The New Zealand
Medical Journal
Te ara tika o te hauora hapori

Published by the Pasifika Medical Association Group

Vol 136 | No 1583 | 2023 October 6

The imperative to tax ultra-processed food if political parties are serious about improving mental health in future generations

Cascade of care and rapid treatment pathway at Auckland City Hospital for patients with a new diagnosis of HIV infection, 2015–2019

Exploring health professionals' viewpoint of provision of nutrition advice for women with endometrial cancer

Continued mitigation needed to minimise the high health burden from COVID-19 in Aotearoa New Zealand

The New Zealand Medical Journal
Te ara tika o te hauora hapori

PMA PASIFIKA MEDICAL ASSOCIATION Group

Publication information

published by the Pasifika Medical Association Group

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

The *NZMJ*'s first edition was published in 1887, marking the beginning of a rich 136-year history. It was a key asset of the New Zealand Medical Association (NZMA) up until July 2022.

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

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

ISSN (digital): 1175-8716

Editorial Board

The New Zealand **Medical Journal**
Te ara tika o te hauora hapori

PMA PASIFIKA MEDICAL ASSOCIATION Group

Publication information

published by the Pasifika Medical Association Group

Further information

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

To contribute to the *NZMJ*, first read:
journal.nzma.org.nz/journal/contribute

Other enquiries to

PMA Group
69 The Terrace
Wellington 6140
New Zealand

To subscribe to the *NZMJ*, email:

nzmj@pmagroup.co.nz

Subscribers to the *New Zealand Medical Journal* previously through the NZMA should now get in contact to subscribe via the above email if they wish to access the *Journal* for 2023.

Private subscription is available to institutions, to people who are not medical practitioners, and to medical practitioners who live outside New Zealand. Subscription rates are below.

All access to the *NZMJ* is by login and password, but IP access is available to some subscribers.

Read our conditions of access for subscribers for further information
journal.nzma.org.nz/legal/nzmj-conditions-of-access

If you are a member or a subscriber and have not yet received your login and password, or wish to receive email alerts, please email: nzmj@pmagroup.co.nz

Subscription rates for 2023

New Zealand subscription rates		Overseas subscription rates	
Individuals*	$360	Individual	$503
Institutions	$680	Institutions	$700
Individual article	$45	Individual article	$45

*NZ individual subscribers must not be doctors (access is via NZMA Membership)

New Zealand rates include GST. No GST is included in international rates.

Individual articles are available for purchase by emailing nzmj@pmagroup.co.nz.

Contents

Editorial

Articles

Viewpoints

Clinical correspondence

Letters

Research letters

100 years ago

Summaries

The imperative to tax ultra-processed food if political parties are serious about improving mental health in future generations

Julia J Rucklidge, Roger T Mulder

There is now robust research highlighting the strong association between consumption of ultra-processed products (UPF) and poor mental health. The data are most concerning in pregnancy. The more UPF the mother eats and/or the less whole foods she eats, the greater the risk of her child developing mental health problems. Successive governments are silent on the dangers of UPF food on mental health. With rising numbers of people struggling with mental health problems alongside the crippling costs to health, we need forward and transformative initiatives to tackle this problem.Taxing UPFs would be one avenue to adjust the fiscal levers to sway more people to make healthier food choices.

Goals of care in the Wellington Emergency Department: a clinical audit

Jesse Cain, Brad Peckler, Sinéad Donnelly

New Zealand has an ageing population where many older persons present to the emergency department. There are many treatment options, from curative to comfort-based care. Goals of care discussions explore treatment options with patients to formulate an appropriate care plan if they are to deteriorate. These discussions reduce aggressive treatment, hospitalisation and cost to the healthcare system. We aim to determine how often goals of care are being discussed in the emergency department for older persons.

Head and neck continued: a retrospective analysis of neck dissections from a New Zealand oral and maxillofacial surgery unit

Ellen OY Simpson, Alastair Luo, Jamie Mckenzie, Monish M Maharaj, Thasvir Singh

The Oral and Maxillofacial Surgery (OMS) Unit at Waikato Hospital is one of the only OMS units in New Zealand to ablate oral cavity malignancies and reconstruct the defect with vascularised free flaps. This study's aim was to retrospectively analyse the demographics, nodal yields and metastatic rates, and complications of patients that underwent a neck dissection within the OMS unit. The paper concluded that the OMS unit recommends omission of neck dissection levels IIb and IV in cN0 cases if deemed oncologically safe to do so.

Cascade of care and rapid treatment pathway at Auckland City Hospital for patients with a new diagnosis of HIV infection, 2015–2019

Annabelle Donaldson, Michele Lowe, Simon Briggs

Early initiation of antiretroviral therapy for people living with HIV has been shown to reduce transmission of HIV and improve health outcomes for people living with HIV. For people with newly diagnosed HIV referred to Auckland City hospital between 2015 and 2019, 197/200 (98.5%) were initiated on HIV treatment and of these 99% (195/197) had confirmed suppression of their virus. Policy changes in 2017 enabled a rapid treatment pathway to be established and this has led to a significant shortening of time from diagnosis to starting treatment. It is important that there is increased testing for HIV in New Zealand as there is effective treatment that keeps people well and prevents HIV transmission.

Exploring health professionals' viewpoint of provision of nutrition advice for women with endometrial cancer

Linda Williams, Claire Henry, Bryony Simcock, Sara Filoche

Of the 20 most common cancers, endometrial cancer has the strongest association with high weight. Individuals who survive endometrial cancer are at high risk of experiencing morbidity and mortality from cardiovascular disease due to shared risk factors. This study explored access to nutrition advice as part of survivorship care through interviews with health professionals. How to navigate conversations about high weight, access to limited resourcing and health professionals feeling powerless to overcome system influences were all identified as barriers. A supportive enviroment and community approach were identified as facilitating delivery and uptake of nutrition advice.

A glimpse into the incidence and mortality of aortic dissection in Aotearoa New Zealand

Eric TA Lim, Adib Khanafer

Aortic dissection is a lethal medical diagnosis resulting in a tear in the main blood vessel coming out from the heart, known as the aorta. Currently published studies worldwide are showing that there is a trend towards a global rise in the incidence of aortic dissection. Unfortunately, there is no nationally available study performed here in Aotearoa New Zealand. Our study is the first to nationally map out the incidence and deaths from aortic dissection. Our results are concordant and show a similar rise in the incidence of aortic dissection and a gradual decline in death rates from aortic dissection in Aotearoa New Zealand.

Connectivity for point-of-care testing results: a call for change. A New Zealand national point-of-care testing advisory group (NZ POCT AG) position statement

Samarina MA Musaad, Vanessa Buchan, Geoff Herd, on behalf of the NZ POCT AG

Every New Zealander has the right to a good standard of healthcare, and has the right, if chosen, to have their results available to their healthcare providers. If this right is given to some and not others, this creates an unfair health service. Point-of-care tests are tests done outside of the laboratory near the patient, for example, RAT tests for COVID-19 done at a pharmacy, or urine pregnancy tests done at home. Connecting point-of-care test results means that the results automatically get transferred electronically to the patient's medical record. If the result of a point-of-care test does not get electronically transferred to the patient's medical record it means that the healthcare provider may not know the test was done, the healthcare provider will not be able to see the result and if the result is recorded incorrectly, the healthcare provider will have a wrong result for their patient. All these situations mean that the healthcare provider may not have the correct information to make correct decisions, and so the patient or whānau may not get the best possible healthcare. This article is written to remind decision makers of the avoidable risks to the patient when point-of-care testing results are not electronically transferred, and that electronically transferring these results is no less important than transferring results from a laboratory.

Continued mitigation needed to minimise the high health burden from COVID-19 in Aotearoa New Zealand

Michael G Baker, Amanda Kvalsvig, Michael J Plank, Jemma L Geoghegan, Teresa Wall, Collin Tukuitonga, Jennifer Summers, Julie Bennett, John Kerr, Nikki Turner, Sally Roberts, Kelvin Ward, Bryan Betty, Q Sue Huang, Nigel French, Nick Wilson

The next phase of the COVID-19 pandemic response should integrate control of this disease into a comprehensive respiratory infectious disease mitigation strategy that also covers influenza and other

serious respiratory infections. This combined approach would increase the effectiveness and efficiency of the response. This is the view of 16 leading New Zealand scientists and doctors who have worked actively on the pandemic response. They have written the most comprehensive summary of the pandemic published so far, covering the first three and half years. They note that the pandemic has not gone away and remains an important cause of illness, hospitalisation, long Covid and death (it is currently New Zealand's number one infectious disease killer ahead of influenza), so needs a continuing, strong, evidence-based response. The authors conclude that New Zealand delivered amongst the best pandemic responses in the world, keeping cumulative excess deaths close to zero, and saving an estimated 20,000 lives compared with the mortality rate seen in countries like the United States. Remarkably, it did this using restrictions that were amongst the lowest used by high-income countries (the average stringency of control measures in New Zealand was less than in Sweden, for example). They hope that future Governments will build on this world-leading response which offers a high degree of health protection for severe future pandemics.

Watch that bite: syncope versus seizure

Tony Zhang

This case portrays an exaggerated example of a relatively common clinical sign. A patient with repeated episodes of unexplained "blackouts" was referred for a second opinion on the aetiology. The major clinical clue on examination was the presence of lateral tongue biting, which is highly specific for "ruling in" seizures. The striking feature demonstrated in the image was the presence of accessory tongue tissue as a result of repeated tongue biting over the last few months.

A review of 19 years of anaphylaxis cross-reactivity data to muscle relaxants in New Zealand

Zyllan P Spilsbury, Han Truong

We report the rates of anaphylaxis cross-reactivity of neuromuscular blocking agents (NMBA) for patients who have undergone skin testing after a confirmed allergic event in clinical practice. In cases of NMBA anaphylaxis, the index NMBA alone cannot be used to predict alternative NMBAs for safe future use and referral to a specialist anaesthetic allergy centre remains advised.

The imperative to tax ultra-processed food if political parties are serious about improving mental health in future generations

Julia J Rucklidge, Roger T Mulder

There are good health reasons for making fruits and vegetables more affordable through removing GST. Fruit and vegetables are central to diets identified as being essential for optimising brain health, including protection from developing depression and anxiety as well as reducing the incidence of behavioural problems in children.[1] However, the focus on making fruit and vegetables more affordable overshadows a potentially more important contributor to poor mental health: excess consumption of ultra-processed foods (UPFs). UPFs are foods that are chemically processed, shelf stable, contain cosmetic additives as well as added sugars and salt, and consistently account for more than 50% of daily dietary energy.[2] Consumption of these foods not only leads to excessive sugar consumption, but also results in nutritional displacement from freshly prepared, minimally processed foods, while impeding the ingestion of nutrients identified as essential for optimising brain health, such as vitamins, minerals, omega-3 fatty acids and amino acids.[1]

Global research has consistently reported that UPFs lead to both poorer physical and mental health outcomes.[1] Of greatest concern is research showing that UPFs are contributing 45%, 42% and 51% of energy intakes to diets of infants and children at 12, 24 and 60 months in New Zealand.[3] Meanwhile, 2022 figures from Manatū Hauora – Ministry of Health show that only 4.3% of boys and 7.2% of girls (2–14 years) eat the recommended servings of vegetables and fruit each day. At the same time, we see a doubling of children being diagnosed with psychiatric problems over a decade. From 2012 to 2022, the number of children 2–14 years diagnosed with an emotional or behavioural problem rose from 4.4% to 8.6% in boys and 2.1% to 3.8% in girls. These percentages represent an increase from 26,000 children in 2012 to 53,000 children in 2022.

Given the impact of the early years of life on long-term health outcomes, the studies associating poor quality diet during pregnancy with poorer mental health outcomes in offspring are of particular concern. The Growing Up in New Zealand cohort revealed that only 3% of pregnant women in New Zealand fully adhere to the Manatū Hauora – Ministry of Health's food and nutrition guidelines in pregnancy, with 25% consuming the recommended daily number of servings of vegetables and fruit (≥6).[4] Maternal low adherence to a "healthy dietary pattern" in the third trimester is significantly associated with children's depression and anxiety symptom trajectories from 3 to 8 years (OR=1.87; 95% CI=1.40–2.51).[5] High consumption of a "Western diet" during pregnancy is associated with higher trajectories of hyperactivity and inattention from 3 to 8 years in offspring (OR=1.67; 95% CI=1.13–2.47).[6] Every additional serving of sugar-sweetened beverages (including diet sodas) consumed per day in pregnancy is associated with an average lowering of child IQ between 1.2–1.7 points in mid-childhood (3–7 years).[7]

Changing the diets of women during pregnancy, especially reducing consumption of UPFs, will have a substantial positive effect on the mental health of the next generation. At the time of writing, the only election promise that is aimed at improving long-term health for offspring is increasing paid parental leave, acknowledging that parental presence in early life is a significant contributor to better outcomes for children.[8] However, pregnancy is a more cost-effective time for a government to allocate its resources[9] and it is surprising that it has never been addressed. Nutritional inequity during pregnancy puts offspring at a neurological disadvantage from conception. Overseas initiatives have shown that ensuring mothers receive adequate nutrition during pregnancy, especially fish, leads to better mental health outcomes for her offspring.

As one example, the Special Supplemental Nutrition Program for Women, Infants, and Children (WIC) programmes in the USA provide state funding for supplemental food, healthcare referrals and nutritional education for low-income pregnant, breastfeeding and non-breastfeeding postpartum women for infants up to 5 years identified as nutritionally at risk. Children whose mothers participate in WIC while pregnant score higher on assessments of mental development and cognition at age 2 and later performed better on reading assessments while in school, had a lower incidence of ADHD and other common childhood mental health conditions, and had lower incidence of grade repetition compared to non-participating WIC siblings.[10] Providing some type of food subsidy during pregnancy, as well as education on what to eat, has the potential to offer greater returns than policies that focus on post-pregnancy only. Ka Ora, Ka Ako | Healthy School Lunches Programme represents a comparable type of strategy by introducing healthy lunches in low-decile schools; however, healthy food during pregnancy would have an even greater long-term effect on the health of our tamariki by reducing risk of mental health problems in the first place.

How do we fund such subsidies? Given the research is clear that UPFs are contributing to poor health outcomes, the true cost of food needs to be shared at the cash register. Taxpayers are compensating for the negative health consequences of cheap food through escalating health costs. When heavy taxes were introduced on cigarettes, along with smokefree environments and targeted education on health implications of smoking, consumption went down. Governments are well placed to consider implementing similar taxation strategies and marketing campaigns for UPFs, with evidence suggesting a minimum of 20% tax on sugar-sweetened beverages to have the greatest health impact.[11] Indeed, when other countries have implemented "junk food taxes" or "sugar taxes" there has been a decrease in consumption of those foods,[12] with greater effects observed for lower socio-economic status families.[13] Implementation of restrictions on outdoor UPF advertising led to 6.7% reduction in purchases of products high in energy, sugar and fat in the UK.[14]

If our politicians really want to get serious about the mental health crisis, they need to address our toxic food environment as a substantial contributor to poor wellbeing and adjust the fiscal levers to lower the cost of healthy foods relative to UPFs. Indeed, compared to other predictors of poor mental health in adolescents (like screen time, physical activity and bullying), poor eating (defined by skipping breakfast, eating less than five portions of fruit and vegetables a day, often eating take-aways) has been identified as a larger contributor to poor adolescent mental health.[15] Remarkably, there is no government-funded mental health information site that stresses the role of nutrition as providing the foundations for mental health.

What else could be done? Mandatory reporting of sales of UPFs in supermarkets as a proportion of all sales. Address direct UPF marketing to children, front of package warning labels and limit unhealthy food outlets in low socio-economic status neighbourhoods. There is now ample local research highlighting that young people living in health-constraining environments in New Zealand (e.g., more fast-food outlets) are more likely to experience poorer emotional and mental health.[16] Improving the food environment enables people to make healthier choices more easily and is vital for tackling the mental health crisis.

Successive governments have been silent about the role of our toxic food environment in our deteriorating mental health. A well-nourished brain leads to improved resilience.[1] Having a nourishing food environment is central to improving our wellbeing and that of the next generation's. All citizens should have equitable access to those factors that positively impact on good health across the lifespan.

COMPETING INTERESTS
Nil.

AUTHOR INFORMATION
Julia J Rucklidge: Professor of Clinical Psychology, School of Psychology, Speech and Hearing, University of Canterbury, Christchurch, New Zealand.
Roger T Mulder: Professor of Psychiatry, University of Otago, Christchurch, New Zealand.

CORRESPONDING AUTHOR
Julia J Rucklidge: Professor of Clinical Psychology, School of Psychology, Speech and Hearing, University of Canterbury, Christchurch, New Zealand.
E: julia.rucklidge@canterbury.ac.nz

REFERENCES

1. Rucklidge JJ, Johnstone JM, Kaplan BJ. Nutrition Provides the Essential Foundation for Optimizing Mental Health. EPCAMH. 2021;6:131-154. doi: 10.1080/23794925.2021.1875342.
2. Adams J, Hofman K, Moubarac JC, Thow AM. Public health response to ultra-processed food and drinks. BMJ. 2020 Jun;369:m2391. doi: 10.1136/bmj.m2391.
3. Fangupo LJ, Haszard JJ, Taylor BJ, et al. Ultra-Processed Food Intake and Associations With Demographic Factors in Young New Zealand Children. J Acad Nutr Diet. 2021 Feb;121(2):305-313. doi: 10.1016/j.jand.2020.08.088.
4. Morton SM, Grant CC, Wall CR, et al. Adherence to nutritional guidelines in pregnancy: evidence from the Growing Up in New Zealand birth cohort study. Public Health Nutr. 2014 Sep;17(9):1919-29. doi: 10.1017/s1368980014000482.
5. Collet OA, Heude B, Forhan A, et al. Prenatal Diet and Children's Trajectories of Anxiety and Depression Symptoms from 3 to 8 Years: The EDEN Mother-Child Cohort. J Nutr. 2021 Jan;151(1):162-169. doi: 10.1093/jn/nxaa343.
6. Galera C, Heude B, Forhan A, et al. Prenatal diet and children's trajectories of hyperactivity-inattention and conduct problems from 3 to 8 years: the EDEN mother-child cohort. J Child Psychol Psychiatry. 2018 Sep;59(9):1003-11. doi: 10.1111/jcpp.12898.
7. Cohen JFW, Rifas-Shiman SL, Young J, Oken E. Associations of Prenatal and Child Sugar Intake With Child Cognition. Am J Prev Med. 2018 Jun;54(6):727-735. doi: 10.1016/j.amepre.2018.02.020.
8. Khan MS. Paid family leave and children health outcomes in OECD countries. Child Youth Serv Rev. 2020 Sep;116:105259. doi: 10.1016/j.childyouth.2020.105259.
9. Doyle O, Harmon CP, Heckman JJ, Tremblay RE. Investing in early human development: timing and economic efficiency. Econ Hum Biol. 2009 Mar;7(1):1-6. doi: 10.1016/j.ehb.2009.01.002.
10. Caulfield LE, Bennett WL, Gross SM, et al. Maternal and Child Outcomes Associated With the Special Supplemental Nutrition Program for Women, Infants, and Children (WIC) [Internet]. Rockville (MD): Agency for Healthcare Research and Quality (US); 2022 Apr. Report No.: 22-EHC019.
11. Blakely T, Cleghorn C, Mizdrak A, et al. The effect of food taxes and subsidies on population health and health costs: a modelling study. Lancet Public Health. 2020 Jul;5(7):e404-e413. doi: 10.1016/s2468-2667(20)30116-x.
12. Hernández FM, Batis C, Rivera JA, Colchero MA. Reduction in purchases of energy-dense nutrient-poor foods in Mexico associated with the introduction of a tax in 2014. Prev Med. 2019 Jan;118:16-22. doi: 10.1016/j.ypmed.2018.09.019.
13. Bíró A. Did the junk food tax make the Hungarians eat healthier? Food Policy. 2015 Jul;54:107-115. doi: 10.1016/j.foodpol.2015.05.003.
14. Yau A, Berger N, Law C, et al. Changes in household food and drink purchases following restrictions on the advertisement of high fat, salt, and sugar products across the Transport for London network: A controlled interrupted time series analysis. PLoS Med. 2022 Feb;19(2):e1003915. doi: 10.1371/journal.pmed.1003915.
15. Gireesh A, Das S, Viner RM. Impact of health behaviours and deprivation on well-being in a national sample of English young people. BMJ Paediatr Open. 2018 Nov;2(1):e000335. doi: 10.1136/bmjpo-2018-000335.
16. Hobbs M, Bowde N, Marek L, et al. The environment a young person grows up in is associated with their mental health: A nationwide geospatial study using the integrated data infrastructure, New Zealand. Soc Sci Med. 2023 Jun;326:115893. doi: 10.1016/j.socscimed.2023.115893.

Goals of care in the Wellington Emergency Department: a clinical audit

Jesse Cain, Brad Peckler, Sinéad Donnelly

ABSTRACT

AIMS: To determine how often goals of care (GOC) are being discussed with older patients in the emergency department (ED).
METHODS: This clinical audit included 300 presentations of patients aged 80 years and over in the Wellington ED. The timeframe was from 1 July to 17 July 2021. Electronic records were interrogated for GOC discussions.
RESULTS: Most older patients (62%) did not have a GOC discussion in the ED. Of patients over the age of 80 who had a GOC discussion in the emergency department, only 14% of those discussions were initiated by ED clinicians.
CONCLUSIONS: There are no current standards for GOC within the ED and this should be established for further research. Protocols and education regarding facilitating GOC discussions in the ED could be established to improve the frequency of GOC discussions.

New Zealand has an ageing population, where older people are living longer with more medical comorbidities.[1,2] Many older people present to the emergency department (ED) and these presentations can be a sign of deterioration in overall health.[3]

In older persons, curative or otherwise aggressive treatment may not be appropriate as it can significantly reduce quality of life.[4] Recent evidence shows that most older people near end of life do not want life-prolonging measures.[5] Despite this, patients nearing death can receive more aggressive treatment in the ED.[6] Decision making regarding the appropriate treatment options for older people can be informed by shared goals of care (GOC) discussions.

Shared GOC discussions are where clinicians and patients discuss their health, treatment options and patient values. Together, clinicians and patients establish an agreed treatment plan for the current presentation and explore treatment options if they are to deteriorate.[7] The overall aim of this discussion is to ensure the treatment received is medically, ethically and personally appropriate for the individual. Shared GOC discussions improve patient satisfaction, and result in reduced hospitalisation, aggressive interventions and cost to the health system.[8]

Evidence regarding GOC in the ED is limited, and further research is needed in this area.[9] However, GOC discussions could have an important role in the ED. Boarding and access block is a well-documented problem, thus, patients can spend prolonged periods in the ED, including in waiting rooms, corridors and in ramped ambulances.[10] Older patients can deteriorate at any time in the busy department and a GOC discussion could prevent the responding team providing inappropriate care that could cause harm.

Standards

In New Zealand, the Health Quality & Safety Commission publishes the Shared Goals of Care Form to aid GOC discussions. This has been used for several years at Wellington Hospital. This document has treatment goals A, B, C and D (view Appendix) to guide management. GOC A and B aim to prolong life through curative or restorative treatment. These patients would receive consideration of intensive care and medical emergency team (MET) calls. However, patients with GOC A would receive cardiopulmonary resuscitation whereas those in GOC B would not. GOC C aims to improve quality of life by managing symptoms. In these patients, CPR and intensive care are not appropriate; however, they would still be for MET calls. The GOC D treatment goal is comfort while dying where CPR, ICU treatment and MET calls are no longer appropriate.

At Te Whatu Ora Capital and Coast, the shared GOC policy states that all patients (excluding maternity and paediatric patients) must have GOC documented within 24 hours of admission. These are only valid for a single admission and require re-discussion and documentation on subsequent admissions. GOC can change throughout admission depending on the patient condition, and the adjustments need to be documented accordingly.

This policy does not provide specific guidance to the ED setting and there are no clear standards for how often GOC should be discussed within the ED.

This clinical audit determines how often we are discussing GOC with older people in the Wellington ED.

Methods

Data were collected retrospectively and included all presentations of patients over 80 years of age to the Wellington ED. There were no exclusion criteria. We did not exclude patients who re-presented within the same time frame or self-discharged as the aim is to assess whether GOC were being discussed at each presentation.

Te Whatu Ora Capital and Coast uses two electronic health records, Medical App Portal (MAP) for most secondary and tertiary services within the region, and Emergency Department Information System (EDIS) for use within the ED, which automatically uploads notes to MAP once finalised.

The dataset included the first 300 presentations of all eligible patients from July 1 2021. The time frame of these presentations was between 1 July and 17 July. National Health Index numbers (NHIs) for these presentations were retrieved from EDIS. Records on MAP were then interrogated for eligible patients to assess documentation of GOC discussions for their current presentation. Key words such as "GOC", "goals of care", "NFR" or "CPR" were searched, as well as a manual search through the emergency and admitting service electronic notes for a GOC discussion. During the manual search we also identified other phrases that indicated a GOC discussion had taken place such as palliation/palliative cares, comfort-based cares and non-invasive or aggressive treatment.

We collected data regarding ethnicity, gender, agreed GOC treatment option, which service discussed GOC, residential care status, level of function (independence with walking and personal cares), if time was spent time in the corridor and the outcome of the presentation (admission, mortality within 18 months).

