesses, with or without previous biliary pathology, and therefore ensuring appropriate imaging prior to operative management.

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**COMPETING INTERESTS**

Nil.

**AUTHOR INFORMATION**

Dr Georgia Butt: General Surgical Registrar, North Shore Hospital, Auckland, New Zealand.

Dr Rana Alsadat: General Surgical Registrar, North Shore Hospital, Auckland, New Zealand.

Mr Universe Leung: Consultant Hepatobiliary and General Surgeon, North Shore Hospital, Auckland, New Zealand.

**CORRESPONDING AUTHOR**

Dr Georgia Butt: General Surgical Registrar, North Shore Hospital, Auckland, New Zealand. E: GRosemaryButt@gmail.com

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# Vision-threatening complications in herpes zoster ophthalmicus: lessons from two unvaccinated patients with orbital apex syndrome

Christian P Pappas, Anna M Waldie, Aditi Shukla, Derek Chan

**H**erpes zoster ophthalmicus (HZO) is a vaccine-preventable neurocutaneous disease associated with vision- and life-threatening sequelae. Immunisation of eligible groups is critical, particularly among the elderly and immunocompromised in whom the risk of recurrent disease and complications is over twofold greater. Systemic antiviral treatment within 72 hours of rash is associated with significant reductions in the risk of postherpetic and ocular complications such as orbital apex syndrome (OAS), a vision-threatening complication characterised by ptosis, ophthalmoplegia and optic neuritis occurring secondary to varicella zoster virus (VZV) vasculopathy. We review presentations of HZO with secondary OAS in two elderly, immunocompromised and unvaccinated patients with devastating visual outcomes. We emphasise to physicians and ophthalmologists the importance of vaccination, the requirement for a multidisciplinary approach to antiviral and steroid therapy and the need for early recognition of significant neuro-ophthalmic sequelae.

## Case 1

An 88-year-old male with a background of chronic lymphocytic leukaemia (CLL) in remission for 12 years presented to the emergency department with 7 days of left parietal headache and 4 days of vesicular rash in the distribution of the left ophthalmic nerve (V1). He was unvaccinated for shingles. Baseline visual acuity was 6/9 in the right eye and 6/12 in the left eye, with classic pseudodendrites on corneal fluorescein staining consistent with uncomplicated HZO. He was prescribed oral valaciclovir 1000mg three times daily and discharged for routine outpatient 5-day follow-up.

The patient re-presented the next day in new rapid atrial fibrillation and was transitioned to

intravenous (IV) aciclovir 10mg/kg twice daily. At ophthalmic review on day 4 of admission, the left eye was found proptosed and anaesthetised with complete internal and external ophthalmoplegia, complete ipsilateral ptosis and total vision loss, consistent with dysfunction of cranial nerves II, III, IV, VI and the ophthalmic division of cranial nerve V. Secondary OAS was diagnosed (Figure 1, Figure 2).

Computed tomography (CT) brain venogram was negative for cerebral venous sinus thrombosis (CVST), while magnetic resonance imaging (MRI) of the orbits with gadolinium contrast demonstrated classical findings of OAS (Figure 3). A multidisciplinary team of neurologists, ophthalmologists, infectious diseases physicians and general medical physicians commenced 3 days of IV methylprednisolone 1000mg with step-down to oral prednisolone 50mg in a 6-week taper, with 2-weeks of IV aciclovir followed by 1 week of oral valaciclovir 1000mg three times daily.

Twenty-one weeks after rash onset, the patient's ophthalmoplegia partially resolved with a residual 25% deficit in left eye abduction and persisting partial ptosis. The left pupil remained fixed and dilated, and the eye was non-light perceiving.