We also recorded if patients had more than one major comorbidity, which we defined as: ischemic heart disease (previous myocardial infarction or angina), atrial fibrillation, significant valvular disease, heart failure, cerebrovascular disease (previous transient ischemic accident or stroke), peripheral vascular disease, diabetes, renal failure, chronic obstructive pulmonary disease and active cancer.

If information regarding past medical or functional history was not available for the current admission, information was gathered from other electronic notes including recent clinic letters, admissions or from the patient's online primary care profile.

Results

Demographics

Three hundred presentations of patients over 80 years of age to the Wellington ED were included. The time frame was between 1 July to 17 July 2021. Fifty-seven percent of the patients were female and 43% were male. The majority of the patients had more than one major comorbidity at 87%, over half were not independent with mobility or personal cares at 53%, and a smaller proportion were from a rest home at 11%. The majority of the patients presenting were admitted at 64% and of those admitted most were admitted to a medical specialty at 80%. Almost half (48%) of the patients spent time in the corridor (Table 1).

The majority of these patients were New Zealand European at 83%, whereas Māori made up a small proportion at 2%. A smaller proportion were Asian and Pasifika at 7% and 8% respectively (Table 2).

Goals of care discussions

Of the audited sample of 300 patients over the age of 80, 115 (38%) had GOC discussed and 185 (62%) did not have goals discussed (Figure 1).

Of those discussed, 16 (14%) were discussed by emergency doctors and 99 (86%) were discussed by the referred service.

A higher proportion of those who had GOC discussed were admitted (93%) compared those who did not (46%). Those with GOC discussed also had higher percentages of comorbidities, dependence with personal cares and died within 18 months compared to those who did not.

Ethnicity

Less than half of patients had GOC discussed in each ethnic group except for Māori, of whom 67% had GOC discussed. Pasifika and Asian had the lowest percentage discussed and were similar at 28% and 25% respectively. For New Zealand European, the percentage was higher than Pasifika and Asian at 40% (Figure 1).

Comparison of different levels of care

A high proportion of patients were admitted in those who had GOC assigned as A, B and C at

Table 1: Demographics of older persons aged 80 years and over presenting to the emergency department.

Demographics of presentations	
Gender	129 (43%) males 171 (57%) females
Comorbid	260 (87%)
Rest home	33 (11%)
Dependent	160 (53%)
Outcome	191 (64%) admitted to a speciality 152 (51%) admitted to medical specialities 38 (13%) admitted to surgical specialities 10 (34%) discharged 7 (2%) self-discharged
Corridor	145 (48%)
Died within 18 months	52 (16%)

Table 2: Percentage of older persons aged 80 years and over presenting to the emergency department by ethnicity.

Presentations by ethnicity	
New Zealand European	249 (83%)
Asian	20 (7%)
Pasifika	25 (8%)
Māori	6 (2%)

100%, 89% and 100% respectively. However, only 50% of those with GOC D were admitted.

Those with GOC A had fewer comorbidities at 29% compared to those at other levels of care. Those with GOC B and D had greater proportions of comorbidities at 96% and 100% respectively. Those with GOC C had a more moderate proportion at 61%.

No patients with GOC A were dependent with personal cares. Those at GOC B, C and D had increasingly higher proportions of people dependent with personal cares at 28%, 66% and 83% respectively.

One hundred percent of patients with GOC D died within 18 months, whereas patients with GOC C and B had lower mortality rates at 44% and 42% respectively. Patients with GOC A had a much lower mortality rate at 29%.

Of patients who had GOC discussed, half had GOC B and 38% had GOC C. A small proportion were GOC A at 6% and 5% were GOC D.

Four percent of patients had a GOC discussion documented but did not have a level of care assigned. Similar to the patients with GOC D, this group had a greater proportion of comorbidities at 86% and death within 18 months at 86%. Fifty-seven percent of these patients were admitted. (Table 3.)

Patients who re-presented

Six patients re-presented between 1 July and 17 July 2021. Five of these patients presented twice and one presented three times. Three patients who re-presented did not have GOC discussed at

Figure 1: Percentage of older persons aged 80 years and above who had goals of care discussed in the emergency department by ethnicity.

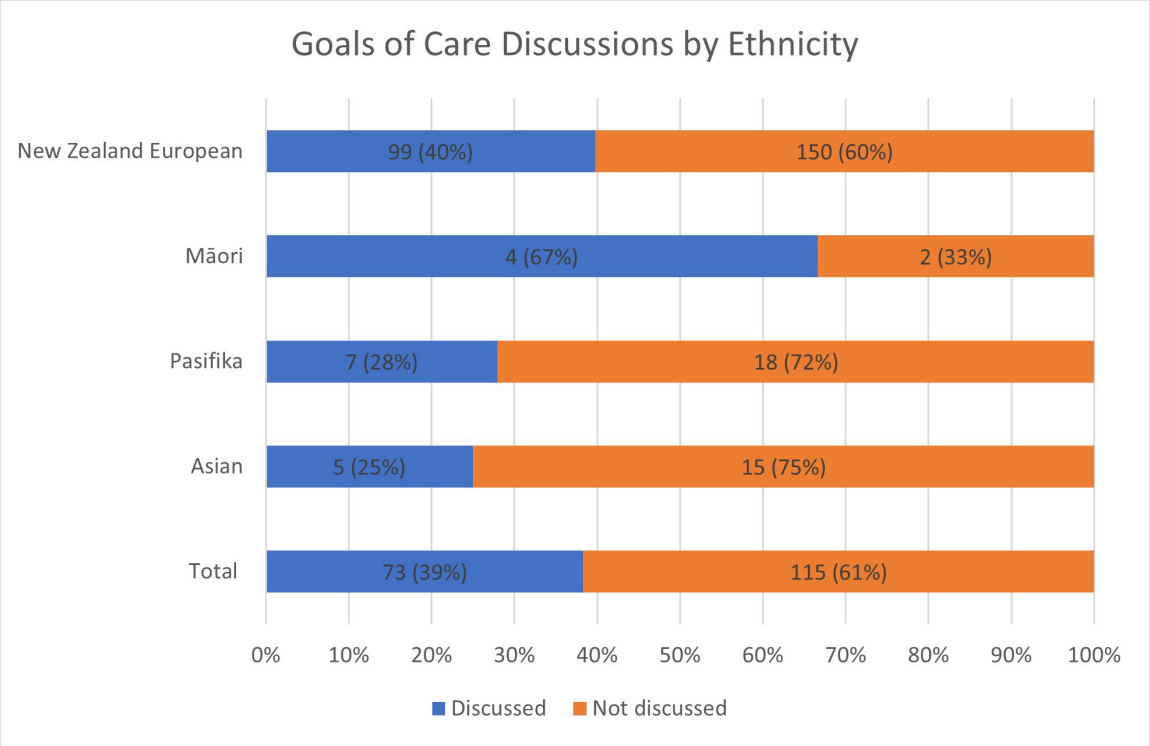


Table 3: Percentage of older persons aged 80 years and above who had goals of care discussed and not discussed by demographics and by level of care.

Comparison of patients with and without goals of care discussions							
Goals of care discussed							**Goals of care not discussed**
	GOC A 7 (6%)	GOC B 57 (50%)	GOC C 38 (33%)	GOC D 6 (5%)	No level 7 (4%)	Total 115 (38%)	185 (62%)
Comorbid	2 (29%)	55 (96%)	23 (61%)	6 (100%)	6 (86%)	109 (95%)	151 (82%)
Dependent with personal cares	0%	16 (28%)	25 (66%)	5 (83%)	4 (57%)	49 (43%)	49 (26%)
Admit	100%	54 (95%)	38 (100%)	3 (50%)	4 (57%)	107 (93%)	85(46%)
Died within 18 months	2 (29%)	24 (42%)	17 (45%)	6 (100%)	6 (86%)	65 (56%)	36(19%)

any encounter and three did. Of those who had GOC discussed, two had GOC discussed on the first encounter and one had GOC discussed on their third encounter. These discussions were carried out by the admitting services.

Discussion

This clinical audit included 300 presentations of patients over 80 years old to the Wellington ED. The time frame was between 1 July and 17 July 2021. GOC were discussed in less than half (38%) of these presentations. Two other recent studies showed similar results. However, these studies involved patients with serious illness and those being transferred to a different facility.[11,12]

Most patients did not have GOC discussions initiated by emergency services but by medical services. This may be driven by the well-established shared GOC protocol and awareness around GOC within the medical specialties. Emergency physicians may be less inclined to initiate GOC before referral due to the busy environment of the ED and due to an expectation that the admitting team should discuss the GOC during the admission process.[13]

Most patients with GOC discussed were admitted. Patients who had GOC discussed had more comorbidities, greater dependence for personal cares and higher rates of death within 18 months. Most of these patients were also made GOC B or below, where cardiac resuscitation and intensive care is not indicated. This may be due to doctors being more inclined to discuss GOC in patients they identify as medically frail and who may deteriorate through an admission. Patients made GOC B or below are likely to be in advanced stages of illness or nearing end of life. The possibility of them passing away sooner is likely to be higher, irrespective of if they get invasive or comfort treatments.

Half of those with GOC D were discharged. These patients may be more likely to have a known terminal illness where the option of palliation through hospice or a care facility may be available and more appropriate than admission.

Ethnicity

There were fewer presentations of Māori over the age of 80 to the ED, at 2% compared to New Zealand European at 83%. This could be due Māori having a lower life expectancy compared to non-Māori and therefore having a younger population with proportionally fewer old people.[14] Discussing GOC in Māori less than 80 years of age may be considered. Most Māori had GOC discussed. Given the small sample size, this result is difficult to interpret as it is likely heavily impacted by chance. However, it is possible that this result could be due to clinicians being more likely to discuss GOC with Māori due to the known inequalities of health in this group.

Barriers to discussing goals of care

These findings may be due to the multiple barriers to facilitating GOC discussions in the ED.

GOC discussions are challenging within the environment of the ED, with the current issues of access block, ramped ambulances and delays in admissions. This creates a busy environment where some clinicians may feel these discussions are not appropriate due to lack of privacy in a corridor, time constraints and prioritisation of time towards more critically ill patients.[13,15]

Emergency physicians have limited information about a patient's health when they are assessed, which can make it difficult to decide if a patient is a candidate for aggressive treatment or not. Advanced directives can help in this decision making; however, these may not be accessible, are out of date or inappropriate. This further adds to the challenge of discussing GOC in the emergency setting where clinicians may feel this may be better done when more information is available and when family are present for these discussions.

Another barrier to initiating GOC in the ED is when there is disagreement between the emergency clinician and the admitting team on the appropriate GOC, which can lead to emergency clinicians not finalising GOC.

Patients may have had GOC previously discussed and clinicians may not feel it is appropriate to rediscuss this with the patient if they feel treatment goals have not changed.

Some patients may not have capacity due to altered cognition from delirium or due to their underlying pathology relating to the current presentation. This could make a shared GOC discussion inappropriate at the time of presentation.

Other barriers to having these discussions can be due to lack of prognostic tools, uncertainty around the trajectory of the patient's condition and lack of therapeutic relationship with the patient.[13,15]

Limitations

A limitation of this audit is that we only accessed electronic documentation of GOC. GOC discussions can be documented in multiple formats, either electronically on the admission or discharge note or directly written on the paper Shared Goals of

Care Form. It is possible that GOC could have been documented in the Shared Goals of Care Form and not put in the electronic admission note. This may lead to underestimation of GOC discussions in the ED. However, the Shared Goals of Care Form is unable to be uploaded electronically, so it is expected that GOC discussion is documented electronically in the ED. There are otherwise no written notes within the ED, and all notes written on discharge summaries and admission notes are entirely electronic where GOC should be documented.

This population was small and predominantly New Zealand European, with small numbers in non-European subgroups. This could make these results influenced by chance and difficult to interpret.

Recommendations

Given the ageing population, GOC discussions for older patients are likely to be a recurrent theme clinically in the ED. GOC needs to be discussed and documented to prevent unnecessary aggressive treatment that could do more harm. Currently, GOC forms are not available electronically. Shared GOC paper forms should be uploaded to electronic health records or these discussions should be recorded electronically in a standard and easily accessible format.

GOC discussions can be ethically and medically complex. These discussions would ideally be done in primary care where the patient is well, there is an ongoing therapeutic relationship and there is adequate time and privacy. Advanced care forms in primary care should be uploaded electronically to the hospital system to ensure accessibility and aid in GOC decision making.

There are no current standards on the frequency of GOC discussion within the ED. The prevalence of these GOC discussions could be improved with the establishment of protocols and further education.

Given the small sample of Māori and Pasifika, a future audit examining shared GOC discussions in these groups should be done in a younger age group or within a region with a higher population of Māori and Pasifika.

Conclusion

Most patients (62%) over the age of 80 presenting to the Wellington ED did not have GOC discussed. Of the patients who had a GOC discussion in the ED, few of these discussions (14%) were initiated by emergency medicine clinicians. Protocols and education regarding facilitating GOC discussions in the ED could be established to improve the frequency of GOC discussions.

CONFLICTS OF INTEREST
No conflicts of interest declared.

AUTHOR INFORMATION
Dr Jesse Cain, MBChB: Emergency Medicine Senior House Officer, Te Whatu Ora – Health New Zealand.
Dr Brad Peckler, MD, FACEP, FACEM: Emergency Medicine Specialist, Te Whatu Ora – Health New Zealand.
Dr Sinéad Donnelly, MD, FRCPI, FRACP, FAChPM: Consultant Internal Medicine, Te Whatu Ora – Health New Zealand; Associate Professor and Module Convenor Palliative Medicine, Otago School of Medicine, Wellington, New Zealand.

CORRESPONDING AUTHOR
Dr Jesse Cain, MBChB: Emergency Medicine Senior House Officer, Te Whatu Ora Health – New Zealand.
E: jesseacain19@gmail.com

REFERENCES
1. Stats NZ. One million people aged 65+ by 2028 [Internet]. Wellington: Stats NZ; 2022 Jul 27 [cited 2023 Jan 13]. Availiable from: https://www.stats.govt.nz/news/one-million-people-aged-65-by-2028/#:~:text=The%20number%20of%20people%20aged,over%20the%20next%2050%20years.
2. Divo MJ, Martinez CH, Mannino DM. Ageing and the epidemiology of multimorbidity. Eur Respir J. 2014;44(4): 1055-1068. doi: 10.1183/09031936.00059814.
3. Ukkonen M, Jämsen E, Zeitlin R, Pauniaho SL. Emergency department visits in older patients: a population-based survey. BMC Emerg Med. 2019 Feb 27;19(1):20. doi: 10.1186/s12873-019-0236-3.
4. Wright AA, Zhang B, Ray A, et al. Associations between end-of-life discussions, patient mental health, medical care near death, and caregiver bereavement adjustment. JAMA. 2008 Oct 8;300(14):1665-1673. doi: 10.1001/jama.300.14.1665.
5. Heyland DK, Barwich D, Pichora D, et al. Failure to engage hospitalized elderly patients and their families in advance care planning. JAMA Intern Med. 2013 May 13;173(9):778-787. doi: 10.1001/jamainternmed.2013.180.
6. Kim JS, Lee SY, Lee MS, et al. Agressiveness of care in the last days of life in the emerengcy department of a tertiary hospital in Korea. BMC Palliat Care. 2022 June 7;21(1)105. doi: 10.1186/s12904-022-00988-3.
7. Health Quality & Safety Commission New Zealand. Shared goals of care principles for health service providers [Internet]. Health Quality & Safety Commission New Zealand; 2020 Dec [cited 2023 Sept 16]. Available from: https://www.hqsc.govt.nz/assets/Our-work/Improved-service-delivery/Patient-deterioration/Publications-resources/Shared-Goals-of-Care-principles.pdf.
8. Bernacki RE, Block SD; American College of Physicians High Value Care Task Force. Communication about serious illness care goals: a review and synthesis of best practices. JAMA Intern Med. 2014 Dec;174(12):1994-2003. doi: 10.1001/jamainternmed.2014.5271.
9. Hanning J, Walker KJ, Horrigan D, et al. Review article: Goals-of-care discussions for adult patients nearing end of life in emergency departments: A systematic review. Emerg Med Australas. 2019 Aug;31(4):525-532. doi: 10.1111/1742-6723.13303.
10. Dinh MM, Bein KJ, Latt M, et al. Age before acuity: the drivers of demand for emergency department services in the Greater Sydney Area. Emerg Med J. 2015 Sep;32(9):708-711. doi: 10.1136/emermed-2014-204174.
11. Ouchi K, George N, Schuur JD, et al. Goals-of-Care Conversations for Older Adults With Serious Illness in the Emergency Department: Challenges and Opportunities. Ann Emerg Med. 2019 Aug;74(2):276-284. doi: 10.1016/j.annemergmed.2019.01.003.
12. Chowdary M, Voydik J, Atchinson P. When Time Is Short: Making the Case for Emergency Department Goals of Care Discussions Prior to Transfer. Ann Emerg Med. 2022 Aug;80(4):101.
13. Zannella V, Vaillancourt S. Perceived barriers to goals of care discussions in the emergency department: a multi-center analysis of hospitalist physicians. UTMJ. 2022 Jul 9;99(3):46-32.
14. Stats NZ. Growth in life expectancy slows [Internet]. Wellington: Stats NZ; 2021 Apr 20 [cited 2023 Jan 23]. Availiable from: https://www.stats.govt.nz/news/growth-in-life-expectancy-slows/.
15. Argintaru N, Quinn KL, Chartier LB, et al. Perceived barriers and facilitators to goals of care discussions in the emergency department: A descriptive analysis of the views of emergency medicine physicians and residents. CJEM. 2019 Mar;21(2):211-218. doi: 10.1017/cem.2018.371.

Appendix

Shared goals of care plan

Family Name: _____

Given Name: _____ Gender: _____

AFFIX PATIENT LABEL HERE

Date of Birth: _____ NHI#: _____

Discuss the goal of care for this admission with the person, family, whānau or other (as appropriate). Select the agreed goal of care and document your discussion.

Attempt CPR

A The goal of care is **curative** or **restorative.**

☐ Treatment aims to prolong life.

Attempt CPR: it is clinically recommended and in accordance with the person's known wishes.

Also for referral for ICU level care, MET calls and all appropriate life sustaining treatments.

Additional comments: _____

Do not attempt CPR

B The goal of care is **curative** or **restorative.**

☐ Treatment aims to prolong life and enhance its quality.

Do not attempt CPR: this is likely to cause more harm than benefit or is not desired by the person.

Referral for ICU level care is appropriate ☐ Yes ☐ No

MET calls are appropriate.

Additional comments (e.g. non-invasive ventilation, dialysis): _____

C The goal of care is primarily **improving quality of life.**

☐ Treatment aims to control symptoms, enhance wellbeing and should be easily tolerated.

Do not attempt CPR: this is likely to cause more harm than benefit.

Referral for ICU level care is unlikely to be appropriate.

MET calls are appropriate ☐ Yes ☐ No

Additional comments (e.g. antibiotics, IV fluids, NG feeding): _____

D The goal of care is **comfort whilst dying.**

☐ Treatment aims to alleviate suffering in the last hours or days of life and allow a natural death.

Consider end of life guidelines such as *Te Ara Whakapiri.*

Do not attempt CPR. Referral for ICU level care and MET calls are not appropriate.

Additional comments (e.g. pain management, fluids): _____

This plan has been discussed with the person. If not, record reason overleaf.

Name: _____ Date: / / Time: _____

Designation: _____ Signature: _____

☐ SMO informed, name: _____

This plan is not valid unless signed and dated. Clinically review the person if there are concerns or a change in their condition. Any change to the goal of care requires a new plan and the earlier plan crossed out. Include shared goals of care information in the discharge summary.

Side 1 of 2

HQSC SGOC form v18 Sep 2020

SHARED GOALS OF CARE FORM

Shared goals of care plan

Use this side first to guide the discussion and record key points.

Family Name: _____

Given Name: _____ Gender: _____

AFFIX PATIENT LABEL HERE

Date of Birth: _____ NHI#: _____

Prepare

Consider the person's capacity, their privacy, support people, cultural needs and medical trajectory.

Do they have an:

- Advance Care Plan and/or Advance Directive? ☐Yes ☐No ☐Unknown
- Enduring Power of Attorney (EPA) or legally appointed guardian? ☐Yes ☐No ☐Unknown

If yes, circle either EPA or legal guardian and record their full name:

_____

Seek agreement with the person to have the discussion, with the people they want present.

Full name(s), relationship(s) and role(s) of those present: _____

_____

_____

Discuss

Ask about their understanding of their current condition and what may lie ahead.

Ask how much information they would want to know.

Share your understanding of their current condition and what may lie ahead.

Explore their values and what is important — their priorities, hopes, worries, what helps in tough times and what they would be willing to go through for more time.

_____

_____

_____

_____

_____

_____

_____

Summarise and check for shared understanding.

Recommend and close

Explain your recommendation in plain language, outlining which treatments are more likely to cause benefit than harm.

Reach a decision and document the goal of care overleaf.

Additional comments: _____

_____

_____

_____

_____

☐ Further information in clinical record.

If discussion not held with person, record reason below: _____

_____

_____

_____

_____

Document follow-up plan in the clinical record.

Side 2 of 2

HQSC SGOC form v18 Sep 2020

Head and neck continued: a retrospective analysis of neck dissections from a New Zealand oral and maxillofacial surgery unit

Ellen OY Simpson, Alastair Luo, Jamie Mckenzie, Monish M Maharaj, Thasvir Singh

ABSTRACT

AIMS: The aim of this study is to analyse the demographics, diagnosis, nodal yield, metastatic rates and outcomes of patients undergoing neck dissections within the Waikato Hospital Oral and Maxillofacial Surgery (OMS) Department.

METHODS: All patients that underwent neck dissections under the care of OMS at Waikato Hospital between January 2016 and December 2021 were included. Data on patient demographics, diagnosis, surgery details, nodal yields, histological results and clinical outcome were collected retrospectively for analysis.

RESULTS: One hundred and five patients and 123 neck dissections were included in the final analysis. The median age was 65 years of age. The average nodal yield from a selective neck dissection of levels I–III was 20.1 and I–IV was 25.4. There was no metastatic nodal disease in level IIb, and only 2 neck dissections with nodal disease in level IV. Complications were mostly associated with free flap reconstruction rather than the neck dissection alone.

CONCLUSIONS: The demographics and outcomes of the study cohort are consistent with both the current population and previously published head and neck data. The OMS unit at Waikato Hospital recommends omission of levels IIb and IV in neck dissections for cN0 cases if deemed oncologically safe to do so.

Cancers of the head and neck are among the most common cancers worldwide, totalling in excess of 900,000 cases annually.[1] Squamous cell carcinoma (SCC) is responsible for 90% of all head and neck cancers, while oral squamous cell carcinoma (OSCC) accounts for 40% of all head and neck cancers.[2]

OSCC most commonly metastasises to cervical lymph nodes.[3] A neck dissection is used in the management of OSCC to gain regional control of the disease, allow for pathological staging and direct adjuvant treatment.[4] An access neck dissection (AND) enables access to vessels for free flap microvascular anastomosis and reconstruction without necessarily removing any lymph nodes for disease control or pathological examination.

Cervical lymph node metastases is one of the most significant independent prognostic factors for head and neck cancer, reducing overall survival by up to 50% when present.[5] Clinically node-negative necks (cN0) on histopathologic examination of the cervical lymph nodes ultimately have occult metastatic disease in approximately 20% of cases.[6] In 1990, Shah et al. found that neck levels I, II and III are at highest risk of metastasis from oral cavity cancers.[3] These findings have been reinforced in subsequent literature.[7–9]

The Oral and Maxillofacial Surgery (OMS) department at Waikato Hospital is the only OMS unit within Aotearoa New Zealand to independently ablate oral cavity malignancies, conduct neck dissections and to reconstruct the oral cavity defects using microvascular free flaps. Published research relating to neck dissections from OMS units in Australia and New Zealand is scarce.[10] The purpose of this study was to analyse the demographics, outcomes and nodal yield of patients who underwent neck dissections in the OMS department at Waikato Hospital. This would also facilitate the development of a prospective head and neck database, to ensure clinical governance of the OMS unit and to assess patient complications. With a foundation formed for future research in this area, appropriate patient management recommendations can be made.

Methods

Research consent was obtained from the Waikato District Health Board (now Te Whatu Ora

Waikato). Individual patient consent was obtained at the time of initial surgery to be included in future teachings and research. All patients that underwent a neck dissection under the OMS unit at Waikato Hospital between January 2016 to December 2021 were included for analysis. Patients were primarily identified through a search of Waikato Hospital's Inpatient Management data system and Head and Neck oncology meeting agendas. An example of words entered in the search were "neck* dissection", "wide* local* excision" and "free* flap* reconstruction". There were a total of 105 patients identified through this combined method of database searching and cross-checking. A unilateral neck dissection was counted as one neck dissection and a bilateral neck dissection counted as two for ease of averaging nodal yield. A total of 123 neck dissections were performed. Patients who underwent AND for free flap reconstruction were included to assess complications and for the purpose of creating an ongoing departmental oncology database. However, they were omitted from the statistics of nodal yield.

A database was created using Microsoft Excel 2021 (Microsoft, Redmond, WA, USA) that incorporated data points similar to those used in other head and neck research databases.[10] Patient data were collected retrospectively through electric and hard-copy notes.

Examples of the data points collected included patient demographics detailing gender, ethnicity, age and smoking and alcohol history. Diagnosis data collated histological diagnosis, tumour location and clinical TNM staging. Surgery details included the type of neck dissection (Selective Neck Dissection, Modified Radical Neck Dissection [MRND] and AND), the use of intraoperative frozen specimens, intraoperative findings (e.g., nerve sacrifice), use of tracheostomy and reconstruction modality. The total number of nodes collected per neck per level Ia, Ib, IIa, IIb, III, IV and V were recorded, in addition to the region and number of positive metastatic nodes. Information regarding lymphovascular invasion, perineural invasion, extracapsular spread and primary tumour depth of invasion were also collected. Post-operative complications and any incidence of post-operative shoulder dysfunction were both assessed with all three types of neck dissections. The Clavien–Dindo classification was used to classify complications during the post-operative inpatient stay.[11]

Data collection was completed by two independent researchers, with cross-checking of every fifth patient to ensure consistent and accurate data collection. Univariate statistical analysis was performed with Microsoft Excel. Multivariate statistical analysis was completed with SPSS statistical package (Version 26.0, IBM, Somers, NY, USA). Pearson's Chi-squared tests were used for disease characteristics. A p-value of <0.05 was taken to be statistically significant.

The demographics, diagnosis and primary site statistics were calculated by number of patients (n=105). The relationship between nodal disease and the important variables of differentiation of tumour, location of tumour and TNM staging was measured using only patients that underwent a SND/MRND for OSCC (n=84). The nodal yield for each level of the neck dissection, and percentage of these with positive nodes was calculated. The average total nodal yield was calculated based on a level I–III and I–IV neck dissection for OSCC.

Results

There were 123 neck dissections performed on 105 individual patients from 2016–2021. There were a total of 111 SNDs, 1 MRNDs (with internal jugular vein sacrifice) and 11 ANDs. Eighty-four patients had a unilateral or bilateral neck dissection for OSCC.

Demographic data are reported for the total number of individual patients (n=105). Data on demographics is shown in Table 1.

Squamous cell carcinoma was the most common diagnosis and indication for having a neck dissection at 85%, followed by ameloblastoma at 2% and osteoradionecrosis at 2%. Data on diagnosis is found in Table 2. The most common primary site was the tongue, at 36% of patients, followed by alveolar mucosa of the mandible at 20%. There was one unknown primary. Information on primary site is found in Table 3.

When analysing the relationship between TNM staging and nodal disease, 84 patients who had a SND or MRND for OSCC were included. Seventeen percent of patients had occult nodal disease. Table 4 demonstrates the number of both clinical and pathological T1–T4 and N0–N3 tumours.

Forty percent (40%) of cT4 tumours had at least one positive metastatic node, followed by 29% with cT3, 38% with cT2 and 6.7% with cT1 tumours (p=0.1). The percentage of nodal metastatic disease was 40%, 30% and 6% in poorly, moderately and well differentiated tumours, respectively (p=0.04). This was the only statistically significant finding. Tumours of the

Table 1: Demographics of the 105 patients included in the study.

Demographic	Number (n)	Percentage (%)
Sex		
Male	54	49
Female	51	51
Age		
Min	25	
Max	91	
Average	65	
Median	65	
Ethnicity		
NZ European	77	73
Māori	19	18
Asian	4	4
Other European	2	2
Cook Island	1	1
Indian	1	1
Latin American	1	1
Smoking		
Never	45	43
Ex	43	41
Current	17	16
Alcohol		
Never	35	33
Ex	9	9
Current	61	58

Table 2: Diagnosis of the 105 patients included in the study.

Diagnosis	Number (n)	Percentage (%)
Squamous cell carcinoma	89	85
Ameloblastoma	3	3
Osteoradionecrosis	2	2
Osteomyelitis	2	2
Sarcoma	1	1
Small cell neuroendocrine tumour	1	1
Oncocytoma	1	1
Mucoepidermoid carcinoma	1	1
Metastatic adenocarcinoma	1	1
Melanoma	1	1
Brachial cleft cyst	1	1
Adenoid cystic carcinoma	1	1
Adenocarcinoma	1	1

Table 3: Primary site of the 105 patients included in the study.

Primary site	Number (n)	Percentage (%)
Tongue	38	36
Alveolar mucosa of mandible	21	20
Alveolar mucosa of maxilla	14	13
Buccal mucosa	11	11
Floor of mouth	9	9
Unknown primary	4	4
Soft palate	2	2
Parotid	2	2
Lip	2	2
Tonsil	1	1
Cheek	1	1

Table 4: The total number/percentage of clinical N0, N1 and N2 patients that had either pathological negative or positive nodal disease on histological examination.

Clinical	Number	Pathological	Number
cN0	58	pN0	48 (83%)
		pN+	10 (17%)
cN1	11	pN0	7 (64%)
		pN+	4 (36%)
cN2	15	pN0	4 (27%)
		pN+	11 (73%)

Table 5: The number dissected, average nodal yield, number and percentage of positive nodes of each neck dissection level.

Neck dissection level	Number dissected	Number of levels with pN+	% of positive levels	Average nodal yield	Literature review of average nodal yield per level
Ia	99	3	3	2.7	4–5.7
Ib	106	17	16	3.6	
IIa	114	15	13	5.6	11.2–12.6
IIb	101	0	0	5.7	
III	110	9	8	5.7	7.2–7.6
IV	72	2	3	4.7	6.9–8.7
V	3	1	33	3	9.7

tongue had the highest proportion of positive cervical nodal involvement at 33%. This was followed by the alveolar mucosa of the maxilla and buccal mucosa, both at 33%, and tongue at 24%. There were only two oral cavity primary tumours that involved the lip, one of which had positive nodal disease. These differences were not statistically significant (p=0.82).

Total nodal yield and nodal disease were calculated as a proportion of total neck dissections performed (n=112), excluding AND. There were 99 level Ia neck dissections with an average nodal yield of 2.7 nodes. There were 3 neck dissections with positive nodes in level Ia, which made up 3% of the total number of level Ia dissections. There were 106 level Ib dissections with an average nodal yield of 3.6, with 17 necks (16%) having positive nodal disease. There were 114 level IIa dissections with an average nodal yield of 5.6, with 15 necks (13%) having positive nodal disease. There were 101 level Iib neck dissections with an average nodal yield of 5.7, with no positive lymph nodes found. Level III was dissected 110 times with an average nodal yield of 5.7, with 9 (8%) cases showing positive nodal disease. Level IV was dissected 72 times with an average nodal yield of 4.7, and only 2 necks (3%) with positive nodal disease. These two neck dissections with positive nodal disease also had positive nodes in levels level Iia and Ib. Therefore, there was no evidence of skip metastasis to level IV. There were only three neck dissections that included level V. One out of three had positive nodes in this level that was identified in the preoperative staging and work up of this patient. This was a pT4N2cM0 SCC of the floor of mouth, and also had positive nodal disease in levels Ia and III. The results show that with a selective neck dissection of levels I–III (n=35) and I–IV (n=68), there was a total average nodal yield of 20.1 and 25.4, respectively. This information can be visually found in Table 5.

Complications were calculated as a proportion of total patients included (n=105). These were classified using the Clavien–Dindo system and assigned scores from 0–IIIb.[11] There were no deaths intra-operatively or in the post-operative inpatient stay. There were 38 (36%) patients that had a Clavien–Dindo score of 0, 4 (4%) with a score of I, 33 (31%) with a score of II, 20 (19%) with a score of IIIa and 10 (10%) with a score of IIIb. There was a chyle leak in two (2%) patients. Post-operative shoulder dysfunction was reported at 17%. This number included those that reported shoulder dysfunction of any kind (including mild symptoms) up to 5 years of post-operative outpatients follow up.

The most common Clavien–Dindo II complications were blood transfusions, post-operative delirium, hospital-acquired pneumonia and the need for vasopressor support to aid with post-operative free flap blood pressure targets. The most common Clavien–Dindo IIIa complication was drainage of neck seroma by aspiration in clinic or with ultrasound guided technique. Seventy percent (70%) of these patients with a IIIa complication also had a free flap reconstruction. The most common Clavien–Dindo IIIb complication was due to venous congestion (n=5) of the free flap. Of all the patients that returned to theatre, 90% also had a free flap reconstruction.

Discussion

Waikato Hospital services a population of over 930,000, with Māori representing 23.7%, higher than the national average of 17.4%.[12] In our study population, 18.1% of the study population were Māori, which is therefore consistent with the national ethnicity distribution but is approximately 5% lower than the regional distribution. Patient demographics of age (65 years) and rates of smoking and alcohol use is consistent with previous head and neck cancer literature in New Zealand. However, a male predominance was not found in our study, which may be due to our sample size.[13]

Nodal status is one of the most significant independent prognostic factors for head and neck cancer.[3] Therefore, gaining an adequate nodal yield to obtain a representative nodal sample is paramount. In review of the literature, the mean lymph node yield was between 8 and 39.8 in SNDs.[14–16] There is no definite minimum lymph node count defining an adequate neck dissection, but this topic is of interest.[17] One study showed that a total lymph node yield less than 18 for a neck dissection of levels I–III was associated with decreased disease free specific and overall survival.[18] Another study also showed that the minimum total lymph node requirement for a selective neck dissection was six.[14] The average nodal yield in this study was 20.1 (range of 8–44) for a SND of levels I–III and 25.4 (range of 14–54) for a SND of levels I–IV, which both lie in the upper end of similar reported literature.[15–18] There is an observed correlation between a higher nodal yield and the extent of the cancer.[18] The higher number of T4 tumours compared to other

stages reported in our data might then explain the higher lymph node yield in this study.

Whether or not to dissect level IIb during routine elective/therapeutic neck dissection procedures is an ongoing debate within the literature.[19,20] This discussion centres on the fact that one of the most common long-term complications from neck dissections of level IIb is shoulder dysfunction due to damage to the spinal accessory nerve (SAN). Such shoulder dysfunction can manifest as chronic pain, weakness and reduced range of motion, which all reduce quality of life.[21,22] A SND in a clinically node positive (cN+) neck will most likely include level IIb dissection, but can be modified to preserve level IIb when it is oncologically safe to do so.[19] The benefits of including level IIb in a SND is to ensure occult metastatic disease is not missed in these nodes. A prospective analysis of level IIb lymph node metastasis in END for OSCC showed that metastatic disease in level IIb occurred in 5% of neck dissections and was only found in association with tongue OSCC. In addition all patients with positive nodes in level IIb had positive nodes in level IIa.[21] The counter argument is formed when the risk of occult metastatic disease within level IIb is too low to provide any oncological benefit and comes with increased morbidity.[20] Several studies have reported that with oral squamous cell carcinoma the risk of level IIb metastasis is as low as 2%.[23] Our study adds to this argument, as there were no nodal metastasis found at level IIb in 101 dissections. Therefore, level IIb nodes could be left *in situ* without significantly compromising regional clearance, specifically in patients with a cN0 neck, primary site excluding the tongue and no suspicious intraoperative lymph nodes found at other neck levels.[19,21,24–26] Our study reported shoulder dysfunction in 17% of patients over the course of outpatient follow up. This was difficult to measure retrospectively, but given it is a major complication of head and neck surgery, it warrants further research.

A significant complication uniquely associated with dissecting level IV is the potential for a chyle leak, due to the injury of the thoracic duct. A chyle leak is rare but potentially serious complication that occurs in 2–8% of neck dissections.[27] It can be defined as an iatrogenic thoracic duct injury causing leakage of lymphatic fluid into the surrounding vessels.[28] Our study reported a chyle leak in two (2%) patients. Level IV carries a low risk of occult metastatic disease with OSCC.[3] Therefore, routine dissection of level IV remains controversial in the literature.[29] A meta-analysis conducted in 2019 demonstrated very low rates of skip metastasis to neck level IV in patients diagnosed with cN0 OSCC. Their study reported the risk of level IV involvement at 2.53% and the risk of level IV skip metastasis at 0.5%. Subgroup analysis confirmed that pathological nodes at level I–III were not associated with an increased risk of level IV involvement and that the risk of level IV involvement with oral tongue SCCs was 3.6%. The authors concluded that elective treatment of level IV is not required in patients with cN0 OSCC.[29] Our data had no skip metastasis to level IV, but there were two out of 72 cases (3%) of level IV involvement with OSCC. These two cases both had positive nodes at level I and IIa. One patient was a poorly differentiated cT4cN1 tongue OSCC and the other was a cT2cN1 poorly differentiated buccal mucosa mucoepidermoid carcinoma. Thus, clinicians should consider extending their neck dissection to level IV in patients with gross macroscopic disease in upper levels and with advanced oral tongue cancer.

Conclusion

This study reported demographics and risk factor prevalence consistent with similar published data worldwide. Our practice has changed to consider omitting level IIb and IV when oncologically safe to do so. Furthermore, the OMS unit at Waikato Hospital provides comprehensive treatment and obtains safe patient outcomes for patients undergoing neck dissections for the treatment of oral squamous cell carcinoma.

COMPETING INTERESTS
Nil.

ACKNOWLEDGEMENTS
Mr Simon Lou, Mr Edward Nguyen, Mr Angus Colquhoun.

AUTHOR INFORMATION
Ellen OY Simpson: Oral and Maxillofacial Surgery Registrar, Department of Oral and Maxillofacial Surgery, Te Whatu Ora Waikato, New Zealand.
Alastair Luo: Oral and Maxillofacial Surgery Registrar, Department of Oral and Maxillofacial Surgery, Te Whatu Ora Waikato, New Zealand.
Jamie Mckenzie: Oral and Maxillofacial Surgery Registrar, Department of Oral and Maxillofacial Surgery, Te Whatu Ora Waikato, New Zealand.
Monish M Maharaj: Neurosurgery Registrar, Department of Neurosurgery, Sydney Children's Hospital, Prince of Wales Hospital, Randwick NSW 2031, Australia.
Thasvir Singh: Oral and Maxillofacial Surgery Consultant and Clinical Director, Department of Oral and Maxillofacial Surgery, Te Whatu Ora Waikato, New Zealand.

CORRESPONDING AUTHOR
Ellen Simpson: Oral and Maxillofacial Surgery Registrar, Te Whatu Ora Waikato. Ph: +64 27 868 2389. E: eoysimpson@gmail.com

REFERENCES
1. World Health Organization. Global Cancer Observatory [Internet]. Lyon: World Health Organization; 2023 [cited 6 Feb 2023]. Available from: https://gco.iarc.fr/
2. Döbróssy L. Epidemiology of head and neck cancer: magnitude of the problem. Cancer Metastasis Rev. 2005 Jan;24(1):9-17. doi: 10.1007/s10555-005-5044-4.
3. Shah JP. Patterns of cervical lymph node metastasis from squamous carcinomas of the upper aerodigestive tract. Am J Surg. 1990 Oct;160(4):405-409. doi: 10.1016/s0002-9610(05)80554-9.
4. Nguyen E, McKenzie J, Clarke R, et al. The Indications for Elective Neck Dissection in T1N0M0 Oral Cavity Squamous Cell Carcinoma. J Oral Maxillofac Surg. 2021 Aug;79(8):1779-1793. doi: 10.1016/j.joms.2021.01.042.
5. D'Cruz AK, Vaish R, Kapre N, et al. Elective versus Therapeutic Neck Dissection in Node-Negative Oral Cancer. N Engl J Med. 2015 Aug 6;373(6):521-9. doi: 10.1056/NEJMoa1506007.
6. Pimenta Amaral TM, Da Silva Freire AR, Carvalho AL, et al. Predictive factors of occult metastasis and prognosis of clinical stages I and II squamous cell carcinoma of the tongue and floor of the mouth. Oral Oncol. 2004 Sep;40(8):780-6. doi: 10.1016/j.oraloncology.2003.10.009.
7. Hoda N, Rajani BC, Ghosh S, et al. Cervical lymph node metastasis in squamous cell carcinoma of the buccal mucosa: a retrospective study on pattern of involvement and clinical analysis. Med Oral Patol Oral Cir Bucal. 2021 Jan 1;26(1):e84-e89. doi: 10.4317/medoral.24016.
8. Arun I, Maity N, Hameed S, et al. Lymph node characteristics and their prognostic significance in oral squamous cell carcinoma. Head Neck. 2021 Feb;43(2):520-533. doi: 10.1002/hed.26499.
9. de Zinis LO, Bolzoni A, Piazza C, Nicolai P. Prevalence and localization of nodal metastases in squamous cell carcinoma of the oral cavity: role and extension of neck dissection. Eur Arch Otorhinolaryngol. 2006 Dec;263(12):1131-5. doi: 10.1007/s00405-006-0128-5.
10. Maher H, Simpson E, Singh T. Microvascular reconstruction outcomes from a New Zealand Oral and Maxillofacial Surgery Unit. N Z Med J. 2022 Oct 28;135(1564):59-65.
11. Dindo D, Demartines N, Clavien PA. Classification of surgical complications: a new proposal with evaluation in a cohort of 6336 patients and results of a survey. Ann Surg. 2004 Aug;240(2):205-13. doi: 10.1097/01.sla.0000133083.54934.ae.
12. Stats NZ. Subnational population estimates (DHB, DHB constituency), by age and sex, at 30 June 1996-2022 (2015 boundaries) [Internet]. Wellington: Stats NZ; 2023 [cited 6 Feb 2023]. Available from: https://nzdotstat.stats.govt.nz/wbos/Index.aspx?DataSetCode=TABLECODE7509.
13. Elwood JM, Youlden DR, Chelimo C, et al. Comparison of oropharyngeal and oral cavity squamous cell cancer incidence and trends in New Zealand and Queensland, Australia. Cancer Epidemiol. 2014 Feb;38(1):16-21. doi: 10.1016/j.canep.2013.12.004.
14. Norling R, Therkildsen MH, Bradley PJ, et al. Nodal yield in selective neck dissection. Acta Otolaryngol. 2013 Sep;133(9):965-71. doi: 10.3109/00016489.2013.799290.
15. Friedman M, Lim JW, Dickey W, et al. Quantification of lymph nodes in selective neck dissection. Laryngoscope. 1999 Mar;109(3):368-70. doi: 10.1097/00005537-199903000-00005.
16. Marres CCM, de Ridder M, Hegger I, et al. The influence of nodal yield in neck dissections on lymph node ratio in head and neck cancer. Oral Oncol. 2014 Jan;50(1):59-64. doi: 10.1016/j.oraloncology.2013.09.014.
17. Pou JD, Barton BM, Lawlor CM, et al. Minimum

lymph node yield in elective level I–III neck dissection. Laryngoscope. 2017 Sep;127(9):2070-2073. doi: 10.1002/lary.26545.
18. Ebrahimi A, Clark JR, Amit M, et al. Minimum nodal yield in oral squamous cell carcinoma: defining the standard of care in a multicenter international pooled validation study. Ann Surg Oncol. 2014 Sep;21(9):3049-55. doi: 10.1245/s10434-014-3702-x.
19. Corlette TH, Cole IE, Albsoul N, Ayyash M. Neck dissection of level IIb: Is it really necessary? Laryngoscope. 2005 Sep;115(9):1624-6. doi: 10.1097/01.mlg.0000173154.92581.c5.
20. Dziegielewski PT, McNeely ML, Ashworth N, et al. 2b or not 2b? Shoulder function after level 2b neck dissection: A double-blind randomized controlled clinical trial. Cancer. 2020 Apr 1;126(7):1492-1501. doi: 10.1002/cncr.32681.
21. Elsheikh MN, Mahfouz ME, Elsheikh E. Level IIb lymph nodes metastasis in elective supraomohyoid neck dissection for oral cavity squamous cell carcinoma: a molecular-based study. Laryngoscope. 2005 Sep;115(9):1636-40. doi: 10.1097/01.mlg.0000176540.33486.c3.
22. Celik B, Coskun H, Kumas FF, et al. Accessory nerve function after level 2b-preserving selective neck dissection. Head Neck. 2009 Nov;31(11):1496-501. doi: 10.1002/hed.21112.
23. Paleri V, Subramaniam SK, Oozeer N, et al. Dissection of the submuscular recess (sublevel IIb) in squamous cell cancer of the upper aerodigestive tract: prospective study and systematic review of the literature. Head Neck. 2008 Feb;30(2):194-200. doi: 10.1002/hed.20682.
24. Lim YC, Song MH, Kim SC, et al. Preserving Level IIb Lymph Nodes in Elective Supraomohyoid Neck Dissection for Oral Cavity Squamous Cell Carcinoma. Arch Otolaryngol Head Neck Surg. 2004 Sep;130(9):1088-91. doi: 10.1001/archotol.130.9.1088.
25. Santoro R, Franchi A, Gallo O, et al. Nodal metastases at level IIb during neck dissection for head and neck cancer: clinical and pathologic evaluation. Head Neck. 2008 Nov;30(11):1483-7. doi: 10.1002/hed.20907.
26. Lea J, Bachar G, Sawka AM, et al. Metastases to level IIb in squamous cell carcinoma of the oral cavity: a systematic review and meta-analysis. Head Neck. 2010 Feb;32(2):184-90. doi: 10.1002/hed.21163.
27. Delaney SW, Shi H, Shokrani A, Sinha UK. Management of Chyle Leak after Head and Neck Surgery: Review of Current Treatment Strategies. Int J Otolaryngol. 2017;2017:8362874. doi: 10.1155/2017/8362874.
28. Lee YS, Kim BW, Chang HS, Park CS. Factors predisposing to chyle leakage following thyroid cancer surgery without lateral neck dissection. Head Neck. 2013 Aug;35(8):1149-52. doi: 10.1002/hed.23104.
29. Warshavsky A, Rosen R, Nard-Carmel N, et al. Assessment of the rate of skip metastasis to neck level IV in patients with clinically node-negative neck oral cavity squamous cell carcinoma: A systematic review and meta-analysis. JAMA Otolaryngol Head Neck Surg. 2019 Jun 1;145(6):542-548. doi: 10.1001/jamaoto.2019.0784.

Cascade of care and rapid treatment pathway at Auckland City Hospital for patients with a new diagnosis of HIV infection, 2015–2019

Annabelle Donaldson, Michele Lowe, Simon Briggs

ABSTRACT

AIMS: Legislative changes in 2017 enabled subsidised HIV care for all people living with HIV in New Zealand. This enabled a rapid treatment pathway (RTP) to be developed at Auckland City Hospital (ACH). Our aims were to document the cascade of care for people referred with newly diagnosed HIV infection and evaluate the effect of the RTP.

METHODS: People with newly diagnosed HIV infection in New Zealand referred to ACH between 2015 and 2019 were included in the cascade of care. The 2-year periods before (2015 and 2016) and after (2018 and 2019) the RTP were compared for initiation of antiretroviral therapy (ART) and attainment of HIV viral suppression.

RESULTS: There were 240 people with newly diagnosed HIV infection referred. Of these, 197/200 (98.5%) were on ART and 195/197 (99%) had documented viral suppression. ART was initiated within 6 weeks of referral for 41/120 (34.2%) in the pre-RTP and 76/79 (96.2%) in the RTP periods ($p<0.0001$). Viral suppression was achieved within 6 months of diagnosis for 66/118 (55.9%) in the pre-RTP and 73/75 (97.3%) in the RTP periods ($p<0.0001$).

CONCLUSIONS: A high proportion of people referred with newly diagnosed HIV infection were commenced on ART and achieved viral suppression. The RTP facilitated earlier initiation of ART and achievement of viral suppression.

Early initiation of antiretroviral therapy (ART) has been shown to markedly reduce transmissions of HIV,[1,2] and reduce mortality for people living with HIV (PLHIV),[3] with health benefits occurring regardless of the initial CD4 count.[4,5] With the evidence supporting early ART, in 2015 the World Health Organization recommended that ART be initiated for all PLHIV at any CD4 count.[6]

The "cascade of care" was developed for benchmarking HIV care using the steps of 1) diagnosed with HIV, 2) linked to HIV care, 3) retained in care, 4) on ART, and 5) suppressed HIV viral load.[7,8] UNAIDS proposed the initial ambitious goals that 90% of all PLHIV will know their diagnosis, 90% of all people diagnosed with HIV infection will receive sustained ART and 90% of people receiving ART will have HIV viral suppression.[9] These goals were subsequently updated to 95-95-95 to end the AIDS epidemic by 2030.[10] The cascade of care for New Zealand, undertaken by the AIDS Epidemiology Group, was limited by incomplete data.[11]

In New Zealand in January 2017, there were changes to infectious diseases management under the *Health Act 1956*, allowing subsidised HIV care to be provided regardless of a person's residency status.[12] Later, in July 2017, subsidised ART became available to all PLHIV, at any CD4 count.[13] These major changes in policy enabled a rapid treatment pathway (RTP) for all people with newly diagnosed HIV infection to be developed and implemented at Auckland City Hospital, which came into effect in October 2017. A timeline was outlined to facilitate early engagement and prompt initiation of ART, with referrals for people with newly diagnosed HIV infection offered an outpatient appointment with an HIV specialist within 1 week of referral. ART was aimed to be initiated at this appointment. Support via telephone or face-to-face meetings would be provided by the community HIV team (a team of HIV nurse specialists and a nurse practitioner), with initial contact at the time of the referral and thereafter as required. Key performance indicators (KPIs) were proposed for timing of initiation of ART and attainment of viral suppression. These KPIs were created following careful discussion within the Infectious Diseases (ID) Service and were based on what was thought to be achievable at that time.