## Case 2

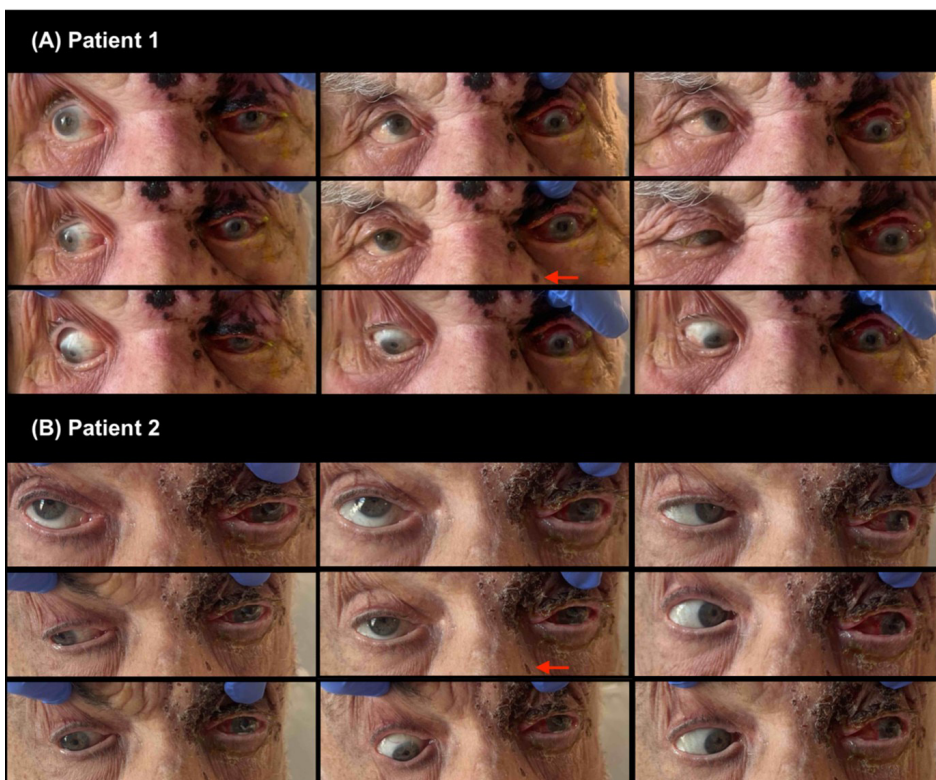
A 77-year-old male with a background of CLL under surveillance presented to the emergency department with a 3-day history of severe, left-sided, pulsatile headache refractory to opioid analgesia and triptans. He was unvaccinated for shingles. Initial CT and MRI of the brain were unremarkable. The patient was admitted for analgesic optimisation, with cluster headache, status migrainosus and trigeminal autonomic cephalalgia the differential diagnoses.

On day 9 of admission a new vesicular rash was

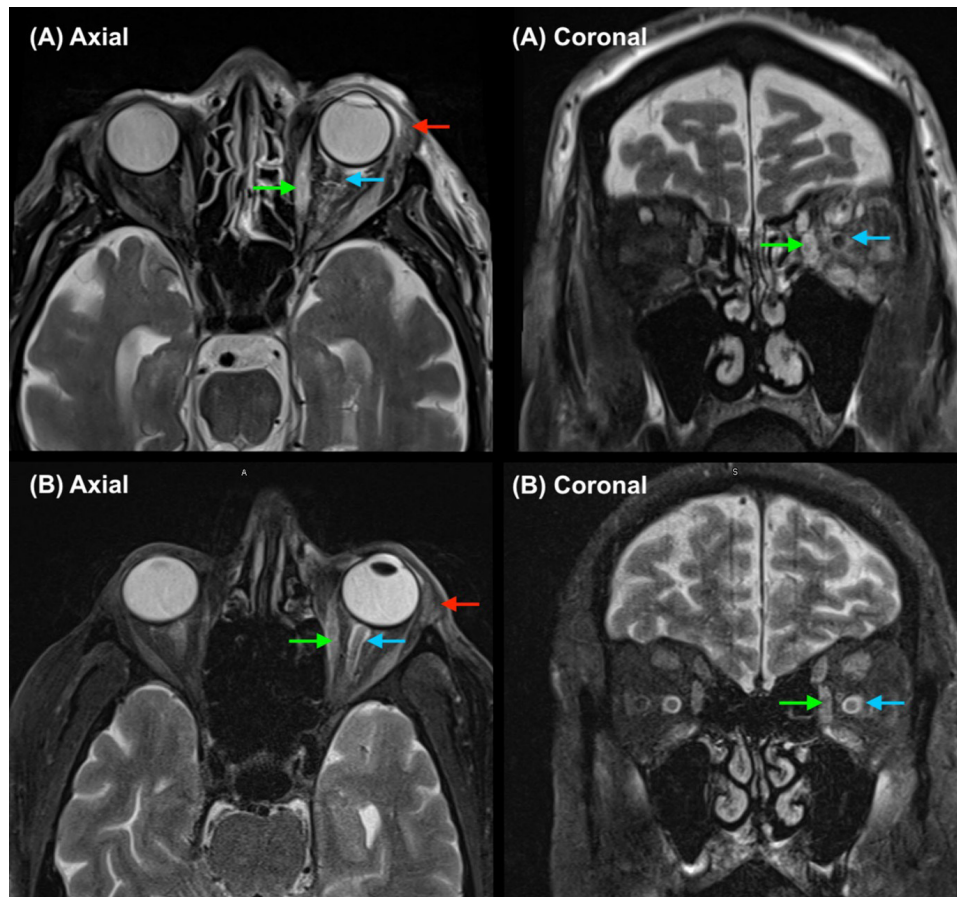
**Figure 1:** Macroscopic appearance of patient 1’s left eye at diagnosis of orbital apex syndrome (OAS). The pupil is fixed and mid-dilated with a relative afferent pupillary defect. There is significant conjunctival hyperaemia with proptosis, and crusted vesicles in the distribution of V1.