Aims

The aims of this audit were to 1) document the cascade of care for people with a newly diagnosed HIV infection referred to the ID Service at Auckland City Hospital, and 2) evaluate the periods before and after initiation of the RTP for people with a newly diagnosed HIV infection referred to the ID Service at Auckland City Hospital, with respect to linkage to care, timing of ART initiation and HIV viral suppression; and furthermore, to determine whether the KPIs were met with i) 90% of new HIV diagnoses initiating ART within 6 weeks of referral, and ii) 90% of new HIV diagnoses obtaining an undetectable HIV viral load within 6 months of diagnosis.

Methods

Adults (≥15 years) with a newly diagnosed HIV infection who were referred to the ID Service at Auckland City Hospital between the dates 1 January 2015 and 31 December 2019 were included. These people were identified from the department's HIV database. PLHIV newly referred to the ID Service at Auckland City Hospital, but those who had been previously diagnosed with HIV infection were excluded. Data extracted from the medical records included demographic details (including self-reported ethnicity) and date of diagnosis with HIV infection. The date of diagnosis was recorded as the date the first positive HIV test was taken, as recorded by the laboratory. If the first test was a rapid test, this date was recorded from the referral letter. Additional data extracted included the date of referral to the ID Service, date of first contact with the community HIV team, date of first HIV specialist appointment or inpatient consultation, date of initiation of ART and HIV viral load testing throughout the first year, as well as the most recent HIV viral load in the year prior to 31 December 2020.

Cascade of care

For the cascade of care, definitions were in accordance with recommendations published.[14,15] As this was an audit of PLHIV referred to our service, the first step in the cascade of care (the proportion diagnosed with HIV) was not able to be assessed.

Linked to care was defined as review by an HIV specialist within 3 months of diagnosis. This did not include the initial contact made by the community HIV team.

Retained in care was considered achieved if the patient was alive and living in New Zealand and in the most recent year had either a HIV viral load documented, or alternatively ART dispensed and evidence that adherence was maintained through a clinic appointment, phone call or contact with a general practitioner (GP).

On treatment was defined as having been dispensed or prescribed ART (not necessarily reflecting adherence to ART).

Viral suppression was defined as a HIV viral load <200 copies/mL. PLHIV were considered to be currently virally suppressed if the HIV viral load had been documented within the 12 months prior to 31 December 2020.

For the cascade of care, the most recent HIV viral load in the year prior to 31 December 2020 was obtained to allow a minimum of 1-year follow-up for all PLHIV. If a PLHIV relocated to another region within New Zealand during this period, data were obtained from the HIV service involved.

Rapid treatment pathway

For comparison of the periods before and after the development of the RTP, accounting for the changes in policy in 2017 and the implementation of the pathway, we compared the 2-year periods of 1 January 2015 to 31 December 2016 and 1 January 2018 to 31 December 2019. For the RTP, the two groups were compared, with respect to linkage to care, timing of initiation of ART (from when the diagnosis was made, and from when the referral was received) and achievement of HIV viral suppression within 6 months of diagnosis.

This review was considered to be an audit of clinical care and did not meet requirements for formal ethical review from the Auckland District Health Board Research Review Committee.

The Fisher's exact test, Chi-squared test and Mann–Whitney U test were used to assess for statistically significant differences between the periods before and after the introduction of the RTP.

Results

There were 399 PLHIV referred to the ID Service during the 5-year audit period from 1 January 2015 to 31 December 2019. Of these, the 103 PLHIV diagnosed overseas and the 56 PLHIV diagnosed elsewhere in New Zealand who re-located to the Auckland Region were excluded.

The remaining 240 people with a newly diagnosed

HIV infection were included. Of these, 214 (89%) were male, with 102/240 (42.5%) self-reporting their ethnicity as NZ European and 16/240 (6.7%) as Māori. The median age was 39 years (interquartile range [IQR] 30–49 years). The likely mode of transmission was men who have sex with men for 179 (74.6%), heterosexual sex for 50 (20.8%), intravenous drug use for 4 (1.7%) and other/not available for 7 (2.9%). The median CD4 count at diagnosis was $396x10^6$/L (IQR 206–$569x10^6$/L), with 58 (24%) recording a baseline CD4 count of <$200x10^6$/L and 41 (17%) with a CD4 count of 200 to $349x10^6$/L.

Cascade of care: Auckland City Hospital

Of the 240 PLHIV, 227 (94.6%) were linked to care with a first specialist appointment or inpatient review within 3 months of diagnosis. For the 200 PLHIV living in New Zealand as of 31 December 2020, 197 (98.5%) were retained in care (the remaining three were lost to follow-up) and 197 (98.5%) were on ART. For those on ART, 195/197 (99%) had documented HIV viral suppression within the last 12 months of the audit period (two had intermittent ART adherence). The additional 40 PLHIV included 33 who relocated overseas and seven who died.

Rapid treatment pathway

There were 123 people newly diagnosed with an HIV infection in the period from 1 January 2015 to 31 December 2016, prior to the development of the RTP, and 82 people diagnosed with an HIV infection in the period from 1 January 2018 to 31 December 2019 following the development of the RTP. The demographics of the before and after RTP groups are shown in Table 1, with no differences seen between these two groups.

Linkage to care

Linkage to care within 3 months of the diagnosis of HIV infection was achieved for 113/122 (92.6%) people newly diagnosed in 2015/2016 compared with 81/82 (99%) people newly diagnosed with an HIV infection in 2018/2019 (p=0.053). For the PLHIV not linked to care within 3 months in 2015/2016, all had initial contact with the community HIV team and baseline bloods within this timeframe. The one patient not linked to care within 3 months in 2018/2019 had a delayed referral to the ID service, which occurred 187 days following diagnosis.

The time from HIV diagnosis to HIV specialist care is shown in Table 2, and the time from referral to HIV specialist care is shown in Table 3. The median time from *diagnosis* to first specialist review was 32 days (IQR 13–54 days) prior to the RTP and 17 days (IQR 7–28 days) following the RTP (p<0.0001). The median time from *referral* to first specialist review was 23 days (IQR 8–41 days) prior to the RTP and was 8 days (IQR 4–16 days) following the RTP (p<0.0001). The median time from referral to initial contact with the ID service, usually with the HIV nurse specialists/practitioner, was 1 day during both periods.

Antiretroviral therapy

ART was initiated within 6 weeks of *diagnosis* for 28/120 (23.3%) PLHIV prior to the RTP and for 66/79 (83.5%) PLHIV following the RTP (p<0.0001). ART was initiated within 6 weeks of *referral* for 41/120 (34.2%) PLHIV prior to the RTP and for 76/79 (96.2%) PLHIV following the RTP (p<0.0001). At 3 months from diagnosis, ART had been initiated in 78/120 (65.0%) PLHIV prior to the RTP and 77/79 (97.5%) PLHIV following the RTP (p<0.0001).

The median time from *diagnosis* to initiation of ART was 68 days (IQR 44–133 days) prior to the RTP and 21 days (IQR 13–31 days) following the RTP (p<0.00001). The median time from *referral* to the ID service to initiation of ART was 51 days (IQR 36–114 days) prior to the RTP and 12 days (IQR 7–20 days) following the RTP (p<0.00001).

HIV viral suppression

At 6 months from diagnosis, 66/118 (55.9%) PLHIV prior to the RTP and 73/75 (97.3%) PLHIV following the RTP had documented HIV viral suppression (p<0.0001). The median time from diagnosis to first documentation of viral suppression was 174 days (IQR 124–272 days) prior to the RTP and 85 days (IQR 63–104 days) following the RTP (p<0.0001).

Discussion

The cascade of care for people newly diagnosed with an HIV infection referred to Auckland City Hospital for the 5-year audit period from 1 January 2015 to 31 December 2019 has shown very high rates of retention in care, initiation of ART and HIV viral suppression. In addition, the RTP has significantly reduced the time from diagnosis of HIV infection to linkage to care and has resulted in earlier initiation of ART and earlier achievement of HIV viral suppression.

This cascade of care, as assessed on 31 December 2020, has shown that 98.5% of PLHIV were on ART and of these, 99% had a suppressed HIV viral load during the last 12 months of the audit. This compares with the Wellington cascade of care—undertaken

Table 1: Demographics of groups before and after rapid treatment pathway for initiation of HIV care for PLHIV referred to the Infectious Diseases Service, Auckland City Hospital.

	Prior to rapid treatment pathway **Jan 2015–Dec 2016**	**Rapid treatment pathway** **Jan 2018–Dec 2019**	***P*-value**
New diagnosis of HIV	123	82	
Male	112 (91.1%)	70 (85.4%)	0.26#
Age at diagnosis (median years, IQR)	38 (30–48)	40 (32–51)	0.73^
Ethnicity			
NZ European	60 (48.8%)	31 (37.8%)	0.51*
Māori	8 (6.5%)	6 (7.3%)	
Asian	22 (17.9%)	18 (22.0%)	
Pasifika peoples	8 (6.5%)	10 (12.2%)	
Other European	18 (14.6%)	9 (11.0%)	
South American	4 (3.3%)	5 (6.1%)	
Middle East/Africa	3 (2.4%)	3 (3.7%)	
CD4 count at diagnosis, median (IQR)	417x10^6/L (209–602x10^6/L)	372x10^6/L (197–528x10^6/L)	0.32^
<200x10^6/L	30 (24%)	21 (26%)	
200–349x10^6/L	21 (17%)	13 (16%)	
350–499x10^6/L	31 (25%)	24 (29%)	
≥500x10^6/L	41(33%)	22 (27%)	
Unknown		2 (2%)	
Outcome			
Available for retention in care assessment+	104	67	
Retained in care	103 (99%)	66 (98.5%)	
Not retained in care	1 (1%)	1 (1.5%)	
Not available for retention in care assessment	19	15	
Transfers overseas+	14	13	
Deaths+	5	2	

PLHIV = people living with HIV; IQR = interquartile range
#Fisher's exact test
^Mann–Whitney U test
*Chi-squared test
+The follow-up period for retention in care assessment, transfer overseas and deaths was 31 December 2020 for both groups

Table 2: Time from HIV *diagnosis* to HIV specialist care for PLHIV referred to the Infectious Diseases Service, Auckland City Hospital.

	Prior to rapid treatment pathway **Jan 2015–Dec 2016, n=123**	**Rapid treatment pathway** **Jan 2018–Dec 2019, n=82**	***P*-value**
Time from diagnosis to first contact with community HIV team, median days (IQR)	10 (2–16)	7 (2–14)	0.36^
Linked to care within 3 months of diagnosis	113/122[a] (92.6%)	81/82 (99%)	0.053[#]
Time from diagnosis to linkage to care, median days (IQR)	32[a] (13–54)	17 (7–28)	<0.0001^
Time from diagnosis (blood test taken) to referral to ID service, median days (IQR)	7 (1–13.5)	6[b] (2–13)	0.91^
Time from diagnosis (result available) to referral to ID service, median days (IQR)	3[c] (0–10)	2[d] (0–10)	0.8^
Time from diagnosis to initiation of ART, median days (IQR)	68[e] (44–133)	21[f] (13–31)	<0.00001^
Initiation of ART within 6 weeks of diagnosis	28/120[g] (23.3%)	66/79[f] (83.5%)	<0.0001[#]
Initiation of ART within 3 months of diagnosis	78/120[g] (65.0%)	77/79[f] (97.5%)	<0.0001[#]
Initiation of ART within 6 months of diagnosis	96/120[g] (80.0%)	78/79[f] (98.7%)	<0.0001[#]
Time from diagnosis to first documentation of viral suppression, median days (IQR)	174[h] (124–272)	85[i] (63–104)	<0.0001^
Viral suppression within 6 months of diagnosis	66/118[j] (55.9%)	73/75[i] (97.3%)	<0.0001[#]

PLHIV = people living with HIV; IQR = interquartile range; ART = antiretroviral therapy
[#]Fisher's exact test
^Mann–Whitney U test
[a] n=122 (1 PLHIV transferred care before being seen)
[b] n=81 (data not available for 1 PLHIV)
[c] n=112 (data not available for 11 PLHIV)
[d] n=77 (data not available for 5 PLHIV)
[e] n=118 (3 PLHIV transferred care before starting ART; 2 PLHIV didn't start ART but later transferred care)
[f] n=79 (3 PLHIV transferred care before starting ART)
[g] n=120 (3 PLHIV transferred care before starting ART)
[h] n=117 (5 PLHIV transferred care before starting ART/achieving viral suppression; 1 PLHIV didn't start ART)
[i] n=75 (7 PLHIV transferred care before starting ART/achieving viral suppression)
[j] n=118 (5 PLHIV transferred care before starting ART/achieving viral suppression)

Table 3: Time from *referral* to HIV specialist care for PLHIV referred to the Infectious Diseases Service, Auckland City Hospital.

	Prior to rapid treatment pathway **Jan 2015–Dec 2016, n=123**	**Rapid treatment pathway** **Jan 2018–Dec 2019, n=82**	***P*-value**
Time from referral to first contact with community HIV team, median days (IQR)	1 (0–2.5)	1 (0–1)	0.08[#]
Time from referral to first specialist clinic appointment/ inpatient review, median days (IQR)	23[a] (8–41)	8 (4–16)	<0.0001[#]
Time from referral to initiation of ART, median days (IQR)	51[b] (36–114)	12[c] (7–20)	<0.00001[#]
Initiation of ART within 6 weeks of referral	41/120[d] (34.2%)	76/79[e] (96.2%)	<0.0001^
Time from referral to first documentation of viral suppression, median days (IQR)	161[f] (117–272)	79[g] (53–98)	<0.00001[#]

PLHIV = people living with HIV; IQR = interquartile range; ART = antiretroviral therapy
[#]Mann–Whitney U test
^Fisher's exact test
[a] n=122 (1 PLHIV transferred care before being seen)
[b] n=118 (3 PLHIV transferred care before starting ART; 2 patients didn't start ART)
[c] n=79 (3 PLHIV transferred care before starting ART)
[d] n=120 (3 PLHIV transferred care before starting ART)
[e] n=79 (3 PLHIV transferred care before starting ART)
[f] n=117 (5 PLHIV transferred care before starting ART/achieving viral suppression; 1 PLHIV didn't start ART)
[g] n=75 (7 PLHIV transferred care before starting ART/achieving viral suppression)

prior to the HIV policy changes—where 89% were on ART, of whom 93% achieved a suppressed HIV viral load,[16] and the national cascade of care for people diagnosed with HIV infection between 2006 and 2017, where 94.5% initiated ART, of whom 82% had a suppressed HIV viral load.[11] The national cascade was limited by incomplete data and almost certainly is an underestimate of the true proportion of PLHIV initiated on ART who are virally suppressed in New Zealand.

Policy changes, based on the evidence supporting early initiation of ART,[1,2,4] have been instrumental in facilitating treatment for all PLHIV in New Zealand, particularly in facilitating rapid treatment for all, irrespective of the CD4 count at the time of diagnosis or of immigration status. The subsequent development of our service KPIs has led to 96% of PLHIV commencing ART within 6 weeks of referral, a significant improvement from the baseline of 34%, and 97% attaining HIV viral suppression within 6 months of diagnosis of HIV infection, again a significant improvement from the baseline of 56%. Potential benefits of earlier treatment and HIV viral suppression include the reduced transmission of HIV infection[1,2] and improved general health for PLHIV.[4,5] All major HIV infection treatment guidelines now recommend that ART is commenced as soon as possible following

diagnosis.[17–19] Studies have shown that the availability of RTPs result in earlier linkage to care and earlier achievement of HIV viral suppression, although whether there are benefits in long-term retention in care or mortality remain unclear.[20,21] The optimal timing for early ART initiation is still being fully assessed, as there are concerns that immediate initiation of ART on the same day as the diagnosis of HIV infection may result in less engagement in care compared with rapid treatment initiated within 2 weeks of the diagnosis of HIV infection,[22] as the information and consideration of lifelong ART may be overwhelming. RTPs are more resource intensive, requiring multidisciplinary coordination and reprioritisation of clinic resources with more intensive initial support, but as we have shown, can result in earlier linkage to care, earlier initiation of ART and earlier attainment of HIV viral suppression.

Not all patients may be suitable for rapid treatment, particularly where there is a risk of immune reconstitution inflammatory syndrome (IRIS), such as occurs with cryptococcal or tuberculous meningitis. It is also important to consider likely engagement in ongoing care, as initiation of ART requires ongoing commitment and lifelong follow-up. Engagement in other programmes such as drug and alcohol support or addressing other barriers to HIV care may take priority.[23] We found only a very small number of PLHIV who did not initiate ART, who were lost to follow-up or who remained in contact with our service but maintained variable adherence to ART. Much of this success is due to the efforts of our community HIV team and social worker, who provide long-term support to PLHIV following their diagnosis of HIV infection and initiation of ART, and who help re-engage those who have been lost to follow-up and further support those with complex needs.

It is notable that late presentations in this audit were common, with 24% of those with a newly diagnosed HIV infection having a CD4 count $<200x10^6$/L, suggesting that these PLHIV were likely to have had an HIV infection for many years. This has also been shown in other New Zealand studies, and provides further evidence to support the need for wider HIV testing in New Zealand.[24,25] The first step in the cascade of care is almost certainly the most challenging, requiring increased HIV testing, reduced barriers to HIV testing and supportive contact tracing.[26] Increased emphasis on HIV testing in New Zealand is essential.

While we met the goal of 90% of new HIV diagnoses initiating ART within 6 weeks of *referral* to our service, a lower proportion (83.5%) initiated ART within 6 weeks of the *diagnosis* of their HIV infection. In this audit there was usually a relatively short delay in the time taken for the person who ordered the initial HIV test to become aware of this result and subsequently make a referral to our service. Now that we have been able to illustrate the significant benefits of the RTP, we hope that people newly diagnosed with HIV infection will be referred as soon as the initial HIV test result becomes available, without waiting for confirmatory HIV testing.

There are several strengths of this audit. We have a comprehensive database with prospective recording of all PLHIV referred to our service. Additionally, for the assessment of the cascade of care, we were able to obtain a high level of follow-up for PLHIV relocating within New Zealand.

There are a number of limitations to this audit. Firstly, it was performed retrospectively. Secondly, our cascade of care only included PLHIV referred to the ID Service at Auckland City Hospital, while HIV care in the Auckland Region is also provided by the Auckland Sexual Health Service, private specialist providers and general practitioners. However, the ID Service at Auckland City Hospital is the largest provider of HIV care in New Zealand (currently providing care for 1,100 of approximately 3,000 diagnosed PLHIV). With the high degree of follow-up that was achieved for PLHIV who entered the cascade of care and who are currently living in New Zealand, this audit provides updated data and complements other New Zealand cascades of care.[11,16] Thirdly, this audit does not provide information on the first step in the cascade of care (people living with undiagnosed HIV infection). This step is not well understood in New Zealand.[27] This step was not able to be assessed by this audit as we are only able to provide care to PLHIV who are diagnosed and then referred to our service. Fourthly, the time to achieve HIV viral suppression may be affected by factors other than the RTP. The documentation of viral suppression may vary with the timing of the follow-up HIV viral load testing; however, we aimed to test follow-up HIV viral loads at 3 and 6 months following initiation of ART throughout the audit period. The increased use of integrase inhibitors that occurred during the audit period, which achieve viral suppression more rapidly than other antiretrovirals,[28] may also have affected the time to achieve viral suppression.

For PLHIV referred to the Auckland City Hospital ID Service, we have shown a high attainment of initiation of ART and HIV viral

suppression in the cascade of care. The RTP, which required a refocus of clinic and multidisciplinary resources, has enabled earlier linkage to care, more rapid initiation of ART and earlier HIV viral suppression. We do need to obtain a greater understanding of the first step in the cascade of care for New Zealand. Increased resources dedicated to enhanced HIV testing will help reduce the proportion of people living with undiagnosed HIV infection.

COMPETING INTERESTS
Nil.

AUTHOR INFORMATION
Annabelle Donaldson: Infectious Diseases Physician, Infectious Diseases Service, Te Whatu Ora Te Toka Tumai, Auckland, New Zealand.
Michele Lowe: Nurse Practitioner, Infectious Diseases Service, Te Whatu Ora Te Toka Tumai, Auckland, New Zealand.
Simon Briggs: Infectious Diseases Physician, Infectious Diseases Service, Te Whatu Ora Te Toka Tumai, Auckland, New Zealand.

CORRESPONDING AUTHOR
Annabelle Donaldson: Infectious Diseases Physician, Infectious Diseases Service, Te Whatu Ora Te Toka Tumai, Auckland, New Zealand.
E: annabelled@adhb.govt.nz

REFERENCES
1. Cohen MS, Chen YQ, McCauley M, et al. Prevention of HIV-1 infection with early antiretroviral therapy. N Engl J Med. 2011;365(6):493-505. doi: 10.1056/NEJMoa1105243.
2. Cohen MS, Chen YQ, McCauley M, et al. Antiretroviral therapy for the Prevention of HIV-1 Transmission. N Engl J Med. 2016; 375(9):830-39. doi: 10.1056/NEJMoa1600693.
3. HIV-CAUSAL Collaboration; Ray M, Logan R, Sterne JA, et al. The effect of combined antiretroviral therapy on the overall mortality of HIV-infected individuals. AIDS. 2010;24(1):123-37. doi: 10.1097/QAD.0b013e3283324283.
4. INSIGHT START Study Group; Lundgren JD, Babiker AG, Gordin F, et al. Initiation of Antiretroviral Therapy in Early Asymptomatic HIV Infection. N Engl J Med. 2015;373(9):795-807. doi: 10.1056/NEJMoa1506816.
5. TEMPRANO ANRS 12136 Study Group; Danel C, Moh R, Gabillard D, et al. A Trial of Early Antiretrovirals and Isoniazid Preventive Therapy in Africa. N Engl J Med. 2015;373(9):808-22. doi: 10.1056/NEJMoa1507198.
6. World Health Organization. Guideline on when to start antiretroviral therapy and on pre-exposure prophylaxis for HIV [Internet]. Geneva: World Health Organizatin; 2015 [cited 2023 May 18]. Available from: https://www.ncbi.nlm.nih.gov/books/NBK327115/pdf/Bookshelf_NBK327115.pdf.
7. Centres for Disease Control and Prevention. Understanding the HIV care continuum [Internet]. 2014 [cited 2023 May 18]. Available from: https://www.cdc.gov/hiv/pdf/dhap_continuum.pdf.
8. Gardner EM, McLees MP, Steiner JF, et al. The spectrum of engagement in HIV care and its relevance to test-and-treat strategies for prevention of HIV infection. Clin Inf Dis. 2011;52(6):793-800. doi: 10.1093/cid/ciq243.
9. UNAIDS. 90-90-90 - An ambitious treatment target to help end the AIDS epidemic [Internet]. Geneva: UNAIDS; 2014 [cited 2023 May 18]. Available from: http://www.unaids.org/en/resources/documents/2014/90-90-90.
10. UNAIDS. Fast-Track - Ending the AIDS epidemic by 2030 [Internet]. Geneva: UNAIDS; 2014 [cited 2023 Jun 26]. Available from: https://www.unaids.org/en/resources/documents/2014/JC2686_WAD2014report.
11. McAllister S, van Asten H, Anglemyer A, et al. Cascade of care of people diagnosed with HIV in New Zealand between 2006 and 2017. HIV Med. 2021;22(2):122-30. doi: 10.1111/hiv.12983.
12. Manatū Hauora – Ministry of Health. Guidance on Infectious Disease Management under the Health Act 1956 [Internet]. 2017 [cited 2023 Apr 4]. Available from: https://www.health.govt.nz/publication/guidance-infectious-disease-management-under-health-act-1956.
13. Pharmac. Decision relating to widening funding criteria for antiretroviral agents for the treatment of HIV [Internet]. 2017 [cited 2023 May 18]. Available from: https://pharmac.govt.nz/news-and-resources/consultations-and-decisions/decision-relating-to-widening-funding-criteria-for-antiretroviral-agents-for-the-treatment-of-hiv/.
14. Medland NA, McMahon JH, Chow EP, et al. The HIV case cascade: a systematic review of data sources, methodology and comparability. J Int AIDS Soc. 2015;18(1):20634. doi: 10.7448/IAS.18.1.20634.
15. Kay ES, Batey DS, Mugavero MJ. The HIV treatment cascade and care continuum: updates, goals, and recommendations for the future. AIDS Res Ther. 2016;13:35. doi: 10.1186/s12981-016-0120-0.
16. Raymond N, Bargh K, Aung KL, Rice J. Cascade of care for people living with HIV infection in the Wellington region. NZ Med J. 2016;129(1432):41-51.
17. HHS Panel on Antiretroviral Guidelines for Adults and Adolescents. Guidelines for the Use of Antiretroviral Agents in Adults and Adolescents with HIV [Internet]. Department of Health and Human Services; 2023 [cited 2023 May 16]. Available from: https://clinicalinfo.hiv.gov/en/guidelines/adult-and-adolescent-arv.
18. Gandhi RT, Bedimo R, Hoy JF, et al. Antiretroviral Drugs for Treatment and Prevention of HIV infection in Adults: 2022 Recommendations of the International Antiviral Society-USA Panel. JAMA.