**Figure 2:** (A) Extraocular movements of patient 1 at diagnosis of OAS, demonstrating complete akinesia of the left eye. (B) Extraocular movements of patient 2 at diagnosis of OAS. Crusted vesicular rash is noted in the left distribution of V1. Hutchinson’s sign is present (red arrows). The left eye demonstrates complete ptosis and complete internal and external ophthalmoplegia, except in abduction with a 25% deficit.



**Figure 3:** (A) Magnetic resonance imaging (MRI) T2-weighted turbo spin echo scans with gadolinium contrast bolus of patient 1 in axial and coronal planes. Findings include mild left eye proptosis, with preseptal and periorbital oedema (red arrow), thickening and enhancement of the left optic nerve sheath (blue arrow), ocular sclera and extraocular muscles (green arrow) consistent with orbital apex syndrome. No other intracranial or orbital pathology is identified. (B) MRI T2-weighted turbo spin echo fat-suppressed scans without contrast of patient 2 in axial and coronal planes. Findings include enhancement of the left extraocular muscles (green arrow) and optic nerve sheath (blue arrow), distension of the left superior ophthalmic vein and left periorbital subcutaneous enhancement (red arrow).



noted in the distribution of the left ophthalmic nerve with significant pseudodendrites on corneal fluorescein staining, consistent with HZO. Baseline visual acuity was 6/9 in the right eye and 6/24 in the left. He was commenced on IV aciclovir 10mg/kg three times daily for 2 weeks in the context of immunosuppression. Vesicular lesion swab polymerase chain reaction testing was positive for VZV DNA.

On day 13 of admission, the patient noted subjective visual deterioration. The left eye demonstrated complete ptosis, and complete internal and external ophthalmoplegia, except in abduction with a 25% deficit (Figure 2). Visual acuity was count-fingers in the affected left eye. Secondary OAS was diagnosed, with the diagnosis

subsequently confirmed by MRI of the brain (Figure 3). In consultation with a multidisciplinary team, the patient received pulse IV methylprednisolone 1000mg for 5 days with step-down to oral prednisolone 75mg in 6-week taper, with 2 weeks of IV aciclovir.

Six weeks after rash onset, best corrected left eye visual acuity had significantly improved to 6/24. Extraocular muscles demonstrated normal abduction, with a 50% residual deficit in elevation and depression and 100% deficit in adduction.

## Discussion

Herpes zoster (shingles) is a vaccine-preventable neurocutaneous disease characterised by reac-

tivation and retrograde migration of latent VZV within sensory ganglia. The lifetime risk of shingles is 20–30% among the general population,<sup>1</sup> while the incidence and recurrence rate is over two-fold greater among the elderly and immunocompromised.<sup>2,3</sup> HZO is characterised by reactivation within the ophthalmic division of the trigeminal nerve and is the second most frequent distribution after thoracic disease, accounting for 10–20% of cases.<sup>1</sup> Ocular involvement occurs in 50% with HZO within 6 months of rash onset, with a reduction to 30% following appropriate antiviral use.<sup>4</sup> Keratitis and anterior uveitis are common, while more significant complications include neurotrophic keratopathy and acute retinal necrosis.<sup>1</sup> Hutchinson's sign (cutaneous involvement of the lateral dorsum, tip or root of the nose) strongly suggests ocular involvement.<sup>5</sup> Postherpetic neuralgia occurs in 47.5% of patients with shingles 70 years and older, and is thought to affect patients with HZO more frequently than other dermatomal distributions.<sup>1,6</sup>

OAS is an exceedingly rare yet sight-threatening neuro-ophthalmic complication of HZO characterised by dysfunction of cranial nerves II, III, IV, VI and the ophthalmic division of cranial nerve V. Of uncertain incidence, the hallmarks of disease are complete unilateral ptosis, internal and external ophthalmoplegia and reduced visual acuity, typically occurring within 4 weeks of rash onset.<sup>7</sup> While the true pathophysiology of OAS remains unclear, VZV vasculopathy is postulated to be the underlying mechanism, with ischaemic optic and cranial neuropathies developing secondary to an occlusive vasculitis.<sup>7,8</sup>

No specific risk factors for secondary OAS have been identified, although affected patients tend to be older and present with delayed treatment initiation, as in our cases.<sup>8</sup> High-resolution MRI with gadolinium contrast and fat-suppressed sequences is essential for both diagnostic clarification and to exclude more common aetiologies of OAS such as trauma, haemorrhage and CVST.<sup>7</sup> Typical findings include enlargement of the extraocular muscles and diffuse post-contrast enhancement of the orbital apex involving the optic nerve (Figure 2).<sup>8</sup> The visual prognosis is poor; while approximately 90% demonstrate improvements in extraocular motility, 50% retain irreversibly

poor visual acuity,<sup>7</sup> as in our cases.

Vaccination of eligible populations is critical. Recombinant VZV glycoprotein E vaccination (RZV, Shingrix, GlaxoSmithKline) is recommended for use in patients 50 years and older and immunocompromised patients 18 years and older. As of December 2022, Shingrix has replaced live-attenuated vaccination (Zostavax, Merck & Co.) on the National Immunisation Schedule Wātaka Tuku Awhikiri ā-Motu,<sup>9</sup> surpassing it in both efficacy and duration of immunity.<sup>10</sup> A recent retrospective cohort study of over 170,000 individuals in the United States of America who received 2 doses of RZV identified an overall adjusted effectiveness of 89.1% against HZO in clinical settings.<sup>11</sup> Contrastingly, caution is suggested when considering vaccination in patients with a history of HZO, in whom RZV is associated with a higher likelihood of HZO recurrence within 56 days of vaccination.<sup>12</sup>

Management of uncomplicated HZO in immunocompetent patients is 7 days of systemic antivirals, with ophthalmic referral being mandatory.<sup>7</sup> Treatment within 72 hours of rash onset is strongly associated with a reduced incidence of postherpetic complications.<sup>7</sup> For OAS, no unifying treatment regimen has been defined. Multidisciplinary care with systemic antivirals and steroids in an empirical tapering pattern over 2–6 months appears routinely within the literature.<sup>8</sup> Although not statistically significant, treatment within 72 hours of rash onset appears correlated with improved visual recovery.<sup>7</sup> This may explain the contrasting visual outcomes in our cases.

## Conclusion

HZO is a common neurocutaneous disease associated with vision-threatening sequelae. Both clinicians and patients should remain vigilant for new-onset ptosis, ophthalmoplegia and reduced visual acuity within 4 weeks of rash onset, which should prompt urgent consideration of OAS, a rare and sight-threatening complication occurring secondary to VZV vasculopathy. Recombinant zoster vaccination is critical in eligible populations, especially the elderly and immunocompromised.

**COMPETING INTERESTS**

None of the authors have any proprietary interest or conflicts of interest related to this submission.

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Patients have provided informed consent to the publication of images and data. Patient anonymity is preserved within the manuscript text.

This study was reviewed by the South Eastern Sydney Local Health District Human Research Ethics Committee, Low Negligible Risk sub-committee, who confirmed that formal ethical review was not required in accordance with the Australian Government National Health and Medical Research Council National Statement (updated 2018).

**AUTHOR INFORMATION**

Dr Christian P Pappas, MD, MMed (OphthSci): The University of Sydney, Faculty of Medicine and Health, Camperdown, New South Wales, Australia; Sydney Hospital and Sydney Eye Hospital, Sydney, New South Wales, Australia.

Dr Anna M Waldie, BSc, MD, MMed (OphthSci): Department of Ophthalmology, Prince of Wales Hospital, Randwick, New South Wales, Australia.

Dr Aditi Shukla, MBBS: Department of General Medicine, The Sutherland Hospital, Caringbah, New South Wales, Australia.

Dr Derek Chan, BSc (Med), MBBS, MPH, FRANZCO: Department of Ophthalmology, Prince of Wales Hospital, Randwick, New South Wales, Australia.

**CORRESPONDING AUTHOR**

Dr Christian P Pappas, MD, MMed (OphthSci): The University of Sydney, Faculty of Medicine and Health, Camperdown, New South Wales, Australia; Sydney Hospital and Sydney Eye Hospital, Sydney, New South Wales, Australia.  
E: christianpappas2997@gmail.com

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# Antifungal susceptibility of genital yeast isolates, Auckland, 2016–2025

Arthur J Morris, Wendy P McKinney, Sally A Roberts

## ABSTRACT

**AIM:** Our aim was to record current susceptibility results of genital yeast isolates and to compare the results to the previous report covering the period 2001–2015.

**METHODS:** Genital yeast isolates had their antifungal susceptibility determined by disc diffusion or minimum inhibitory concentration following standard methods. Sequential isolates from the same person had their initial and last susceptibility results compared.