2023;329(1):63-84. doi: 10.1001/jama.2022.22246.
19. European AIDS Clinical Society. EACS Guidelines [Internet]. 2022 [cited 2023 May 16]. Available from: eacsociety.org/guidelines/eacs-guidelines/.
20. Bai R, Du J, Lv S, et al. Benefits and Risks of Rapid Initiation of Antiretroviral Therapy: a Systematic Review and Meta-Analysis. Front Pharmacol. 2022;13:898449. doi: 10.3389/fphar.2022.898449.
21. Michienzi SM, Barrios M, Badowski ME. Evidence Regarding Rapid Initiation of Antiretroviral Therapy in Patients Living with HIV. Curr Infect Dis Rep. 2021;23(5):7. doi: 10.1007/s11908-021-00750-5.
22. Hung CC, Phanuphak N, Wong CS, et al. Same-day and rapid initiation of antiretroviral therapy in people living with HIV in Asia. How far have we come? HIV Med. 2022;23 Suppl 4:3-14. doi: 10.1111/hiv.13410.
23. Mirzazadeh A, Eshun-Wilson I, Thompson RR, et al. Interventions to reengage people living with HIV who are lost to follow-up from HIV treatment programs: A systematic review and meta-analysis. PLoS Med. 2022;19(3):e 1003940. doi: 10.1371/journal.pmed.1003940.
24. Bateman JP, Saxton PJW, de Gouw A, et al. Late presentation of HIV infection among adults in New Zealand from 2011 to 2020. Int J STD AIDS. 2023;34(5):332-37. doi: 10.1177/09564624231151458.
25. Gilmour J, Henley R, Lowe M, et al. Delayed diagnosis of HIV infections in women in the Auckland and Northland regions. N Z Med J. 2022;135(1556):104-13.
26. Manatū Hauora – Ministry of Health. National HIV action plan for Aotearoa New Zealand 2023-2030 [Internet]. 2023 [cited 2023 May 18]. Available from: https://www.health.govt.nz/publication/national-hiv-action-plan-aotearoa-new-zealand-2023-2030.
27. Saxton PJW, Dickson NP, Griffiths R, et al. Actual and undiagnosed HIV prevalence in a community sample of men who have sex with men in Auckland, New Zealand. BMC Public Health. 2012;12:92. doi: https://doi.org/10.1186/1471-2458-12-92.
28. Kanters S, Vitoria M, Doherty M, et al. Comparative efficacy and safety of first-line antiretroviral therapy for the treatment of HIV infection: a systematic review and network meta-analysis. Lancet HIV. 2016;3(11):e510-e520. doi: 10.1016/S2352-3018(16)30091-1.

Exploring health professionals' viewpoint of provision of nutrition advice for women with endometrial cancer

Linda Williams, Claire Henry, Bryony Simcock, Sara Filoche

ABSTRACT

AIMS: The aim of this study was to explore barriers and facilitators to delivery and uptake of nutrition advice to women diagnosed with endometrial cancer from a health professionals' viewpoint.

METHODS: Fifteen semi-structured interviews with health professionals with experience in providing healthcare to women diagnosed with endometrial cancer were audio-recorded and transcribed. Interviews were analysed using reflexive thematic analysis. Topics included high weight as a risk factor for endometrial cancer, nutrition information sources, and barriers and facilitators to delivering nutrition advice in clinical care.

RESULTS: Four themes were identified. The first three exist as barriers to women receiving nutrition advice—how to navigate conversations about high weight, access to limited resourcing and health professionals feeling powerless to overcome system influences. The fourth theme identified a community approach need to facilitate a supportive environment and share knowledge.

CONCLUSIONS: This study, through the lens of health professionals, highlights barriers to the delivery and uptake of nutrition advice at the patient, community and system levels. Enhancing survivorship for women after the diagnosis of endometrial cancer may be enabled by further understanding of how to overcome barriers and promote facilitators. Communication and partnership with women are imperative to achieving this.

Endometrial cancer is the sixth most common cancer among women worldwide.[1] In 2020 there were 723 new cases of endometrial cancer in Aotearoa New Zealand, increased from 455 cases in 2011. It is now the fifth most frequently diagnosed cancer in the country. Age-standardised incidence rates are increasing for all women, with steady increases over the last 10 years. Cases are increasing rapidly in those under 50 years of age.[2] Pacific women carry the burden of disease, accounting for 18% of new cases despite accounting for 8% of the female population.[3]

Of the 20 most common cancers, endometrial cancer has the strongest association with high weight (body mass index >25kg/m^2).[4] The terms "obesity" and "overweight" are associated with stigma and negative connotations of individuals, and therefore the authors chose the term high weight throughout this article.[5,6] The likelihood of a woman with high weight developing endometrial cancer increases significantly as additional excess weight accumulates.[7] Excess weight results in unopposed estrogen excess, insulin resistance and inflammation, all of which promote endometrial cancer growth.[8,9]

Early-stage endometrial cancers are highly treatable with hysterectomy. In the last 20 years, 5-year survival rates in Aotearoa New Zealand have increased from 73–79%.[10] However, there is a significant sequalae with endometrial cancer survivors experiencing morbidity and mortality from cardiovascular disease.[11]

Endometrial cancer survivors have a higher incidence of unrecognised and inadequately treated hyperglycemia and elevated cholesterol, putting them at significantly higher 10-year increased risk of cardiovascular disease compared to women in the general population.[12,13]

Women with early-stage low grade endometrial cancer are more likely to die from cardiovascular disease than their endometrial cancer.[14] While there is currently insufficient high-quality evidence to determine the effect of lifestyle interventions on survival, quality of life, or significant weight loss in women with a history of endometrial cancer, weight-loss interventions have been associated with improvements in breast and colorectal cancer-

specific survival, as well as a reduction in the risk of cardiovascular disease.[15]

Improving survivorship for women with endometrial cancer has been identified as an area of unmet need by women with endometrial cancer, researchers and health professionals.[16]

Nutrition and lifestyle advice as part of survivorship care may have potential to modify comorbidities such as cardiovascular disease and enhance overall quality of life.[17]

A previous study reported a role for health promotion activities after treatment for endometrial cancer survivors, with participants reporting inadequate information and having to search on their own for advice and support.[18] An Aotearoa New Zealand-based qualitative interview study of cancer survivors reported a desire for more dietary information and support as part of a focus on health and wellbeing in the future.[19]

Nutrition advice is not routinely incorporated into the endometrial cancer care pathway. The aim of this study was to explore barriers and facilitators to delivery and uptake of nutrition advice to women diagnosed with endometrial cancer from a health professionals' viewpoint.

Methods

Health professionals with experience in providing healthcare to women diagnosed with endometrial cancer were recruited via snowball sampling. Initial recruitment began from the researchers' local networks. Participants were asked if they knew other suitable participants from their own networks. Contact details were shared, and LW directly emailed potential participants to invite them to take part. A wide range of health professions and specialities, as well as geographical locations across Aotearoa New Zealand, were invited to take part.

Participants took part in a one-on-one semi-structured interview with LW, who is female, an experienced dietitian and PhD candidate. CH is a biomedical scientist and SF is a health-care researcher. CH and SF were involved in the development of the study protocol and analysis. BS is a consultant gynaecological oncologist who assisted with analysis and interpretation.

Interviews commenced by LW explaining her background as well as the goals of the PhD research. Time was taken to build a relationship with participants. Written informed consent was obtained from the participants.

Interviews took place face-to-face in university or hospital buildings, or by video call. No repeat interviews took place. Written interview notes were made. Interviews were audio-recorded, transcribed using Otter.ai™ software and then manually checked for accuracy by LW.

A topic guide was used during the interview. Questions included exploring awareness of high weight as a risk factor for endometrial cancer, sources of nutrition information and barriers and facilitators to incorporating nutrition advice in the clinical care. Transcripts were not returned to participants for checking and participants did not provide feedback on the findings.

Transcripts were independently reviewed and coded by LW, CH and SF using a combination of manual coding and NVivo™ software. Analysis was undertaken using grounded theory. An inductive approach was taken using reflexive thematic analysis. Each researcher independently developed codes, sub-themes and main themes to create a coding tree. Regular meetings, collaboration and discussion were used to construct final themes. Analysis began after ten interviews. After twelve interviews thematic saturation emerged. A further three interviews were completed to confirm thematic exhaustion.

Results

Participant characteristics

Twenty health professionals were contacted via email, of whom 15 volunteered to take part. Interviews lasted between 25 and 58 minutes. Four were in person, and 11 were via video call. Demographics and professions of participants are displayed below (Table 1 and 2). Participants' geographical locations were spread across the Te Whatu Ora regions with three in Northern, nine in Central and three in Te Waipounamu.

Four themes and eight sub-themes were constructed using thematic analysis (Table 3). The first three were barriers to women receiving nutrition advice: how to navigate conversations about high weight, access to limited resourcing and health professionals feeling powerless to overcome system influences. The fourth theme explores a community approach need to facilitate a supportive environment and share knowledge.

Theme 1: how to navigate conversations

Health professionals' skills and confidence in navigating conversations about high weight were identified as barriers to knowledge being shared and nutrition advice being accessible.

Table 1: Profession of participants.

Profession	Number
Consultant Obstetrician and Gynaecologist	1
Consultant Gynae-Oncologist	2
Obstetrics and Gynaecology Registrar	1
Gynaecology Clinical Nurse Specialist	3
Medical Oncology Nurse	1
Medical Oncologist	1
Radiation Oncologist	1
Oncology Dietitian	2
Radiation Therapist	1
Cancer Society Nurse	1
General Practitioner	1

Table 2: Demographics of participants.

Age	
<40 years	5
>40 years	10
Ethnicity	
Māori	2
Asian	2
European	11
Gender	
Female	14
Male	1

Table 3: Thematic structure.

Inductive codes	Preliminary/sub-themes	Final themes
Clinician finds conversations hard	Overcoming taboo	**Theme 1: how to navigate conversations**
Blame/shame		
Cultural considerations	Engagement and timing	
Differences in clinician approach		
Engagement important for cancer treatment	Sense of responsibility to share knowledge	
Responsibility to share knowledge		
Culturally appropriate care		
Lack of access to nutrition care	Need for improved resourcing	**Theme 2: access to limited resourcing**
Format of nutrition care		
Sources of information	Survivorship care	
Survivorship care		
Food poverty	Social determinants of health	**Theme 3: health professionals feel powerless to overcome system influences**
Health geography		
Assumption that nutrition is low priority for low socio-economic group		
Family/whānau approach	Family/whānau and community as enablers	**Theme 4: approach needed to facilitate a supportive environment and share knowledge**
Motivations for change		
Culturally appropriate care	Approach needed	
Primary care		
Public health		

Table 4: Example quotes for Theme 1.

Quote
"*It is a bit of a taboo subject, I think, because how do you raise it without causing offence or apportioning blame? And I think it's just too hard for a lot of clinicians*." (Interviewee 15)
"*I think health professionals find it hard to talk to women about weight, because of the fat shaming thing people do struggle. We, the health professionals, do, and I think it's something we need to get better at doing. I think the really huge thing is somehow we need to get medical professionals better at tackling these kinds of those conversations with women*." (Interviewee 11)
"*That could then be a barrier for them accessing care and the right treatments that they need later down the line. It's like, I think we are not wanting to alienate them, and we need to educate them appropriately about that. It is quite a difficult space to navigate*." (Interviewee 8)
"*I think the women deserve to know what is causing the issue. We're not saying this because if you lose a couple of kilos your cancer is going to regress. It is what it is. But moving forward, we can reduce the risk of the cancer coming back. Plus, we can reduce all the other comorbidity related conditions*." (Interviewee 9)
"*I think it's difficult. I think the real answer is they don't want to talk to me. Because I'm a bloke and I really try, but I think that there are possibly other people who can do it better than I can. And I'll do my best ... I think women speaking to women will be better*." (Interviewee 2)
"*I think talking to someone from their cultural background would be helpful. Even though their English is very good, some information cannot be filtered through. So, I think having somebody from their own culture*." (Interviewee 13)

Table 5: Example quotes for Theme 2.

Quote
"*My advice is very general. I speak to them about exercise, and I speak to them very generically about diet. I give as much of encouragement as possible. I give them a Green Prescription for exercise, but I don't have any dietitian service I can refer to*." (Interviewee 2)
"*In terms of treatment, endometrial cancer, we are treating a symptom of obesity. Then there's the whole other range of cardiovascular, diabetic, joint problems. We're just not addressing them. We're dealing with a symptom*." (Interviewee 2)
"*Every system has got things that they do well, don't do well, but I honestly don't know. I feel like our healthcare is kind of down there, for these women anyway. I feel awful for them*." (Interviewee 9)

Table 6: Example quotes for Theme 3.

Quote
"*It's cheaper to buy Coke, it's cheaper to buy pies. It's the whole poverty and the whole social settings there as well*." (Interviewee 6)
"*You can imagine in an affluent area you had to go quite a long way to find fast-food, but if you live in a less affluent area there were any number of places. I think that's huge, it's probably the main thing I'd go as far as to say*." (Interviewee 11)
"*I would suggest that a lot of a lot of people I look after, it's not on their radar of concern, because they have too many other things to worry about. Feeding the family, keeping their jobs, they don't believe that their nutrition is important. I might be wrong, but I'm not sure that they know much about that*." (Interviewee 10)

Table 7: Example quotes for Theme 4.

Quote
"*Eating and food is something so heavily integrated into our society—family, whānau, friend gatherings, for reward or comfort. I think it is also important that the information is given is appropriate for the patients and their family and support network*." (Interviewee 3)
"*Women want nutrition information, but they eat what their families eat, how they were brought up eating, as their community does. Generally, women do best when husbands, children and whānau are engaged*." (Interviewee 4)
"*So, this is not me being judgmental. But you know, when you see a patient, you need to look at everything. It's not just the patient, it is the family, it is what sort of support they have. So, I think engaging with family sometimes works a lot better*." (Interviewee 9)
"*In my experience, women are keen and motivated and want to understand, want to do well, particularly that young cohort … They want to have children!*" (Interviewee 10)
"*We had a Pacific Island health support group. It was that sort of service that was really, really, really, really valuable. I just found it helped us to make sure that we were really meeting the patient's needs. Sometimes we thought we were, but we weren't. So, it was the rapport building. It was everything. It was just so important*." (Interviewee 7)
"*Women would want to talk; they often fall outside of western medicine practices due to their cultures, so need culturally appropriate interventions*." (Interviewee 4)
"*I think that a lot of that has to come into primary care, I mean, a lot of the women will be seen in general practices, pregnancy stuff, contraceptives and smears and things. There are opportunities for the practice nurses doing the smears and actually being able to say to patients who are coming regularly 'Do you know that lifestyle can reduce cancer?' And using that kind of little opportunity to actually do some health promotion?*" (Interviewee 11)
"*The GP also has closer rapport than the extended healthcare worker, so, like, the GP can encourage people to see a dietitian if they are overweight*." (Interviewee 13)
"*I actually think that looking at the endometrial cancer population … probably the horse has bolted by that stage. And in terms of preventative medicine, it needs to be with primary care and with schools. And it's then the education around being taught to cook at schools, being taught to garden at schools, that sort of thing is going to change more, than 500 women a year who get endometrial cancer*." (Interviewee 14)

Overcoming taboo

Taboo, apportioning blame and not causing offence were discussed as reasons why participants did not start conversations about high weight. Two participants questioned whether conversations about high weight were taking place at all for some women, as the discomfort felt by the health professionals may mean the subject was avoided entirely. Finding the right language to use was consistently mentioned as a barrier by participants who were cautious to not place blame but were not confident in the correct respectful language to use to navigate a supportive conversation. Only one health professional was confident in initiating conversations. Several participants suggested that health professionals needed to improve their skills and confidence regarding approaching these conversations while being able to continue to build rapport and engagement with their patients.

Engagement and timing

Five participants felt that conversations about high weight should be taking place in primary care and were the responsibility of the oncology team. The time of cancer diagnosis and treatment planning was considered an inappropriate time to discuss high weight due to the perception of causing overload of information. Having a conversation with a woman about high weight was viewed as potentially risky and harmful to the trusting relationship required for cancer treatment.

Sense of responsibility to share knowledge

Despite finding it difficult to have conversations about high weight, several participants felt a responsibility to share knowledge and provide education to women.

How to share knowledge was considered a sensitive area, and some participants did not feel they were the right person. It was suggested that it would be better for women to be talking to women and that receiving advice from professionals from a different cultural background made it harder to raise and continue the conversation in a culturally safe way. Participants were aware that any public health messaging campaigns were too late for women already diagnosed with endometrial cancer but felt a responsibility to raise awareness to the next generation of women.

Theme 2: access to limited resources

Need for improved resourcing

Access to resources was identified as a barrier to providing nutrition advice for women with endometrial cancer. Eleven participants reported that nutrition advice from a professional such as a dietitian was not accessible. Discussion on nutrition and high weight was often lacking due to time pressures. Participants talked about wanting to assist women with nutrition advice post treatment; however, they did not know of appropriate community services.

Participants were unsure where women received nutrition information from. Social media was mentioned by two dietitians as a source of information. The reliability and accuracy of this information was questioned. Some thought GPs and consultants were giving out nutrition and lifestyle information. Different localities had access to different services for their women, with one service having access to a gym programme and others having no access at all.

Survivorship

Five interviewees identified a lack of survivorship care and highlighted this as an opportunity to provide women with nutrition advice to optimise coexisting comorbidities. Interviewee 2 highlighted that treatment of endometrial cancer with hysterectomy cured the cancer but did not address the causative factors of the cancer. Two clinical nurse specialists were planning to set up their own survivorship clinics to provide holistic care to women. Both reported limited access to accurate and reliable resources to assist with this.

Theme 3: provider feels powerless to overcome system influences

Participants expressed feeling powerless to overcome the wider influences within society that contribute to women's nutrition options and choices. Ten participants identified social determinants of health, such as rising food costs and prevalence of fast-food outlets in low socio-economic areas as barriers. The cost of fast-food was often considered the cheaper option than cooking homemade meals for families who have limited resources. The prevalence of fast-food takeaways in areas of high deprivation was also highlighted as a barrier. Two participants expressed their worry about targeting by fast-food companies to low socio-economic areas. Six participants assumed that nutrition was a low priority for some women due to other life stressors such as caring for families, working and providing food.

Theme 4: approach needed to facilitate a supportive environment and share knowledge

Participants discussed that a multilevel approach was needed to raise awareness of high weight as a risk factor for cancer and to provide access to nutrition advice.

Family/whānau and community as enablers

Four participants highlighted the importance of a woman's family/whānau and community, and how it can impact an individual's health, lifestyle choices and decisions. The importance of providing advice that is accessible and suitable for the whole family/whānau was thought to be important. Two participants emphasised this by discussing their experiences working in largely Pacific populations. Intergenerational living and focus on childbearing were significant among these communities and decisions about women's health were often decided at a whānau/family level.

A community approach to overcoming barriers and opening conversations about high weight and gynaecological conditions was considered essential to removing taboos and promoting access to information. It was felt that progress was being made in some of these areas by local community-led campaigns, but this needed to be followed through at all levels such as primary care and public health messaging.

Participants highlighted motivating factors that they felt were important when considering solutions. Conserving fertility for future children and being healthy for current children and grandchildren were considered highly motivating factors.

Approach needed

Partnership with Māori- and Pacific-led services was thought to be important to ensure that the advice given was culturally appropriate. Participants were aware that women may feel more comfortable when speaking with women of their own culture. One nurse discussed how she was planning to set up a survivorship clinic in partnership with Pacific and Māori cancer nurse specialists. Building partnerships with local cultural health services was seen to facilitate the delivery of culturally appropriate nutrition advice.

Tertiary clinicians often assumed conversations about nutrition and lifestyle were taking place in primary care. Primary care was identified as an area to begin conversations about nutrition and lifestyle. This was because women have more regular contact and longer-term relationships with their primary care team.

Participants suggested that public health messaging was needed to educate on the link between high weight and cancer to raise awareness in the community. Several acknowledged that this is a difficult topic to talk about publicly and difficult to get the messaging right; however, they felt that women should have access to the knowledge.

Four participants suggested that public health initiatives needed to be directed at the next generation of women by increasing healthy eating education in schools and teaching young people cooking skills. Interventions targeting women already diagnosed with endometrial cancer were considered too late and young women in the next generation needed to have access to healthy eating and activity education programs so they were empowered.

Discussion

The aim of this study was to explore the barriers and facilitators to the delivery and uptake of nutrition advice for women with a history of endometrial cancer from the perspective of healthcare professionals. Our findings reveal that having open conversations about high weight, limited resourcing and system influences were all perceived barriers. Health professionals had suggestions on how to facilitate a supportive environment for nutrition advice to be accessible.

Not knowing how to initiate a conversation about high weight is common, with both health professionals and people living with high weight reporting hesitation.[20] When weight is discussed, the language used, the tone of the consultation and the nature of the advice are considered critical to create an environment that is safe for both the health professional and women.[21] A qualitative study of women with high weight and a history of endometrial cancer found that most health providers did not discuss high weight, despite women reporting a desire to have been counselled specifically on the association with endometrial cancer.[22] Health professionals' skills and confidence in managing conversations about high weight have been recognised and identified as an area for improvement.[23,24] Our qualitative study identifies this need among health professionals in Aotearoa New Zealand when discussing survivorship after endometrial cancer.

There is an increasing need for survivorship support. International guidelines identify that cancer survivors are at risk of developing other primary cancers and chronic conditions, and recommend health promotion activities for all cancer survivors.[25] Multiple studies have identified the correlation of cardiovascular risk factors in women with a history of endometrial cancer and suggest health promotion activities to modify traditional risk factors.[11,13] Our study has identified that there is a significant lack of resources in the provision of nutrition and other lifestyle advice for endometrial cancer survivors. Due to this, survivorship care is not routine and is being developed at local levels by clinical nurse specialists due to local need being identified.

This study identified that health professionals feel powerless to overcome system barriers such as access to healthy food, prevalence of fast-food outlets in low socio-economic areas and financial burden. Two studies have identified that women living in socially deprived areas are more likely to present with advanced endometrial cancer, thus compounding the impact social determinants can have on the prevalence and presentation of the disease.[26,27]

It is well documented that people living in low socio-economic areas are more likely to be living with high weight and its associated comorbidities. Within Aotearoa New Zealand, research has shown a high growth rate in endometrial cancer cases in under 50-year-old women living in the most socio-economically deprived quintiles of Auckland.[28] In 2009, Richardson stated "overweight and obesity cannot be managed only at the individual level. Community level policy changes and interventions are needed to complement individual efforts."[29] This agrees with our findings that policy changes and community actions are required.

Our study highlights that assumptions can be made by health professionals about whether nutrition is important to individual women and whether women have the means to make decisions and choices about their nutrition. This unconscious bias may disadvantage women and result in different recommendations and inconsistent application of clinical guidelines by health professionals which could disempower women.[30]

Participants highlighted several areas for improvement to facilitate and empower women to have access to nutrition advice. Recommendations include health promotion initiatives that are family-focused and community-led, overcoming the taboo of talking about gynaecology and high weight, as well as harnessing motivating factors such as maintaining fertility. Engaging with local cultural health providers, initiating nutrition and lifestyle conversations in primary care, raising awareness of the links between high weight and cancer through public health messaging, and educating and empowering the next generation were all recommended steps to facilitate a supportive environment where knowledge is shared with women.

A strength of this study is the in-depth interviews conducted by a researcher independent from the clinical departments of the interviewees. A wide range of health professionals were interviewed. Paraphrasing and summarising were used through the interviews by the researcher to clarify meaning and increase rigour to the data collected. Three researchers read and coded all the transcripts independently, allowing for investigator triangulation to achieve themes, increase rigour and thus reduce observer bias. A completed Consolidated Criteria for Reporting Qualitative research (COREQ) checklist is provided for this research (Appendix 1). A limitation of this study is that thirteen of the interviewees were employed by tertiary health services, one by primary care services and one by an independent charity. This may influence the transferability of the results.

Endometrial cancer cases are increasing globally. Due to high rates of successful treatment for early-stage cases, there are increasing numbers of women who require survivorship care. This research builds on evidence of a lack of survivorship care for women with a history of endometrial cancer. Resourcing survivorship care and addressing the barriers identified may have the potential to have a significant impact on all-cause morbidity and mortality for women who have experienced endometrial cancer. This may be enabled through further understanding of how to overcome barriers and promote facilitators. Communication and partnership with women are imperative to achieving this.

COMPETING INTERESTS
Nil.

ACKNOWLEDGEMENTS
We would like to thank the health professionals who contributed their valuable time, knowledge and experiences to this research.

AUTHOR INFORMATION
Mrs Linda Williams: PhD Candidate, Department of Surgery and Anaesthesia, University of Otago, Wellington.
Dr Claire Henry: Lecturer, Department of Surgery and Anaesthesia, University of Otago, Wellington.
Dr Bryony Simcock: Consultant Gynae-Oncologist, Department of Gynaecology, Christchurch Hospital, Te Whatu Ora – Waitaha Canterbury.
Associate Professor Sara Filoche: Associate Dean of Research, Head of Department, Department of Obstetrics, Gynaecology and Women's Health, University of Otago, Wellington.