**RESULTS:** Disc testing was performed on 1,307 initial isolates; 17 (1.3%) were from males. The most frequent isolates were *Candida albicans* (64%), *Nakaseomyces glabratus* complex (17%) and *Candida parapsilosis* complex (7%). While 94% of isolates were susceptible to clotrimazole, susceptibility for other azoles ranged from 62% to 84%. All isolates were susceptible to nystatin. Isolates non-susceptible to one topical azole were often resistant to all azoles tested. For fluconazole, itraconazole and miconazole fewer isolates were susceptible than in the previous time period. The susceptibility to clotrimazole did not change. One hundred and eight women had sequential isolates, range 2–5, collected 1 week to 75 months apart, median 6 months. Four pairs (4%) had a change from susceptible to resistant, all for miconazole, suggesting increased resistance. All latter isolates were susceptible to at least two other azoles and nystatin.

**CONCLUSIONS:** There appears to have been an increase in antifungal resistance to several topical agents used for genital yeast infections. However, in a previously susceptible isolate, treatment failure seldom indicates a change to antifungal resistance. Women with recurrent vulvovaginal yeast infection can be reasonably treated empirically while identification and susceptibility results are awaited.

Yeasts, mostly *Candida* species, can cause troublesome vulvovaginal infection. Approximately 75% of women have at least one episode of vaginal candidiasis in their lifetime and 5–8% experience recurrent disease ( $\geq$ four episodes a year), mainly in their childbearing years.<sup>1</sup> Culture is recommended in cases of suspected vaginal candidiasis as symptoms are non-specific and antifungal susceptibility testing is often requested/performed especially in recurrent disease.<sup>2</sup> We reviewed the disc susceptibility and broth microdilution minimum inhibitory concentration (MIC) results for genital yeast isolates tested over a 10-year period from 2016 to 2025. Our aim was to record current susceptibility results and to compare the results to the previous report covering 2001 to 2015.<sup>3</sup>

Only the first isolate of a species was included for each individual. Disc testing followed Clinical and Laboratory Standards Institute (CLSI) methods using Neo-Sensitabs tablets (Rosco Diagnostica, Denmark), as previously reported.<sup>3</sup> The five antifungal agents tested were clotrimazole, fluconazole, itraconazole, miconazole and nystatin. Tablet potency and interpretive criteria for topical treatment are presented in Appendix Table 1. *Nakaseomyces glabratus* (*N. glabratus*) (previously *Candida glabrata*) and disc non-susceptible *Candida*

*albicans* (*C. albicans*) isolates had MICs determined by the broth colorimetric microdilution method, Sensititre® YeastOne® (TREK Diagnostic Systems, West Sussex, England), as previously reported.<sup>4</sup> The interpretive criteria for MIC testing are presented in Appendix Table 2. The clinical history and treatment details were unknown. There were 108 individuals, all women, with sequential isolates of the same yeast species where the initial isolate was susceptible by disc testing to two or more azole agents. We compared the initial and last susceptibility results to see if they had changed over time.

Disc testing was performed on 1,307 initial isolates; 17 (1.3%) were from males. There were 207 (16%) isolates from other hospitals, 675 (52%) from the regional community laboratory and 425 (33%) from Auckland City Hospital wards and clinics including 387 (27% overall) from sexual health clinics. Requests for susceptibility testing from the community and hospital clinics are often for isolates from women who have not responded to initial treatment or who have recurrent infections. For example, community referrals are based on clinical information being provided stating either recurrent infection or breakthrough symptoms on suppressive treatment. The most frequent isolates were *C. albicans* (64%), *N. glabratus* com-

plex (17%) and *Candida parapsilosis* (*C. parapsilosis*) complex (7%) (Table 1). While 94% of isolates were susceptible to clotrimazole, susceptibility for other azoles ranged from 62–84%. All isolates were susceptible to nystatin. *Pichia kudriavzevii* (*P. kudriavzevii*) (previously *Candida krusei*) was the least susceptible group. For fluconazole, itraconazole and miconazole fewer isolates were susceptible than in the previous time period (Table 1). There was no difference in fluconazole resistance between hospital or community isolates, either for all species or for the most common isolate *C. albicans*.

The susceptibility of azole non-susceptible isolates to other antifungals is shown in Table 2. Pan-resistance was common in these isolates (Table 2). One hundred and eight women had sequential isolates, range 2–5, collected 1 week to 75 months apart, median 6 months. Of the 108 sets, 78 (72%) had identical susceptibility results and 26 had a single susceptibility change, e.g., susceptible to intermediate or intermediate to resistant, likely indicating biological variation within the limits of the test method. Four pairs (4%) had a change from susceptible to resistant, all for miconazole, suggesting increased resistance. All latter isolates were susceptible to at least two other azoles and nystatin.

After MIC testing for fluconazole, 26% of *C. albicans* and 90% of *N. glabratus* were susceptible-dose dependent with 60% and 10% being resistant, respectively (Table 3). The fluconazole results are in stark contrast to non-genital *C. albicans* isolates over the same period, where 635 of 652 (97%) were susceptible (unpublished laboratory data in: email, Arthur Morris, 1 February 2026). For itraconazole, almost all *N. glabratus* isolates were wild type, i.e., indicating the likely absence of acquired or mutational resistance. All species, for which criteria exist, were wild type for amphotericin (Table 3).

Apart from clotrimazole, with 94% being susceptible by disc testing, susceptibility to other azoles was variable, and as low as 62% for miconazole. This variability in commonly suggested agents for vulvovaginitis suggests susceptibility testing should be considered if initial treatment fails. That said, if a known active agent is used

and symptoms return, it is uncommon for a subsequent isolate to have become resistant (4%). This is in keeping with the observations of others.<sup>5–8</sup> It was common for an isolate non-susceptible to one azole agent to be non-susceptible to all azole agents. Resistance to antifungal agents may have increased since the last reported period, and there was an increase in the number of pan-azole resistant isolates, 43 in this period vs only three previously.<sup>3</sup> However, this is likely due to the selection of isolates for testing because clinician requests for susceptibility testing are usually triggered after previous azole exposure, for example following breakthrough symptoms on suppressive treatment or recurrent infection following azole exposure from self- or clinician-prescribed treatment. Our study is limited because without treatment information we are unable to evaluate its impact on isolate susceptibility. Changed referral patterns between the time periods may have also occurred which could have impacted the observed resistance rates.

The observation that all isolates were wild type to amphotericin is reassuring and would support its use for cases where azole agents are failing.

These susceptibility results will allow further monitoring of antifungal susceptibility over time. Given the recent change, the next review should probably be in 5 years rather than 10. Molecular testing for azole resistance mechanisms and to confirm strain identity would be useful additional information to give insight into the results observed in the low proportion of women with sequential isolates with apparent changes in susceptibility.

We conclude that, in this selected patient group, there appears to have been an increase in antifungal resistance to several topical agents used for genital yeast infections. However, susceptibility to clotrimazole has not changed. In a previously susceptible isolate treatment, failure after a stat dose or short-course treatment seldom indicates a change to antifungal resistance, and women with recurrent vulvovaginal yeast infection can be reasonably treated empirically while identification and susceptibility results are awaited.

Ethics: Under HDEC guidelines this audit of laboratory results is out of scope for HDEC review.

**Table 1:** Disc susceptibility results for vaginal yeast isolates to five antifungal agents.

Species/complex (Previous name)	Number, % Susceptible	Clotrimazole	Fluconazole	Itraconazole	Miconazole	Nystatin
<i>Candida albicans</i> n=843, 64%	n	792	816	816	843	843
	%S	95	80	82	57	100
<i>Nakaseomyces glabratus</i> ( <i>Candida glabrata</i> ) complex n=227, 17%	n	216	Not done	Not done	227	227
	%S	90	-	-	92	100
<i>Candida parapsilosis</i> complex n=88, 7%	n	82	85	85	88	88
	%S	100	91	97	38	100
<i>Clavispora</i> ( <i>Candida</i> ) <i>lusitaniae</i> n=35, 3%	n	34	30	30	35	35
	%S	97	87	97	86	100
<i>Pichia kudriavzevii</i> ( <i>Candida krusei</i> ) n=39, 3%	n	38	34	34	39	39
	%S	100	0 <sup>a</sup>	79	8	100
<i>Saccharomyces cerevisiae</i> n=23, 2%	n	21	21	21	22	22
	%S	100	86	90	95	100
Other species <sup>b</sup> n=52, 4%	n	45	46	46	49	49
	%S	93	67	74	49	100
Total n=1,307, 100%	n	1,228	1,038	1,038	1,303	1,304
	%S	94	78	84	62	100
Previous reporting period, 2001–2015 <sup>c</sup>	n	673	508	508	675	681
	%S	94	92	93	81	99.7
P-value		-	<0.001	<0.001	<0.001	-

<sup>a</sup> Intrinsicly resistant.<sup>b</sup> Other species are listed in Appendix Table 3.<sup>c</sup> Reference 3.

**Table 2:** Disc susceptibility results of non-susceptible isolates to other antifungal agents.

Non-susceptible <sup>a</sup> to	n	Susceptible/number tested					Pan-azole resistance <sup>a</sup>
		Clotrimazole	Fluconazole	Itraconazole	Miconazole	Nystatin	
Clotrimazole	68	-	2/45, 4%	1/45, 2%	6/68, 9%	68/68, 100%	43, 63%
Fluconazole	228	171/214, 80%	-	79/228, 35%	11/228, 5%	228/228, 100%	43, 19%
Itraconazole	170	114/158, 72%	21/170, 12%	-	3/170, 2%	170/170, 100%	43, 25%
Miconazole	502	407/469, 87%	245/462, 53%	295/462, 64%	-	502/502, 100%	43, 9%

<sup>a</sup> Includes intermediate and resistant isolates.