CORRESPONDING AUTHOR
Linda Williams: Department of Surgery and Anaesthesia, University of Otago, Wellington. Ph: 021 176 0668. E: linda.williams@postgrad.otago.ac.nz

REFERENCES
1. Sung H, Ferlay J, Siegel RL et al. Global Cancer Statistics 2020: GLOBOCAN Estimates of Incidence and Mortality Worldwide for 36 Cancers in 185 Countries. CA Cancer J Clin. 2021;71(3): 209-249. doi: 10.3322/caac.21660.
2. Te Whatu Ora – Health New Zealand. New Zealand Cancer Registry (NZCR) [Internet]. Wellington: Te Whatu Ora – Health New Zealand; 2022 [cited 2023 Apr 10]. Available from: https://www.health.govt.nz/nz-health-statistics/national-collections-and-surveys/collections/new-zealand-cancer-registry-nzcr.
3. Scott OW, Tin Tin S, Bigby SM, Elwood JM. Rapid increase in endometrial cancer incidence and ethnic differences in New Zealand. Cancer Causes Control. 2019;30(2):121-127. doi: 10.1007/s10552-019-1129-1.
4. Kitson SJ, Crosbie EJ. Endometrial cancer and obesity. Obstet Gynaecol. 2019; 21(4):237-245. doi: 10.1111/tog.12601.
5. Johnstone J, Herredsberg C, Lacy L et al. What I Wish My Doctor Really Knew: The Voices of Patients With Obesity. Ann Fam Med. 2020;18(2):169-171. doi: 10.1370/afm.2494.
6. King L, Gajarawala S, McCrary MD. Endometrial cancer and obesity: Addressing the awkward silence. JAAPA. 2023;36(1):28-31. doi: 10.1097/01.JAA.0000902884.01725.a3.
7. Jenabi E, Poorolajal J. The effect of body mass index on endometrial cancer: a meta-analysis. Public Health. 2015;129(7):872-80. doi: 10.1016/j.puhe.2015.04.017.
8. Burzawa JK, Schmeler KM, Soliman PT, et al. Prospective evaluation of insulin resistance among endometrial cancer patients. Am J Obstet Gynecol. 2011;204(4):355.e1-7. doi: 10.1016/j.ajog.2010.11.033.
9. Schmandt RE, Iglesias DA, Co NN, Lu KH. Understanding obesity and endometrial cancer risk: opportunities for prevention. Am J Obstet Gynecol. 2011;205(6):518-25. doi: 10.1016/j.ajog.2011.05.042.
10. Te Aho o Te Kahu, Cancer Control Agency. He Pūrongo Mate Pukupuku o Aotearoa 2020, The State of Cancer in New Zealand 2020 [Internet]. Wellington: Te Aho o Te Kahu, Cancer Control Agency; 2021 [cited 2023 Apr 10]. Available from: https://teaho.govt.nz/reports/cancer-state.
11. Sturgeon KM, Deng L, Bluethmann SM, et al. A population-based study of cardiovascular disease mortality risk in US cancer patients. Eur Heart J. 2019;40(48):3889-3897. doi: 10.1093/eurheartj/ehz766.
12. Kitson SJ, Lindsay J, Sivalingam VN, et al. The unrecognized burden of cardiovascular risk factors in women newly diagnosed with endometrial cancer: A prospective case control study. Gynecol Oncol. 2018;148(1):154-160. doi: 10.1016/j.ygyno.2017.11.019.
13. Coughlin SS, Datta B, Guha A, et al. Cardiovascular conditions and obesity among gynecologic cancer survivors: Results from the 2020 behavioral risk factor surveillance system survey. Gynecol Oncol. 2022;165(3):405-409. doi: 10.1016/j.ygyno.2022.03.025.
14. Ward KK, Shah NR, Saenz CC, et al. Cardiovascular disease is the leading cause of death among endometrial cancer patients. Gynecol Oncol. 2012;126(2):176-9. doi: 10.1016/j.ygyno.2012.04.013.
15. Agnew H, Kitson S, Crosbie EJ. Interventions for weight reduction in obesity to improve survival in women with endometrial cancer. Cochrane Database Syst Rev. 2023;3(3):CD012513. doi: 10.1002/14651858.CD012513.pub3.
16. Wan YL, Beverley-Stevenson R, Carlisle D, et al. Working together to shape the endometrial cancer research agenda: The top ten unanswered research questions. Gynecol Oncol. 2016;143(2):287-293. doi: 10.1016/j.ygyno.2016.08.333.

17. Hamilton CA, Pothuri B, Arend RC, et al. Endometrial cancer: A society of gynecologic oncology evidence-based review and recommendations, part II. Gynecol Oncol. 2021;160(3):817-826. doi: 10.1016/j.ygyno.2020.12.021.
18. Koutoukidis DA, Beeken RJ, Lopes S, et al. Attitudes, challenges and needs about diet and physical activity in endometrial cancer survivors: a qualitative study. Eur J Cancer Care (Engl). 2017;26(6). doi: 10.1111/ecc.12531.
19. Peniamina R, Davies C, Moata'ane L, et al. Food, nutrition and cancer: perspectives and experiences of New Zealand cancer survivors. N Z Med J. 2021;134(1545):22-35.
20. Albury C, Strain WD, Brocq SL, et al. The importance of language in engagement between health-care professionals and people living with obesity: a joint consensus statement. Lancet Diabetes Endocrinol. 2020;8(5):447-455. doi: 10.1016/S2213-8587(20)30102-9.
21. Ananthakumar T, Jones NR, Hinton L, Aveyard P. Clinical encounters about obesity: Systematic review of patients' perspectives. Clin Obes. 2020;10(1):e12347. doi: 10.1111/cob.12347.
22. Cusimano MC, Simpson AN, Han A, et al. Barriers to care for women with low-grade endometrial cancer and morbid obesity: a qualitative study. BMJ Open. 2019;9(6):e026872. doi: 10.1136/bmjopen-2018-026872.
23. Ashman F, Sturgiss E, Haesler E. Exploring Self-Efficacy in Australian General Practitioners Managing Patient Obesity: A Qualitative Survey Study. Int J Family Med. 2016;2016:8212837. doi: 10.1155/2016/8212837.
24. Nolan C, Deehan A, Wylie A, Jones R. Practice nurses and obesity: professional and practice-based factors affecting role adequacy and role legitimacy. Prim Health Care Res Dev. 2012;13(4):353-63. doi: 10.1017/S1463423612000059.
25. Rock CL, Thomson CA, Sullivan KR, et al. American Cancer Society nutrition and physical activity guideline for cancer survivors. CA Cancer J Clin. 2022;72(3):230-262. doi: 10.3322/caac.21719.
26. Helpman L, Pond GR, Elit L, et al. Endometrial cancer presentation is associated with social determinants of health in a public healthcare system: A population-based cohort study. Gynecol Oncol. 2020;158:130-136. doi: 10.1016/j.ygyno.2020.04.693.
27. Lyratzopoulos G, Abel GA, Brown CH, et al. Socio-demographic inequalities in stage of cancer diagnosis: evidence from patients with female breast, lung, colon, rectal, prostate, renal, bladder, melanoma, ovarian and endometrial cancer. Ann Oncol. 2013;24(3):843-50. doi: 10.1093/annonc/mds526.
28. Bigby SM, Tin Tin S, Eva LJ, et al. Increasing incidence of endometrial carcinoma in a high-risk New Zealand community. Aust N Z J Obstet Gynaecol. 2020;60(2):250-257. doi: 10.1111/ajo.13108.
29. Richardson LC, Thomas C, Bowman BA. Obesity and endometrial cancer: challenges for public health action. Womens Health (Lond). 2009;5(6):595-7. doi: 10.2217/whe.09.62.
30. Matthews BJ, Qureshi MM, Fiascone SJ, et al. Racial disparities in non-recommendation of adjuvant chemotherapy in stage II-III ovarian cancer. Gynecol Oncol. 2022;164(1):27-33. doi: 10.1016/j.ygyno.2021.10.090.

Appendix 1: COREQ (COnsolidated criteria for REporting Qualitative research) Checklist.

A checklist of items that should be included in reports of qualitative research. You must report the page number in your manuscript where you consider each of the items listed in this checklist. If you have not included this information, either revise your manuscript accordingly before submitting or note N/A.

Topic	Item no.	Guide questions/description	Reported on page no.
Domain 1: research team and reflexivity			
Personal characteristics			
Interviewer/facilitator	1	Which author/s conducted the interview or focus group?	3
Credentials	2	What were the researcher's credentials? e.g., PhD, MD	3
Occupation	3	What was their occupation at the time of the study?	3
Gender	4	Was the researcher male or female?	3
Experience and training	5	What experience or training did the researcher have?	3
Relationship with participants			
Relationship established	6	Was a relationship established prior to study commencement?	3
Participant knowledge of the interviewer	7	What did the participants know about the researcher? e.g., personal goals, reasons for doing the research	3
Interviewer characteristics	8	What characteristics were reported about the interviewer/facilitator? e.g., bias, assumptions, reasons and interests in the research topic	3
Domain 2: study design			
Theoretical framework			
Methodological orientation and theory	9	What methodological orientation was stated to underpin the study? e.g., grounded theory, discourse analysis, ethnography, phenomenology, content analysis	3
Participant selection			
Sampling	10	How were participants selected? e.g., purposive, convenience, consecutive, snowball	3
Method of approach	11	How were participants approached? e.g., face-to-face, telephone, mail, email	4
Sample size	12	How many participants were in the study?	4
Non-participation	13	How many people refused to participate or dropped out? Reasons?	4

Appendix 1 (continued): COREQ (COnsolidated criteria for REporting Qualitative research) Checklist.

Topic	Item no.	Guide questions/description	Reported on page no.
Domain 2: study design			
Setting			
Setting of data collection	14	Where was the data collected? e.g., home, clinic, workplace	3
Presence of non-participants	15	Was anyone else present besides the participants and researchers?	3
Description of sample	16	What are the important characteristics of the sample? e.g., demographic data, date	4
Data collection			
Interview guide	17	Were questions, prompts, guides provided by the authors? Was it pilot tested?	3
Repeat interviews	18	Were repeat interviews carried out? If yes, how many?	3
Audio/visual recording	19	Did the research use audio or visual recording to collect the data?	3
Field notes	20	Were field notes made during and/or after the interview or focus group?	3
Duration	21	What was the duration of the interviews or focus group?	4
Data saturation	22	Was data saturation discussed?	4
Transcripts returned	23	Were transcripts returned to participants for comment and/or correction?	3
Domain 3: analysis and findings			
Data analysis			
Number of data coders	24	How many data coders coded the data?	3
Description of the coding tree	25	Did authors provide a description of the coding tree?	5–6
Derivation of themes	26	Were themes identified in advance or derived from the data?	4
Software	27	What software, if applicable, was used to manage the data?	3
Participant checking	28	Did participants provide feedback on the findings?	3
Reporting			
Quotations presented	29	Were participant quotations presented to illustrate the themes/findings? Was each quotation identified? e.g., participant number	7–12

Appendix 1 (continued): COREQ (COnsolidated criteria for REporting Qualitative research) Checklist.

Topic	Item no.	Guide questions/description	Reported on page no.
Domain 3: analysis and findings			
Reporting			
Data and findings consistent	30	Was there consistency between the data presented and the findings?	7–12
Clarity of major themes	31	Were major themes clearly presented in the findings?	4
Clarity of minor themes	32	Is there a description of diverse cases or discussion of minor themes?	6–12

Developed from: Tong A, Sainsbury P, Craig J. Consolidated criteria for reporting qualitative research (COREQ): a 32-item checklist for interviews and focus groups. Int J Qual Health Care. 2007 Dec;19(6):349-357. doi: 10.1093/intqhc/mzm042.

Once you have completed this checklist, please save a copy and upload it as part of your submission. DO NOT include this checklist as part of the main manuscript document. It must be uploaded as a separate file.

Appendix 2: Health professionals' viewpoint—nutrition advice for endometrial cancer.

Appendix 2: Topic guide.

1.	Link between high weight and endometrial cancer • What do you know regarding nutrition, high weight and endometrial cancer? • Thinking about the women you work with, do you think there is knowledge of the link of nutrition, high weight and endometrial cancer?
2.	Nutrition advice in the endometrial cancer care pathway • Do you know where women with endometrial cancer get information about nutrition and lifestyle? • During women's journeys from initial symptoms to diagnosis and treatment, have you heard of women receiving lifestyle and nutrition advice from a registered professional?
3.	What nutrition advice is needed? • In your experience, what information would women want with regards to nutrition and lifestyle? • In what format and from whom do you think women would like to receive nutrition and lifestyle advice?
4.	Approaching women to participate in nutrition research • Do you think women will be willing to talk about nutrition/lifestyle and their endometrial cancer care pathway experience? • Given I am European and I am aiming to consult women of all ethnicities, particularly Māori and Pacific, how would you recommend I go about recruitment and interviews?
5.	Who else should I speak to? In order to get a wide range of information from professionals working with women with endometrial cancer, who else would you recommend I talk to?

A glimpse into the incidence and mortality of aortic dissection in Aotearoa New Zealand

Eric TA Lim, Adib Khanafer

ABSTRACT

BACKGROUND: Aortic dissection is a lethal medical diagnosis associated with high morbidity and mortality. Currently published studies have noted a rising incidence of aortic dissection globally as well as a downward trend in mortality secondary to aortic dissection. There remains no nationally available study here in Aotearoa New Zealand looking into the incidence and mortality of aortic dissection.

METHOD: A retrospective observational study was performed using data extracted from the Manatū Hauora – Ministry of Health National Minimum Dataset (NMDS) from 1 July 2001 to 30 June 2021. Diagnosis of aortic dissection was based on the ICD-10 version 2 code for aortic dissection (I7100). Population-based statistics were obtained from Statistics New Zealand.

RESULT: A total of 4,737 patients were included in the study over the 20-year period. The incidence rate of aortic dissection in Aotearoa New Zealand is rising and the current median incidence rate is 4.99 per 100,000 per annum. The mortality rate from aortic dissection is slowly decreasing in Aotearoa New Zealand and the current median mortality rate is 2.19 per 100,000 per annum.

CONCLUSION: There appears to be a rise in the incidence of aortic dissection in Aotearoa New Zealand and a decrease in the mortality rate.

Aortic dissection is considered an uncommon medical presentation, yet it is associated with high morbidity and mortality if not recognised. The increased awareness of aortic dissection, the ease of access to healthcare as well as the advancement of medical imaging has allowed for prompt diagnosis of aortic dissection.

Aortic dissection can be classified based on the Stanford classification as type A or type B.[1,2] This is the most commonly used clinical classification. The other well-known classification system is the DeBakey classification, which is more descriptive but less commonly used in clinical practice. In recent years, a new distinct type has been proposed, known as non-A non-B aortic dissection.[1] Diagnosis of aortic dissection is confirmed by computed tomography angiography (CTA) or magnetic resonance aortography (MRA).[1] This is characterised by the presence of a "true lumen", which refers to the initial channel of blood flow, and a "false lumen", which is a new channel created between the layers of the aortic wall, from our understanding of the pathophysiology of the disease.[2]

It is noted that the incidence of aortic dissection has been on the rise over the years, with mortality being on the downtrend.[3,4] Current incidence of aortic dissection globally is quoted to be at 4.8 per 100,000 per annum.[3] This is a clear difference compared to previously published studies from more than 10 years ago, which demonstrated the global incidence of aortic dissection to be at 3.4 per 100,000 per annum.[3] Locally in Aotearoa New Zealand, currently available studies only looked at the incidence of aortic dissection in one specific region rather than nationally.[5] Thus, to date, there are no published studies looking into the incidence of aortic dissection and its mortality in New Zealand. Therefore, this study is aimed at identifying the incidence and mortality of aortic dissection in Aotearoa New Zealand.

Methods

We performed a retrospective observational study looking at patients diagnosed with aortic dissection. Data were obtained from the publicly available Manatū Hauora – Ministry of Health of New Zealand National Minimum Dataset (NMDS) from 1 July 2001 to 30 June 2021. The diagnosis of aortic dissection was based on the International Classification of Diseases (ICD-10) version 2 code for aortic dissection (I7100), which includes patients with a diagnosis of aortic dissection, unspecified site (I7100), aortic dissection, thoracic (I7101), aortic dissection, abdominal (I7102) and aortic dissection, thoracoabdominal (I7103) in the study. Population-based statistics were obtained

from publicly available data from Statistics New Zealand. Data were analysed using Microsoft Excel. Categorical data are presented as counts (percentages). Ethical approval was not required due to the nature of the study design.

Results

A total of 4,737 patients were included in the study over the 20-year period. There were 2,830 male patients and 1,907 female patients. Most of the patients identified themselves as NZ European/Pakeha (55.3%). This was followed by Māori at 19.3% and Pacific Islanders 8.8% (Table 1). Aortic dissection appears to be more common in the 50–80-year-old age group, with the mode being in the 70–79-year-old age group. In terms of gender, the peak incidence of aortic dissection for males is younger, in the 60–69-year-old age group; however, for females, this is in the 70–79-year-old age group (Figure 1).

Over the 20-year data period, the incidence of aortic dissection in Aotearoa New Zealand has been rising steadily (Figure 2). Based on the population data obtained from Statistics New Zealand, the calculated median incidence of aortic dissection in New Zealand is 4.99 per 100,000 per annum.

In terms of mortality from aortic dissection, this appears to have been slowly decreasing over the past 20 years (Figure 3). The calculated median mortality rate from aortic dissection is 2.19 per 100,000 annum in Aotearoa New Zealand. Our data show that most deaths due to aortic dissection occur in the 70–79-year-old age group. This is the same when stratified based on gender (Figure 4).

Table 1: Demographics.

Age group	Male	Female
<20	11 (0.2%)	3 (0.1%)
20–29	30 (0.6%)	20 (0.4%)
30–39	127 (2.7%)	49 (1.0%)
40–49	313 (6.6%)	112 (2.4%)
50–59	607 (12.8%)	263 (5.6%)
60–69	712 (15.0%)	430 (9.1%)
70–79	665 (14.0%)	560 (11.8%)
80–89	334 (7.1%)	402 (8.5%)
90–99	31 (0.7%)	68 (1.4%)
Ethnicity		
NZ European/Pākehā	1,517 (32.0%)	1,104 (23.3%)
Māori	546 (11.5%)	371 (7.8%)
Pacific Islander	246 (5.2%)	171 (3.6%)
Other European	258 (5.4%)	123 (2.6%)
Asian	164 (3.5%)	99 (2.1%)
Other	60 (1.3%)	24 (0.5%)
Not stated	39 (0.8%)	15 (0.3%)

Figure 1: Incidence of aortic dissection by age group and gender.

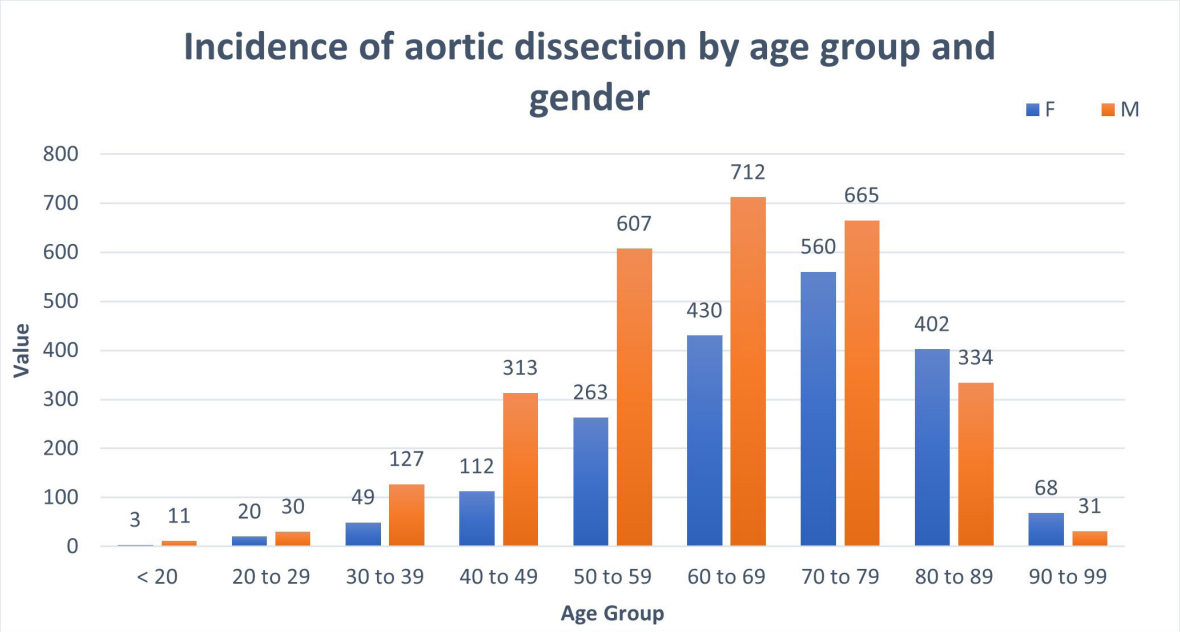


Figure 2: Incidence of aortic dissection per financial year.

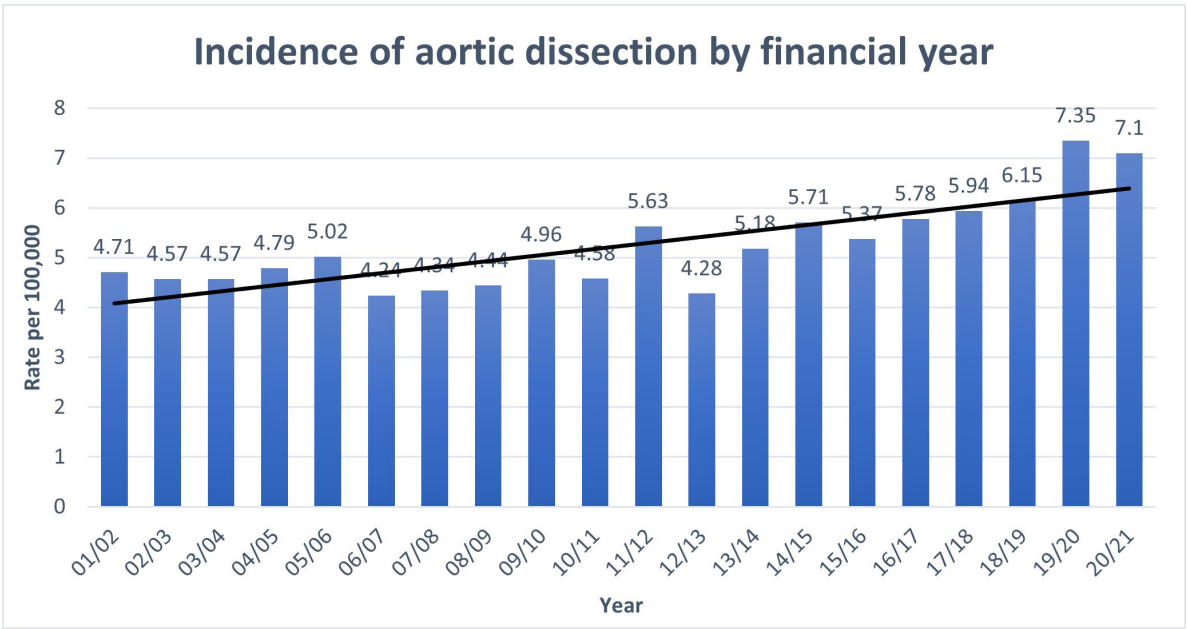


Figure 3: Mortality from aortic dissection per financial year.