**Table 3:** Minimum inhibitory concentration-based susceptibility and wild-type populations for genital yeast species for fluconazole, itraconazole and amphotericin.

Organism group (Previous name)	Antifungal	Susceptible	Susceptible-dose dependent	Resistant	Wild type	Non-wild type
<i>Candida albicans</i>	Fluconazole n=272	35, 13%	74, 26%	163, 60%	No criteria	
<i>Nakaseomyces glabratus</i> ( <i>Candida glabrata</i> ) complex	Fluconazole n=228	Not applicable	205, 90%	23, 10%	No criteria	
<i>Candida albicans</i>	Itraconazole	No criteria			No criteria	
<i>Nakaseomyces glabratus</i> complex	Itraconazole n=211	No criteria			202, 96%	9, 4%
<i>Candida albicans</i>	Amphotericin	No criteria			273, 100%	-
<i>Candida dubliniensis</i>					1, 100%	-
<i>Candida tropicalis</i>					4, 100%	-
<i>Meyerozyma guilliermondii</i> ( <i>Candida guilliermondii</i> )					5, 100%	-
<i>Nakaseomyces glabratus</i> complex					228, 100%	-
<i>Pichia kudriavzevii</i> ( <i>Candida krusei</i> )					10, 100%	-
<i>Saccharomyces cerevisiae</i>					2, 100%	-

**COMPETING INTERESTS**

Nil.

**AUTHOR INFORMATION**

Arthur J Morris: Clinical Microbiologist, New Zealand Mycology Reference Laboratory, LabPlus, Auckland City Hospital, Auckland, New Zealand.

Wendy P McKinney: Medical Laboratory Scientist, New Zealand Mycology Reference Laboratory, LabPlus, Auckland City Hospital, Auckland, New Zealand.

Sally A Roberts: Clinical Microbiologist, New Zealand Mycology Reference Laboratory, LabPlus, Auckland City Hospital, Auckland, New Zealand.

**CORRESPONDING AUTHOR**

Arthur J Morris: Clinical Microbiologist, New Zealand Mycology Reference Laboratory, LabPlus, Auckland City Hospital, Park Road, Auckland 1023, New Zealand. E: arthurm@adhb.govt.nz

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## Appendix

**Appendix Table 1:** Antifungal disc potency and interpretive criteria for yeast disc susceptibility testing.<sup>1-4</sup>

Antifungal	Potency (µg)	Interpretive zone criteria (mm)		
		Susceptible	Intermediate	Resistant
Clotrimazole	10	≥20	12-19	≤11
Fluconazole	25	≥20	12-19	≤11
Itraconazole	10	≥15	10-14	No zone
Miconazole	10	≥20	12-19	≤11
Nystatin	50	≥15	10-14	No zone

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**Appendix Table 2:** Interpretive criteria for minimum inhibitory concentration testing for yeasts.<sup>1-3</sup>

Organism group (Previous name)	Antifungal	Interpretive criteria (mg/L)				
		Susceptible	Susceptible- dose dependent	Resistant	Wild type	Non-wild type
<i>Candida albicans</i>	Fluconazole	≤2	4	≥8	No criteria	
<i>Nakaseomyces glabratus</i> ( <i>Candida glabrata</i> ) complex	Fluconazole	Not applicable	≤32	≥64	No criteria	
<i>Candida albicans</i>	Itraconazole	No criteria			No criteria	
<i>Nakaseomyces glabratus</i> complex	Itraconazole	No criteria			≤4	>4
<i>Candida albicans</i>	Amphotericin	No criteria			≤2	>2
<i>Candida dubliniensis</i>					≤0.5	>0.5
<i>Candida tropicalis</i>					≤2	>2
<i>Meyerozyma guilliermondii</i> ( <i>Candida guilliermondii</i> )					≤2	>2
<i>Nakaseomyces glabratus</i> complex					≤2	>2
<i>Pichia kudriavzevii</i> ( <i>Candida krusei</i> )					≤2	>2
<i>Saccharomyces cerevisiae</i>					≤2	>2

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**Appendix Table 3:** Other yeast species having susceptibility testing performed 2016–2025.