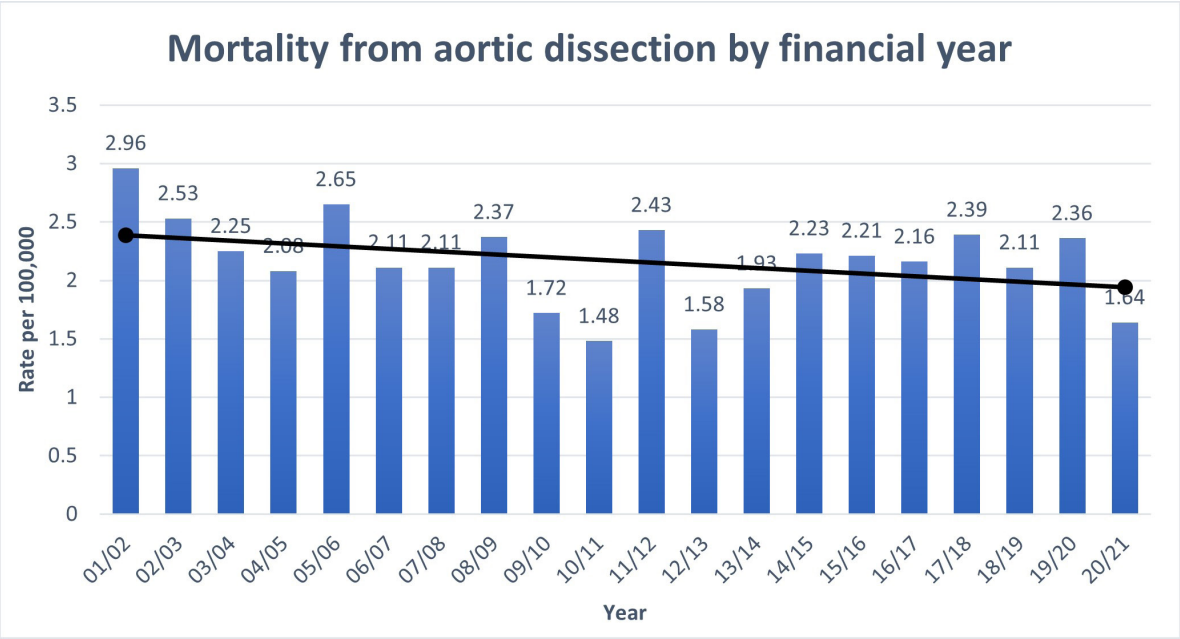
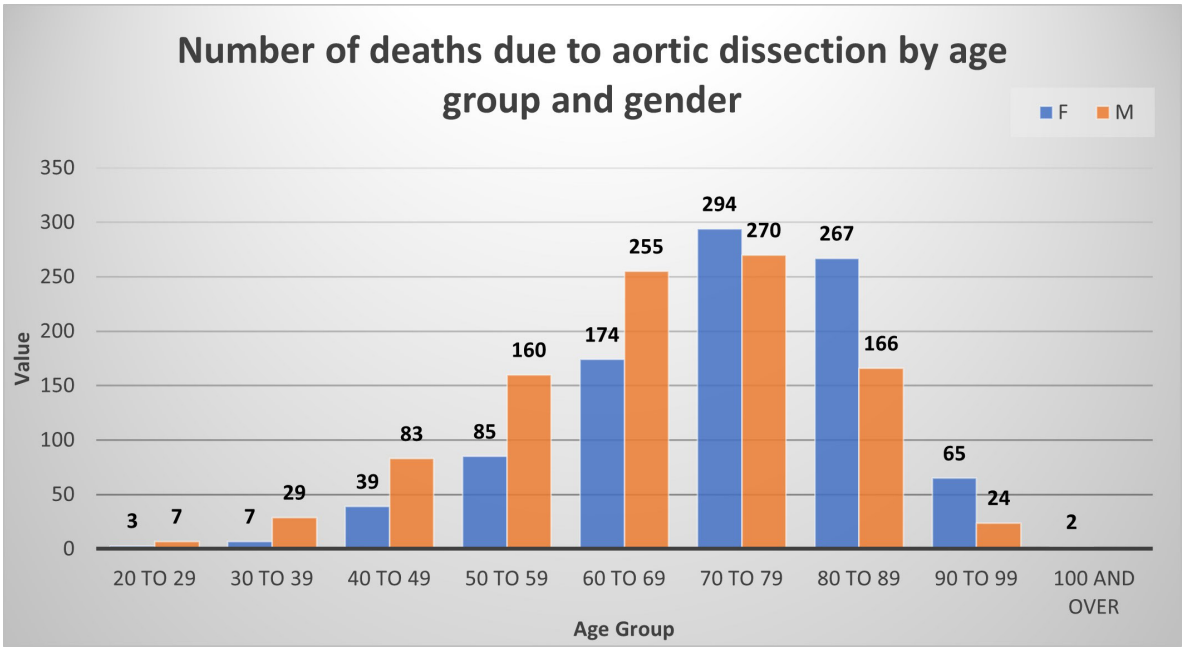


Figure 4: Number of deaths due to aortic dissection by age group and gender.



Discussion

The current median incidence of aortic dissection in Aotearoa New Zealand is comparable to the incidence rates reported by other countries world-wide such as Canada, the United States of America, Italy and Taiwan.[3] Despite being geographically close, the incidence of aortic dissection in Aotearoa New Zealand is lower compared to Australia.[3,6] However, the only available study on the incidence of aortic dissection from Australia is based in a single region and may not be completely reflective of the overall incidence in the country.[6] The observed incidence in New Zealand is comparably lower than in the United Kingdom, which has an incidence rate of 6 per 100,000 per annum.[7] One of the possible reasons to account for this difference is the significant over-representation of Europeans in the study in comparison to other ethnic groups.[7]

Our study demonstrates that aortic dissection is more common in the third quarter of life with a male predominance in comparison to their female counterparts. It is noted that males tend to present slightly younger with aortic dissection compared to females. This is not only true with the peak incidence for males happening in a younger age group than in females, but also in general (Figure 1). This is similar to the data from the International Registry of Acute Aortic Dissection (IRAD).[8] One exception was noted from Figure 1, which shows that after the age of 80 years old, females have a higher incidence of aortic dissection. One possible explanation to this observed difference could be attributed to the life expectancy of males in New Zealand, which is quoted to be up to 80 years old.[9] Therefore, as a consequence, there is less of the male population remaining in the octogenarian and older groups. A similar finding can also be observed in Figure 4.

It is also evident that there is a small proportion of cases of aortic dissection that occur in the group under 30 years of age (Figure 1). Connective tissue disease—such as Marfan syndrome—is associated with aortic dissection and patients tend to present at a much younger age group.[2,8] Interestingly, Marfan syndrome is known to occur equally in both males and females, but in Figure 1 we see a male predominance that could suggest other aetiologies being involved in causing aortic dissection in the younger population. Among the other possible causes could be trauma, illicit drug use and anatomical variations such as presence of a bicuspid aortic valve.[8] This reasoning can also be applied to what is observed in Figure 4 with regards to a number of deaths noted in the younger age group (less than 30 years old).

The limitation in our study is attributed to its retrospective nature and therefore reliance on correct clinical coding of the diagnosis of aortic dissection. From this, we are unable to differentiate between each sub type of aortic dissection—type A and type B—in order to determine their specific incidence rates. Nevertheless, our study is able to provide a snapshot into the current landscape of what the incidence and mortality rates from aortic dissection are in Aotearoa New Zealand.

Our study reports on observed incidence rather than actual incidence. This becomes relevant with regards to identifying if the rise in aortic dissection incidence is due to better recognition rather than being a true epidemic. The suspicion is that this is likely to be multifactorial, from better awareness and ease of access to imaging modalities. However, the only way to be certain this is not a true rising epidemic would be to perform a prospective cohort study.

Conclusion

There appears to be a rising incidence of aortic dissection in Aotearoa New Zealand, similar to what is being observed world-wide. Further prospective studies should be done to map out the exact incidence of the different sub-types of aortic dissection. There should be a push towards better control of cardiovascular risk factors, which would hopefully lead to a reduced risk of New Zealanders developing aortic dissection in the future.

COMPETING INTERESTS
None declared.

AUTHOR INFORMATION
Eric TA Lim, MB ChB: Department of Vascular, Endovascular and Transplant Surgery, Christchurch Hospital, Christchurch, New Zealand.
Adib Khanafer, MBBS, FRCS, FRACS: Department of Vascular, Endovascular and Transplant Surgery, Christchurch Hospital, Christchurch, New Zealand.

CORRESPONDING AUTHOR
Dr Eric TA Lim: Department of Vascular, Endovascular and Transplant Surgery, Christchurch Hospital, Private Bag 4710, Christchurch 8140, New Zealand. E: eric_lta@hotmail.com

REFERENCES
1. Czerny M, Schmidli J, Adler S, et al. Current options and recommendations for the treatment of thoracic aortic pathologies involving the aortic arch: an expert consensus document of the European Association for Cardio-Thoracic surgery (EACTS) and the European Society for Vascular Surgery (ESVS). Eur J Cardiothorac Surg. 2019 Jan 1;55(1):133-162. doi: 10.1093/ejcts/ezy313.
2. Criado FJ. Aortic dissection: a 250-year perspective. Tex Heart Inst J. 2011;38(6):694-700.
3. Gouveia E Melo R, Mourão M, Caldeira D, et al. A systematic review and meta-analysis of the incidence of acute aortic dissections in population-based studies. J Vasc Surg. 2022 Feb;75(2):709-720. doi: 10.1016/j.jvs.2021.08.080.
4. Abdallah N, Mouchati C, Crowley C, et al. Trends in mortality from aortic dissection analysed from the World Health Organization Mortality Database from 2000 to 2017. Int J Cardiol. 2022 Aug 1;360:83-90. doi: 10.1016/j.ijcard.2022.05.043.
5. Xu W, Mani K, Khashram M. Ethnic differences in incidence and outcomes of acute aortic syndromes in the Midland region of New Zealand. J Vasc Surg. 2022 Feb;75(2):455-463. doi: 10.1016/j.jvs.2021.08.066.
6. Dinh MM, Bein KJ, Delaney J, et al. Incidence and outcomes of aortic dissection for emergency departments in New South Wales, Australia 2017-2018: A data linkage study. Emerg Med Australas. 2020 Aug;32(4):599-603. doi: 10.1111/1742-6723.13472.
7. Howard DP, Banerjee A, Fairhead JF, et al. Population-based study of incidence and outcome of acute aortic dissection and premorbid risk factor control: 10-year results from the Oxford Vascular Study. Circulation. 2013 May 21;127(20):2031-2037. doi: 10.1161/CIRCULATIONAHA.112.000483.
8. Evangelista A, Isselbacher EM, Bossone E, et al. Insights from the International Registry of Acute Aortic Dissection: A 20-Year Experience of Collaborative Clinical Research. Circulation. 2018 Apr 24;137(17): 1846-1860. doi: 10.1161/CIRCULATIONAHA.117.031264.
9. StatsNZ. Life expectancy [Internet]. New Zealand: Statistics New Zealand. [cited 2023 April 4]. Available from: https://www.stats.govt.nz/topics/life-expectancy.

Connectivity for point-of-care testing results: a call for change

A New Zealand national point-of-care testing advisory group (NZ POCT AG) position statement

Samarina MA Musaad, Vanessa Buchan, Geoff Herd, on behalf of the NZ POCT AG

ABSTRACT

This article hopes to minimise challenges such as result transcription errors, undocumented tests and results, delays in management and over-testing, by making seven recommendations in support of implementing nation-wide connectivity for point-of-care testing. The ultimate goal is to facilitate safer and equitable point-of-care medical laboratory testing throughout the patient journey and in all geographical locations of New Zealand. The recommendations have been endorsed by the New Zealand Society for Pathologists and The New Zealand Institute of Medical Laboratory Science.

Connectivity for point-of-care testing (POCT) results helps ensure that clinicians have access to complete and accurate diagnostic information for decision making. It is the capability of a POCT device to link electronically with the laboratory, hospital information systems and patients' permanent electronic medical record or general practice patient management systems. Connectivity facilitates continuity of patient care and quality assurance of POCT practices.

Electronic transfer of results for laboratory-based testing is a given, and yet, the state of connectivity for POCT is highly inconsistent across New Zealand, depending on individual organisations and their progress in this space. There are regional, bureaucratic, operational and fiscal barriers to implementation at the expense of an increased and avoidable clinical risk to patients. Variations in these barriers would lead to inequitable care. This article highlights the need for connectivity of POCT devices in New Zealand wherever POCT is conducted by discussing its benefits, the risks directly associated with lack of connectivity and barriers to implementation. It seeks to draw the attention of funders and policy makers to the current state of connectivity in the country and to canvass clinical and political will for improvement.

Background and context

A glucose result on a neonate was transcribed into the notes as 4.1 mmol/L. The correct glucose result transmitted from the connected glucose meter to the patient's electronic medical record was 1.4 mmol/L. The clinical range for neonatal glucose is 2.6 to 8.0 mmol/L. This was a true near miss. See Appendix 1 for more real-life examples of near misses and incidences contributed to by using unconnected POCT devices.

POCT is medical laboratory testing carried out at the "point of care". It is also known as "bedside testing" or "near patient testing" and is carried out in a variety of settings including hospital wards, emergency departments, intensive care units, operating theatres, outpatient clinics, pharmacies, community general practice, marae and in patient homes.

Connectivity is the capability of a POCT device to link electronically with laboratory and hospital information systems and patients' electronic medical records (EMR) in hospitals and primary care. Connectivity is a standard of care for POCT. It is a requirement of the New Zealand Best Practice Guidelines for Point-of-Care Testing[1] where possible, and of the Australasian Association of Clinical Biochemists (AACB) Point-of-Care Testing Implementation Guide.[2]

Electronic transfer of results for laboratory-based testing is an expected given, yet currently, connectivity for POCT is highly inconsistent across New Zealand, depending on individual organisations' infrastructure and set-up. For example, most of the large metropolitan hospitals use a wide range

of POCT devices and have extensive connectivity systems for monitoring devices, quality assurance and integration of test results in the patient EMR. In contrast, medium sized hospitals have incomplete connectivity systems for POCT. Small rural hospitals without on-site laboratory support rely on POCT for decision making. However, these hospitals often have very limited connectivity and consequently, the test results from the point-of-care (POC) devices used at these hospitals may not be included in the EMR. In addition, these test results are not available for review by clinicians at the referral hospitals within the region.

A main challenge is that the scope and scale of POCT in New Zealand is extensive and includes a large number of devices used in many clinical settings. These devices range from simple dipstick tests (many of which have no connectivity capability) and polymerase chain reaction tests used to screen for and detect SARS-CoV-2 or Influenza A and B, to expensive and complex blood analysers with connectivity capability. All these tests are performed by a large number of staff who are non-laboratory trained, e.g., nurses, pharmacists, midwives or clinicians. In addition, some devices are used by patients and whānau. Where a device does not have inherent connectivity capability, alternative technologies can be leveraged, e.g., the rapid antigen test (RAT) catcher technology used for SARS-CoV-2 POCT (RAT test) screening. Unlike straightforward connectivity, such technology involves human input. When available, connectable RAT tests should replace current RAT tests.

Te Whatu Ora – Health New Zealand advocates for regional and national plans to bring healthcare closer to home, supporting primary care and ensuring safe and equitable healthcare delivery. Patient care is a continuum: home → primary care → secondary care → tertiary care; POCT connectivity is an important aspect of such a continuum and of the new health delivery paradigm to deliver equitable standardised services across New Zealand.

For connectivity to be implemented, there needs to be political and logistic integration across the health system framework of funding, delivery and education/governance and, indeed, end users and beneficiaries. Connectivity for POCT requires buy-in from a wide range of agencies, including: Manatū Hauora – Ministry of Health, Te Whatu Ora – Health New Zealand, Te Aka Whai Ora – Māori Health Authority, Health Information Technology groups, Pharmaceutical Management Agency (Pharmac), New Zealand Medicines and Medical Devices Safety Authority (Medsafe), Royal New Zealand College of General Practitioners, Hauora Taiwhenua – Rural Health Network, Pasifika Medical Association Group, Royal New Zealand College of Urgent Care, College of Nurses Aotearoa (NZ), New Zealand College of Midwives, Pharmaceutical Society of New Zealand, private hospitals, Ara Poutama Aotearoa – Department of Corrections, New Zealand Defence Force, St John Ambulance, community health providers, marae, patients, and all other providers and users of POCT in New Zealand. In addition, the manufacturers and local suppliers of POCT devices are essential for the successful implementation and ongoing support of connectivity systems.

All the above create bureaucratic, operational and fiscal challenges to providing a standardised fit-for-purpose model, at the expense of an increased and avoidable clinical risk to patients.

Repercussions of lack of connectivity for POCT results include, but are not limited to: 1) management without knowledge of all tests previously conducted, giving rise to avoidable medical intervention and under or over-prescribing, 2) incomplete or inaccurate clinical records due to typographical errors arising from manual transcription necessary in the absence of electronic connectivity, and 3) delays in disposition or treatment while waiting for repeat testing, all of which potentially carry significant clinical and medico-legal risk at provider and organisational levels. Repeat testing and investigating clinical incidences have financial and resource implications. Furthermore, lack of connectivity compromises quality assurance practices, because connectivity is a key component for device management such as customisation (e.g., gender and age adjusted reference ranges), software upgrades, quality control (an essential frequent check to ensure the device is functioning as expected) and operator lock out for untrained operators. Connected devices can alert POCT coordinators to device malfunction. Newer POCT devices, such as glucose meters with connectivity, assist operators to perform tests correctly. For example, the device will not perform the test measurement if the patient specimen is clotted or there is insufficient specimen applied to the test strip. Therefore, consumers and patients who use unconnected POCT devices receive substandard care.

Benefits of connectivity include, but are not limited to:

1. Helping ensure test results are accurate and clinically reliable.
2. Ensuring continuity of care by allowing test results undertaken by the patient/user to be accessible to all clinicians providing care, e.g., a tertiary clinician knowing a result of a test performed by the patient/primary provider and *vice versa*.
3. Mitigating risk due to human transcription errors.
4. Reducing clinical risk and supporting safer patient care.
5. Health cost saving through reduction of repeat testing.
6. Supporting public health measures and epidemiological data gathering and data mining when needed.
7. Ensuring all devices/tests are connected, supporting equity of care across New Zealand, with quality-integrated testing in patients' localities throughout the country.
8. Connectivity across New Zealand, helping assist with capturing and reporting of clinical adverse events associated with POCT devices and tests.[3]
9. Improving quality assurance practices.
10. Providing support for medico-legal accountability for health carers and their organisations.
11. Traceability facilitating post-market surveillance.

Barriers to implementation

1. Connectivity solutions are expensive. Each organisation is required to capitally fund the project start-up and ongoing operational cost. A national approach would be highly advantageous and create efficiencies across the health system.
2. Concerns about patient confidentiality. Some patients may not desire connectivity for their test results for personal reasons. Patient consent should always be sought.
3. Information technology security concerns can be minimised by working with health information technology structures that already exist in our health system.
4. A conceptual barrier exists, in that a carefully thought-out national quality assurance framework for POCT needs to be implemented. This may need to be individualised and adapted to various geographies, but the underpinnings should be uniformity of access to standardised quality POCT.

Summary and recommendations

The current state of connectivity for POCT is highly variable across New Zealand, creating avoidable clinical risk and inequity in service delivery which a national solution could address. Connectivity is achievable where there is clinical and political will. For these reasons, the NZ POCT AG makes the following recommendations, endorsed by the New Zealand Society for Pathologists (NZSP) and The New Zealand Institute of Medical Laboratory Science (NZIMLS):

1. *Recommendation*: real time and historical results (with patient consent) from POCT devices in any geographical location in New Zealand should be universally accessible to health carers involved in the patient's care.
   Rationale: POC diagnostic information and test results are not universally integrated within the patient's EMR.
2. *Recommendation*: a secure means of actioning recommendation 1 should be implemented using alternative technologies until connectable POCT devices are in the market.
   Rationale: a number of devices in New Zealand do not have connectivity capability.
3. *Recommendation*: patients should be allowed to share their results with their health providers.
   Rationale: many POC tests are performed by patients on themselves (or use wearable devices) or by caregivers. Patients and whānau should be informed and have access to devices with connectivity capability.
4. *Recommendation*: implementation of a nation-wide connectivity framework for POCT tests, leveraging existing successful connectivity platforms and championed by Manatū Hauora – Ministry of Health, Te Whatu Ora – Health New Zealand and Te Aka Whai Ora – Māori Health Authority, is needed to help integrate patients' POCT results within their EMR in all settings.
   Rationale: a nation-wide connectivity framework for POCT tests does not exist.
5. *Recommendation*: a process is required to conduct an immediate, and periodic,

gaps and needs assessment of the state of connectivity solutions across the health continuum to inform a sustainable work plan.
Rationale: the scope and scale of POCT is evolving and expanding rapidly.

6. *Recommendation*: the existing funding and regulatory agencies, Pharmac and Medsafe, respectively, and any future purchasing and regulatory bodies, should incorporate connectivity as an essential component for funding decisions and regulation of POCT devices. These decisions must be made in accordance with the NZ POCT AG recommendations submitted to the select committee on the Therapeutics Products Bill currently before Parliament.[4]
Rationale: consideration and financial support of connectivity for POCT devices is not currently a priority.
7. *Recommendation*: an Adverse Events Management System (AEMS) should be implemented in the interest of patient safety,[3] and was also recommended in the NZ POCT AG submission on the Therapeutics Products Bill.[4] The success of such a system would depend on successful connectivity for POCT devices.
Rationale: New Zealand does not have an integrated national AEMS for POCT devices.

COMPETING INTERESTS
Nil.

AUTHOR INFORMATION
Samarina MA Musaad: Consultant Chemical Pathologist, Chemical Pathology Department, Te Whatu Ora – Waitematā, LabPlus Te Toka Tumai, and Te Tai Tokerau; Clinical Lead Northern Region POCT Network.
Vanessa Buchan: Service Manager, Pathology, Te Whatu Ora – Waitaha Canterbury.
Geoff Herd: Point of Care Testing Coordinator, Pathology Services, Whangārei Hospital, Te Tai Tokerau Northland; Lead Scientist Northern Region POCT Network.

CORRESPONDING AUTHOR
Samarina MA Musaad: Chemical Pathology Department, Te Whatu Ora – Waitematā, 124 Shakespeare Road, Takapuna 0620, Auckland.
E: Samarina.musaad@waitematadhb.govt.nz

REFERENCES
1. New Zealand Point-of-Care Testing Advisory Group. New Zealand Best Practice Guidelines for Point-of-Care Testing 2022 [Internet]. Auckland: Te Whatu Ora – Waitematā; Nov 2022 [cited 2023 May 1]. Available from: https://irp.cdn-website.com/102112c1/files/uploaded/2022%20NZPOCTAG%20Guidelines.pdf.
2. Australasian Association of Clinical Biochemists. Point of Care Testing Implementation Guide [Internet]. Alexandria NSW: Australasian Association of Clinical Biochemists Inc; 2019 [cited 2023 May 1]. Available from: https://aacb.asn.au/common/Uploaded%20files/aacb/guidelines%20and%20position%20statements/guidelines/aacb%20-endorsed%20guidelines/20191105%20SRA%20PoCT%20Implementation%20Guide.pdf.
3. Musaad SM, Kahn SA, Herd G. Point-of-care testing: High time for a dedicated National Adverse Events Monitoring System. Clin Biochem Rev. 2015 Feb;36(1):3-6.
4. New Zealand Parliament Pāremata Aotearoa. Therapeutic Products Bill [Internet]. Wellington: New Zealand Parliament; 2023 [cited 2023 Apr 20]. Available from: https://www.parliament.nz/mi/pb/sc/make-a-submission/document/53SCHE_SCF_BILL_130084/therapeutic-products-bill/.

Appendix 1: Scenarios.

Examples of more real-life clinical risks associated with lack of connectivity:

1. An operator/health carer missed recording a positive urine pregnancy test. The patient was exposed to a radiological investigation with the risk of harm to the unborn foetus.
2. Surgically operating on a patient without knowing their COVID-19 rapid antigen test result because of delays in implementing connectivity.
3. An International Normalised Ratio (INR) result for warfarin monitoring, requiring medical intervention may not be viewable by the treating clinician; this can result in mismanagement, bleeding, or thrombosis.
4. Patient C says they had two POCT Hepatitis C screening tests. Dr F cannot find a record of the tests and results. The test is repeated.

Continued mitigation needed to minimise the high health burden from COVID-19 in Aotearoa New Zealand

Michael G Baker, Amanda Kvalsvig, Michael J Plank, Jemma L Geoghegan, Teresa Wall, Collin Tukuitonga, Jennifer Summers, Julie Bennett, John Kerr, Nikki Turner, Sally Roberts, Kelvin Ward, Bryan Betty, Q Sue Huang, Nigel French, Nick Wilson

ABSTRACT

In this article we review the COVID-19 pandemic experience in Aotearoa New Zealand and consider the optimal ongoing response strategy. We note that this pandemic virus looks likely to result in future waves of infection that diminish in size over time, depending on such factors as viral evolution and population immunity. However, the burden of disease remains high with thousands of infections, hundreds of hospitalisations and tens of deaths each week, and an unknown burden of long-term illness (long COVID). Alongside this there is a considerable burden from other important respiratory illnesses, including influenza and RSV, that needs more attention. Given this impact and the associated health inequities, particularly for Māori and Pacific Peoples, we consider that an ongoing respiratory disease mitigation strategy is appropriate for New Zealand. As such, the previously described "vaccines plus" approach (involving vaccination and public health and social measures), should now be integrated with the surveillance and control of other important respiratory infections. Now is also a time for New Zealand to build on the lessons from the COVID-19 pandemic to enhance preparedness nationally and internationally. New Zealand's experience suggests elimination (or ideally exclusion) should be the default first choice for future pandemics of sufficient severity.

This viewpoint article reviews the past, current and potential continuing health impact of COVID-19 in Aotearoa New Zealand. It aims to identify the optimal response to this pandemic as it transitions to being an endemic infectious disease. It also considers how we can build pandemic preparedness nationally and internationally based on lessons from COVID-19, particularly as it is experienced by the most affected groups. In addition, it addresses questions about the relative effectiveness of the New Zealand response to date, the stringency of control measures and the factors associated with excess mortality during the pandemic.

Epidemiology and impact of the COVID-19 pandemic in New Zealand

The World Health Organization (WHO) removed the designation of the COVID-19 pandemic as a public health emergency of international concern (PHEIC) on 5 May 2023.[1] This change signified its shift from requiring emergency control measures but did not refer to its global pandemic status or continuing health impact. And on 15 August the New Zealand Government removed the remaining COVID-19 mandates covering self-isolation and wearing of face masks for visitors to healthcare facilities.[2] Consequently, this is a suitable time to review the current status of the pandemic in New Zealand and the associated response measures.