Species (Previous name)	
<i>Candida dubliniensis</i>	9
<i>Candida inconspicua</i>	1
<i>Candida tropicalis</i>	10
<i>Cutaneotrichosporon (Trichosporon) mucoides</i>	1
<i>Cyberlindnera (Candida) fabianii</i>	1
<i>Cyberlindnera jadinii (Candida utilis)</i>	1
<i>Cyberlindnera</i> species	1
<i>Kluyveromyces marxianus (Candida kefyri)</i>	6
<i>Kodamaea (Pichia) ohmeri</i>	1
<i>Meyerozyma (Candida) guilliermondii</i>	10
<i>Pichia (Candida) norvegensis</i>	1
<i>Pichia membranifaciens (Candida valida)</i>	1
<i>Rhodotorula glutinis</i>	1
<i>Trichosporon</i> species	1
<i>Wickerhamiella (Candida) pararugosa</i>	1
<i>Wickerhamomyces anomalus (Candida pelliculosa)</i>	5
Yeast not <i>Candida albicans</i>	1
<b>Total</b>	<b>52</b>

# Hospital Policy

NZMJ, 1926

It is unnecessary to refer here in any detail to Hospital Policy in view of the full report of the "round-table" conference which appears in another part of this issue. The people of New Zealand are indebted to the broad and generous minded men who released Dr. MacEachern from his important duties at home to place the benefit of his advice and experience before New Zealanders. It is evident, as the result of this visit, that the Press and the public are alive to the importance of hospitals as national institutions, and they realise that no system is so perfect that it is not capable of improvement. The Governments of Victoria and of New South Wales eagerly proclaimed their sponsorship of Dr. MacEachern in an advisory capacity. The New Zealand Government very modestly appeared anxious by way of contrast, to give the medical men, through the Medical Association, the responsibility and, we trust, the credit of enlisting our distinguished visitor's services in the cause of progress and humanity. Any hesitancy on the part of our Government should be relieved by the promised active co-operation and the encouragement of the medical profession, the Press, the Hospital Boards Association, and we believe also by the more thoughtful section of the general public.

The curse of hospital policy in New Zealand is politics. Politicians multiply the number of hospital districts, not in the interest of patients, but for political reasons. Ministers of the Crown in charge of hospital administration come and go with the turn of the political wheel, and they cannot raise hospital policy out of the political arena. Can a Minister tackle the solution of a uniform policy of hospital staffing or are local prejudices and pre-

dictions to prevail haphazard? What is good for Wanganui cannot be bad for Hamilton. When two systems are diametrically opposed, one must be better than the other. Medical men will generally agree that to place a good hospital of fifty beds or more under the full control of a more or less inexperienced doctor with the help, perhaps, of a house surgeon, to exclude the services of good experienced men practising in the district, to prevent co-operation and emulation, is to do a grave wrong to the people, some of them unthinking, who go as patients to such a hospital. If the great majority of medical men are wrong in this opinion they are surely entitled to be set right by the Department or the boards, or whatever persons are the authors of a system which is condemned in every progressive country in the world. Let this policy be justified or else swept away, but not ignored. Much useful reform of the present hospital, which is in some ways admirable, can now be effected by the co-operation of the Department, the boards and the medical profession. The new Minister of Health gives promise of progressive ideas, the Department has declared itself in favour of innovations of far-reaching effect, hospital development has now become a public question, and surely within this year into which we have not very far entered we shall have some practical outcome to all the thought and discussion which have centred upon the hospitals of this country. The medical profession, as experts in the treatment of the sick, will be false to itself and to its traditions if it allows in silence any considerations, political or otherwise, to set a limit to continued progress in hospital as well as in private practice.

# Expression of concern: “Scurvy in a non-weight-bearing paediatric patient”

**URL:** <https://nzmj.org.nz/journal/vol-139-no-1631/scurvy-in-a-non-weight-bearing-paediatric-patient>

The editors of the *New Zealand Medical Journal* wish to issue an expression of concern regarding the article titled “Scurvy in a non-weight-bearing paediatric patient”, published in this journal.

Concerns have been raised regarding the adequacy of consent obtained for publication of this case report. While there is no dispute regarding the clinical accuracy or educational value of the content presented, the issues raised relate specifically to whether appropriate consent processes were fully met in accordance with journal policy and accepted ethical standards.

The *Journal* takes matters of patient consent and confidentiality very seriously. In light of

these concerns, and following discussion with the authors, we are undertaking a formal review of the circumstances surrounding consent for this publication. This process includes consideration of any additional information that may clarify the situation.

Pending the outcome of this review, readers are advised to interpret the article with caution in relation to its compliance with ethical publication standards.

The process may lead to a formal retraction of the article. Should this occur, a retraction notice will be published, and the article content will be withdrawn in accordance with standard publishing practice.

Professor Frank Frizelle

Editor in Chief

*New Zealand Medical Journal*