The broad features of the surveillance and epidemiology of COVID-19 in New Zealand are described in Appendix 1 and summarised below:

- Disease surveillance and wastewater testing data suggest COVID-19 infection since January 2022 has occurred as a series of four pandemic waves of diminishing size (though there were small waves of infection in 2020 and 2021, these are better described as outbreaks that were either eliminated or well controlled). These waves were associated with a succession of Omicron subvariants.[3] There were 2.1 million cases reported in 2022.
- COVID-19 is a major cause of hospitalisation in New Zealand, resulting in 22,426 hospitalisations in 2022.[4]
- COVID-19 has become a leading cause of death in New Zealand. It resulted in 2,448

deaths (attributed to COVID-19 as the underlying or contributory cause) in 2022 (6.3% of 38,574 total reported deaths that year).[4,5]
- COVID-19 remains an important source of inequities, with Māori and Pacific Peoples markedly more likely than Asian, European and other New Zealanders to be admitted to hospital and die from this infection.[6] In addition, high case rates have been observed in occupations relating to education, retail and hospitality.[7]
- It is common to experience new health problems following a COVID-19 infection,[8,9] and the high baseline of infections and reinfections during 2022–2023 has led to the emergence of long COVID, particularly among population groups with high infection rates.[10,11]
- New Zealand managed to sustain relatively low excess mortality during widespread Omicron infections,[12] and cumulative excess mortality in New Zealand from January 2020 to June 2023 remains close to zero (Figure 7, Appendix 1).

Future course of the pandemic

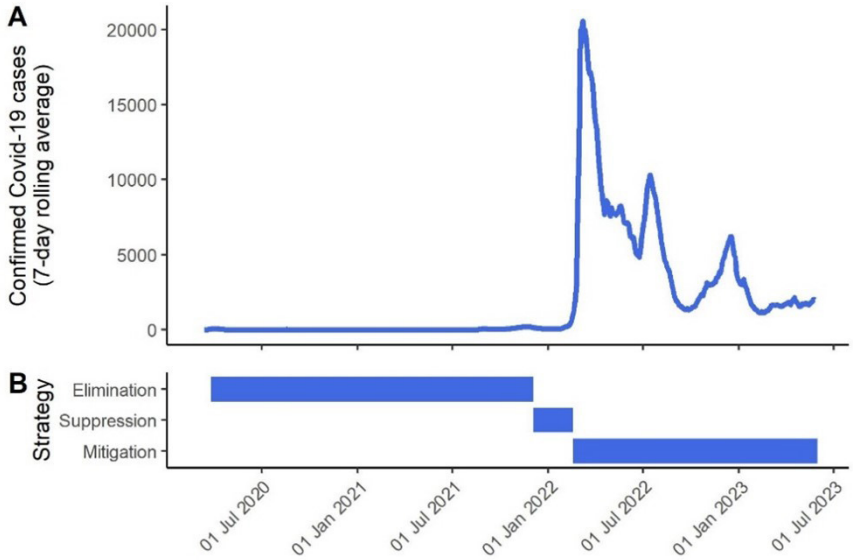
The future course of the pandemic is difficult to estimate. It depends on the interaction of organism factors (such as ongoing viral evolution), host factors (such as waning natural and post-vaccination immunity, which also reflects vaccine improvements) and environmental factors (such as greater mixing indoors in winter and fewer pandemic controls). The net effect of these changes is likely to continue to generate a succession of pandemic waves. These waves will probably decline in size, unless we see major new SARS-CoV-2 variants or sub-variants emerging.[13]

At a certain point, it will be more appropriate to describe COVID-19 as having moved from a pandemic to an endemic disease. A pandemic is "*an epidemic occurring worldwide, or over a very wide area, crossing international boundaries and usually affecting a large number of people*".[14] COVID-19 is arguably still at that stage, partly because it is displaying unpredictable epidemic waves that have not become season-specific, as with influenza. Assuming it settles into a more stable and predictable pattern, then it would be best described as endemic, which is "*the constant occurrence of a disease, disorder, or noxious infectious agent in a geographic area or population group*".[14] Continuing, unexpectedly large jumps in SARS-CoV-2 virus evolution remind us to be cautious about considering the pandemic over.[15]

It is important to estimate the future impact of COVID-19, even when it becomes endemic, to guide an effective and proportionate response. For example:

- COVID-19 could result in around 13,900 hospitalisations in 2023 (based on an average 268 hospitalisations per week for the first half of the year).
- COVID-19 could cause around 1,090 deaths in 2023 (based on an average of 21 COVID-attributed deaths per week for the first half of 2023). These measures may under-estimate mortality since those who have had a COVID-19 infection appear to be at increased risk of subsequent death for at least 2 years, particularly for people with a severe acute infection.[9,16,17]
- The future health and societal burden from longer-term impacts of COVID-19 may be substantial if ongoing levels of transmission are sustained. Incidence and prevalence estimates of long COVID vary depending on study design and case definitions (see Appendix 1 for examples). Health conditions associated with COVID-19 infection range from mild and transient to life limiting, including increased mortality risk in the years following infection, as above.
- An increasing proportion of COVID-19 infections are identified as reinfections (around half of new cases at the time of writing,[18] although this figure is likely an under-estimate). The ongoing emergence of new Omicron subvariants means that some people are reinfected after short intervals (sometimes just a few months)[19,20] compared with other common pathogens (e.g., seasonal influenza, which typically symptomatically infects adults once or twice a decade,[21] although asymptomatic infection is likely to be more frequent[22]). Each COVID-19 infection carries some risk of serious illness and death,[23] but it is currently hard to quantify the extent to which the protective effects of vaccination and prior exposure[24,25] will be offset by an increase in cumulative risk after multiple infections.[23]

Figure 1: Reported COVID-19 cases in New Zealand (A) and changing COVID-19 pandemic responses strategies (B) during the pandemic. Data source: Ministry of Health (MoH).[4] The key dates for these strategies are described in Appendix 2.



Responding to the pandemic

The following are key areas where New Zealand can act to reduce the health impact of COVID-19 and other respiratory infections and increase its health security in the face of future pandemic threats (Table 1). We propose that the response should continue to be shaped by key principles, notably: science-informed strategic leadership; a Te Tiriti and equity focus; use of the precautionary principle; and the need to create legacy benefits for our health system and other essential infrastructure.[26] In addition, cost effectiveness needs to be a guiding consideration as resources applied to COVID-19 responses need to be justified in relation to other competing uses.[27]

Choosing an optimal and equitable response strategy

New Zealand has delivered one of the world's most strategic COVID-19 pandemic responses, taking an elimination strategy from March 2020[28] (closely related to an exclusion strategy, as practiced by many Pacific Island states, which is even more effective as it avoids the need for elimination measures[29]). It then transitioned to suppression in December 2021,[26] followed by mitigation from February 2022 onwards[30] (Figure 1 and Appendix 2). Elimination is currently not feasible with available and acceptable interventions, so the decision is about the optimal level of control, from suppression to mitigation to no strategic response.[29]

We consider the impact of COVID-19 justifies a continuing mitigation strategy to reduce its burden on health and the healthcare system. That means using a combination of vaccination and public health and social measures to reduce these impacts (described as "vaccines plus"[31]). This approach has been supported by both the Lancet COVID-19 Commission and a major global consensus paper on the pandemic.[32,33]

Equity needs to be at the heart of any response to endemic and pandemic infectious diseases, with strong Māori leadership at all levels in decision making and delivery. Providing such protection is a Te Tiriti obligation and is supported by the significantly higher burden of both disease and social consequences of the pandemic faced by Māori and Pacific Peoples. Fortunately, Te Aka Whai Ora (the Māori Health Authority) is well placed to provide leadership nationally. Similar engagement is needed at all levels of service delivery.[34]

Developing and implementing an integrated respiratory infection strategy to reduce disease burden

As COVID-19 transitions to becoming endemic, some argue that it should be treated more like other infectious diseases. We propose the converse approach of treating other serious respiratory infections such as influenza and respiratory syncytial virus (RSV) more like COVID-19. This is the argument for exploring an integrated respiratory infection control strategy that builds on the co-benefits and efficiencies of preventing multiple infections, along with a strong emphasis on equity.[35]

In the past, the annual toll from influenza of around 500 deaths and its substantive impact on our hospital system has been tolerated.[36,37] Yet influenza largely disappeared during the first 2 years of the pandemic.[38] This finding shows the disease burden of influenza is not inevitable and that public health measures can alter the annual epidemic patterns.[38] We need to identify the most effective and cost-effective mix of respiratory protections that lower the burden of multiple respiratory diseases.[39,40]

Elements of such a strategy could include: enabling self-isolation for those with respiratory infections;[41] good indoor ventilation and air filtration, which can reduce the risk of respiratory infection[42,43] as well as improve concentration at school and increase worker productivity;[44] mask use in high-risk indoor environments such as healthcare facilities and public transport, where ventilation is typically poor;[45,46,47] and systematic approaches to reducing transmission in key indoor environments such as schools.[48] However, the New Zealand Government has recently terminated the COVID-19 Leave Support Scheme and lifted the face mask requirement for visitors to healthcare settings.[2]

Achieving and maintaining high and equitable vaccine coverage for all at-risk groups

Vaccination has been a key intervention that has reduced the health impact of the COVID-19 pandemic in New Zealand and globally.[49] The elimination strategy delayed widespread transmission of COVID-19 in New Zealand for almost 2 years, providing time for international vaccine development and achieving high vaccination coverage, giving a beneficial level of population immunity before most people had been exposed to the virus.

Future vaccination policy needs to be considered across all vaccine-preventable respiratory illnesses and evolve as vaccine formulations and ability to deliver to populations continue to improve. Complicating factors for COVID-19 vaccines are continuing viral evolution and the short duration of protective immunity both post-infection and post-vaccination. Current COVID-19 vaccines have limited and short duration of immunity to asymptomatic infection and mild disease and therefore have little effect on reduction of community spread. Consequently, they are most effective as individual-level protection against severe disease, particularly for those at highest risk. The new bivalent booster containing an Omicron component has provided increased protection against serious illness and death during the current stage of the pandemic, compared with protection provided by the monovalent vaccine.[50,51]

Vaccine design is continuing to advance, to improve strain matching, duration of immunity and effectiveness. There is good progress towards universal pan-coronavirus[52,53] and influenza vaccines[54] to overcome the challenges of evolving strains. RSV is expected to be the next respiratory vaccine-preventable disease. The United States (US) FDA has recently approved an RSV vaccine for individuals 60 years and above.[55] Vaccines and long-acting passive immunisation approaches in pregnancy and infancy are also very close to international market approval.[56]

Technological advances in vaccinology are also likely to support vaccination uptake and equity. Combination vaccines for Covid-19 and influenza are expected on the market within the next 2 years, which should improve cost effectiveness, ease of delivery and uptake. Future combinations will probably include an RSV vaccine as well. Improved delivery mechanisms, such as intranasal and intradermal, have the potential to improve immunisation uptake and help manage the neglected barrier of needle phobia.[57]

Regardless of the optimal vaccine, there are still delivery challenges, with a relatively low uptake of boosters (with only 53% of the eligible 50+ age group having received a second booster, although rising to 70% for 65 years plus).[58] There are a range of factors that impact uptake, such as fatigue with the sustained COVID-19 response, the level of promotion by health authorities, accessibility of health services in the community, vaccine hesitancy and anti-vaccination views that are fuelled by mis/disinformation.[59]

It is important to acknowledge that serious adverse effects can occur following any vaccination but are rare (myocarditis and pericarditis are rare side effects of mRNA vaccines, for example[60]). At a population level, New Zealand surveillance data provide no evidence that COVID-19 vaccination is causing excess mortality.[61] The period of highest COVID-19 vaccination was in 2021 (Figure 8), which corresponded with low excess mortality (Figure 7). The period of increased excess mortality in 2022 corresponded with widespread COVID-19 infection, which appears to explain the majority of excess deaths.[62]

Enhancing health services to manage respiratory infections

The COVID-19 response has resulted in multiple changes to the operation of the healthcare system in New Zealand. These adaptations include increased use of telemedicine,[63] electronic prescribing,[64] separating respiratory illness from non-respiratory in primary care presentation, regular mask wearing for frontline services and delivery of testing and vaccination by a wider range of healthcare professionals including pharmacists. One area that needs particular focus is optimising effective and equitable delivery of key preventive care. A good example is antivirals such as Paxlovid, which can improve disease outcomes but only if delivered early in an infection.[65] Other therapeutics are likely to become increasingly useful in the future for managing viral respiratory infections.

Understanding of infection prevention and control measures has improved in all healthcare settings. These changes need systematic assessment and guideline development so that valuable and cost-effective changes are retained, e.g., prevention of airborne transmission.[66]

Improving effective public communication about respiratory infections

The pandemic has illustrated the value of effective communication during a public health crisis. But it also highlighted the challenges of effective risk communication and sustaining key behaviour changes. An important advance is to have consistent ways of communicating the risk of seasonal and pandemic respiratory infections. As such, an updated and more equitable version of an alert level system should be considered.[67]

This is also an opportunity to address wider communication goals of promoting pro-social behaviour[32] (which is particularly important for managing an infectious disease transmitted between people) and managing mis/disinformation.[68] Effective engagement with the multiple New Zealand communities is critical throughout the response.

Improving surveillance and research to inform our response

COVID-19 has demonstrated the importance of high-quality, comprehensive disease surveillance for managing a pandemic. Emerging surveillance tools such as genomic surveillance havetransformed outbreak investigations and situational awareness,[69–74] as has wastewater testing.[75] However, there are important gaps in information. It is now time for a comprehensive, effective and sustainable surveillance system for COVID-19, influenza and other important respiratory pathogens.[35]

Point-of-care testing and self-reporting of illness are likely to remain useful ways of measuring disease rates in the community. The value of such surveillance could be enhanced by integrating it better with high-quality sentinel surveillance for respiratory infections.[76] This approach could build on successful community-based models such as the SHIVERS/WellKiwis cohort study.[77] This need has become more critical with the proposed COVID-19 infection prevalence surveys no longer going ahead.[78]

There are multiple important research questions where knowledge is critically important to guide the COVID-19 response. Key examples include the need to accurately monitor the prevalence of long COVID resulting from repeated infections, and the cost effectiveness of measures to improve indoor air quality. It will also be important to identify ways of sustaining high and equitable levels of vaccination coverage as well as public support for respiratory control measures. New Zealand clinical researchers should also be supported to continue their important contributions to international collaborative research programmes.[79]

Improving pandemic preparedness nationally and internationally

Preventing the next pandemic will need to be a major focus as there are multiple infectious agents with pandemic potential.[80] Avian influenza is an increasing concern at present.[81] A major focus of the Royal Commission of Inquiry into COVID-19 is to identify how New Zealand can better prepare for future pandemics.[82] This approach will require a far more adaptable response framework than

the current pandemic plan that is still focussed on pandemic influenza.[83] It will be important to ensure this strategy is sustained, updated and resourced during inter-pandemic periods. The Government recently announced funding for a new Pandemic Research and Response Institute, which could increase local capacity.[84]

It is also crucial to support international initiatives (both regional and global) to strengthen capacity for early detection and control of pandemic threats, and more equitable delivery of key interventions such as vaccines.[85,86] The International Health Regulations are being amended at present, which should provide an opportunity to strengthen the response to emerging pandemic threats. In our view, the greatest lesson from COVID-19 is that elimination (or ideally exclusion) should be the default first choice for future pandemics of sufficient severity.[29,87] If rapid elimination at source or immediately after arrival in a new country is not possible, then at least suppression of spread may provide time to develop effective vaccines and optimise other prevention and control measures.

New Zealand data summarised here show that the elimination strategy not only resulted in low cumulative excess mortality (Figure 7), but also required less stringent controls during the pandemic compared with other high-income countries (Figures 9, 10). Although the 2020–2021 period with the strongest pandemic controls (greatest stringency) was very difficult for many New Zealanders, it was, reassuringly, a period of consistently low excess mortality.[62] Nevertheless, further research is needed to assess potential longer-term effects of both the pandemic and response.

Conclusions

The New Zealand COVID-19 pandemic response has been among the world's most effective, based on key public health metrics such as low cumulative excess mortality. During 2020 and 2021 when control measures were most stringent and vaccination was at its highest, excess mortality declined. Mortality only increased in 2022 in association with widespread circulation of COVID-19 for the first time. The elimination strategy meant that the stringency of control measures was also less than those used by other high-income countries that used suppression/mitigation approaches to COVID-19.

The high infection and reinfection rates in 2023 from this pandemic have ongoing substantial impacts on health and wellbeing and health equity in New Zealand. Because the disease burden remains large, a continuing mitigation strategy is justified. Adoption of an integrated respiratory infectious disease surveillance and control strategy covering influenza, RSV and other important respiratory pathogens would be a valuable legacy of the pandemic.

There is also an opportunity to improve New Zealand's health security by supporting the Royal Commission of Inquiry to identify a highly effective pandemic strategy for this country, and by contributing to global and regional efforts to improve pandemic preparedness. Implementing and sustaining these health security measures will be critically important given persisting concerns of future pandemics from either natural or engineered pathogens.[88]

Table 1: Summary of key measures to manage the ongoing threat from COVID-19 and other pandemic diseases, and to improve public health, equity and health security.

Broad area	Key measures
1. Choose and articulate an optimal and equitable response strategy.	Continue an explicit mitigation strategy to minimise the health impact of ongoing COVID-19 transmission. This strategic setting should be reviewed periodically based on new knowledge about the health impacts of COVID-19 and the availability of improved interventions (notably vaccines that can interrupt transmission, which could make suppression or even elimination of infection feasible).
	Ensure appropriate resourcing of Māori leadership (Te Aka Whai Ora) and service delivery by Māori providers. Also ensure continued Pacific community and provider engagement and participation.
2. Develop and implement an integrated respiratory infection strategy to reduce disease burden.	Maintain or improve clear self-isolation guidelines for COVID-19, with the support measures needed to make them effective (e.g., access to testing, sick leave entitlements and test-to-release guidelines). Consider extending these measures to other serious respiratory infections—albeit with further evaluation of the public acceptability and potential improvements in support from government agencies and the role of mandates for reinforcing such behaviours.
	Improve indoor air quality in public settings and evaluate the effectiveness and cost effectiveness of different options.
	Maintain mask use in high-risk indoor environments such as healthcare settings and explore the advantages and disadvantages of mandating masks in public transport settings, particularly over winter.
	Implement strategies to limit transmission in key shared environments like schools and ensure that resources are in place to protect students' access to education at times of expected high transmission.
3. Achieve and maintain high and equitable vaccine coverage for all at-risk groups.	Continue to refine the COVID-19 vaccination schedule based on best international evidence. Evolve the strategy depending on the type and action of each COVID-19 vaccine.
	Combine the focus on COVID-19 with other national schedule vaccines, particularly with influenza vaccination delivery strategies.
	Increase the focus on equitable vaccination uptake, and community trust and engagement. Continue measures to achieve high and equitable vaccination coverage and evaluate the most effective and cost-effective vaccination promotion interventions.

Table 1 (continued): Summary of key measures to manage the ongoing threat from COVID-19 and other pandemic diseases, and to improve public health, equity and health security.

Broad area	Key measures
4. Enhance health services capacity to manage respiratory infections.	Build on new models for primary healthcare delivery to improve access to essential care, such as telemedicine and provision of testing and vaccination by a wider range of healthcare professionals including pharmacists.
	Review and enhance delivery of essential respiratory infection management tools such as antivirals.
	Review services for optimal management in secondary/tertiary care, and in the community post-discharge to identify improved models of practice for pandemic and endemic respiratory infections.
	Continue to develop and enhance infection protection and control services and systems throughout the healthcare system, notably separating respiratory illness from non-respiratory in primary care presentation, ensuring adequate indoor ventilation and regular mask wearing for frontline services.
5. Improve public communication about respiratory infections.	Establish an effective alert system to communicate public health risk of endemic and pandemic respiratory infections.
	Address wider communication goals of managing mis/disinformation and promoting pro-sociality.
6. Improve surveillance and research to inform our response.	Build an effective national surveillance infrastructure to support management of endemic and pandemic respiratory infections using an optimal mix of integrated methods (including epidemiological, microbiological, genomics, informatics, mathematical modelling, social media information, multiple community narratives) with capacity to be quickly scaled up when needed to support a pandemic response.
	Develop a research agenda to fill key gaps in knowledge about COVID-19 and its management, including better estimates of the current and future health impact of long COVID, selection of cost-effective interventions and identifying ways of improving the equity and sustainability of the response to respiratory infections. It would also be useful to build on successful international collaborative clinical and other research that has accelerated in response to the pandemic.
7. Improve pandemic preparedness nationally and internationally.	Actively support the Royal Commission to identify a highly effective pandemic strategy for New Zealand that is flexible enough to respond to a range of potential pandemic threats beyond the current focus on pandemic influenza. Ongoing scrutiny will be needed to ensure this strategy is sustained, revised and resourced.
	Actively support international efforts to strengthen WHO to deliver a more proactive global response to prevent future pandemics and manage them effectively.
	Work with Australia, South Pacific Island nations and South East Asian nations to strengthen regional pandemic control measures and infectious disease surveillance in general.

Appendix 1: COVID-19 surveillance and epidemiology in New Zealand

Aotearoa New Zealand has a COVID-19 surveillance strategy, with multiple surveillance systems operated by Manatū Hauora – Ministry of Health (MoH), Te Whatu Ora – Health New Zealand and the Institute for Environmental Science and Research (ESR).[89] These systems provide data on different categories of COVID-19 infection and a range of other key measures such as vaccination coverage. Results are presented on the Te Whatu Ora – Health New Zealand website.[18]

Here we present an analysis of COVID-19 surveillance data starting from 2020 up to the time of writing in mid-2023. The data for this analysis were obtained from the MoH[4] and ESR.[90] All data were extracted on 3 July 2023.

COVID-19 cases in the community

COVID-19 is a notifiable condition for diagnosing doctors, with cases confirmed by laboratory-based PCR testing or self-reported rapid antigen tests (RATs).[91] Since early 2022 members of the public have had widespread free access to RAT kits for testing themselves and people they are caring for. They have been required to report positive test results online.[92]

Case numbers remained relatively low during the elimination and suppression stages of the pandemic response but increased markedly following widespread transmission of the Omicron variant from February 2022 onwards (Figure 2). After January 2023, self-reported cases reached their lowest 7-day moving average of 1,132 per day on 11 February 2023. The numbers subsequently rose, reaching a moving average of 2,143 per day on 17 April 2023 before decreasing again as part of New Zealand's fourth pandemic wave.

COVID-19 hospitalisations and ICU admissions

Hospitals report diagnosed COVID-19 cases to the MoH, including admissions to intensive care units (ICUs). There is an international system for coding COVID-19 cases.[93]

During 2023, new weekly admissions increased from 132 for the week ending 19 February to a peak of 343 for the week ending 23 April 2023 before declining slowly (Figure 3).

COVID-19 deaths

Deaths linked to COVID-19 are reviewed by coding staff in the MoH who distinguish those that are attributed deaths (where COVID-19 was considered the underlying or contributing cause of death), and those that are unrelated cases, which are removed.[94] The MoH also reports all

Figure 2: COVID-19 cases in New Zealand, 7-day moving average of daily cases, from January 2020 to June 2023. Source: MoH.[4]

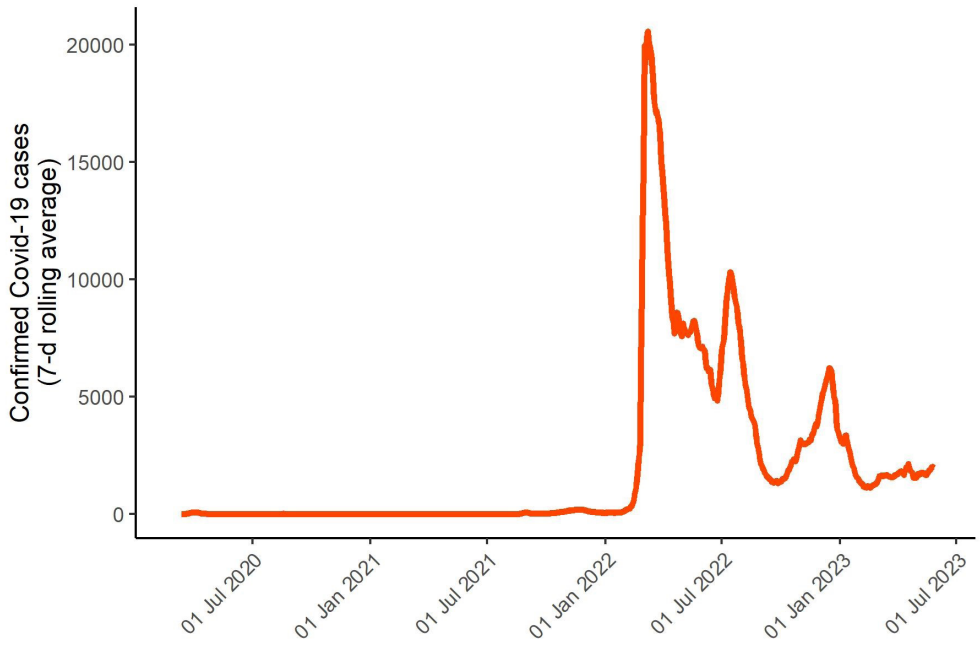


Figure 3: COVID-19 hospitalisations in New Zealand, weekly total, from January 2020 to June 2023. Source: MoH.[4]

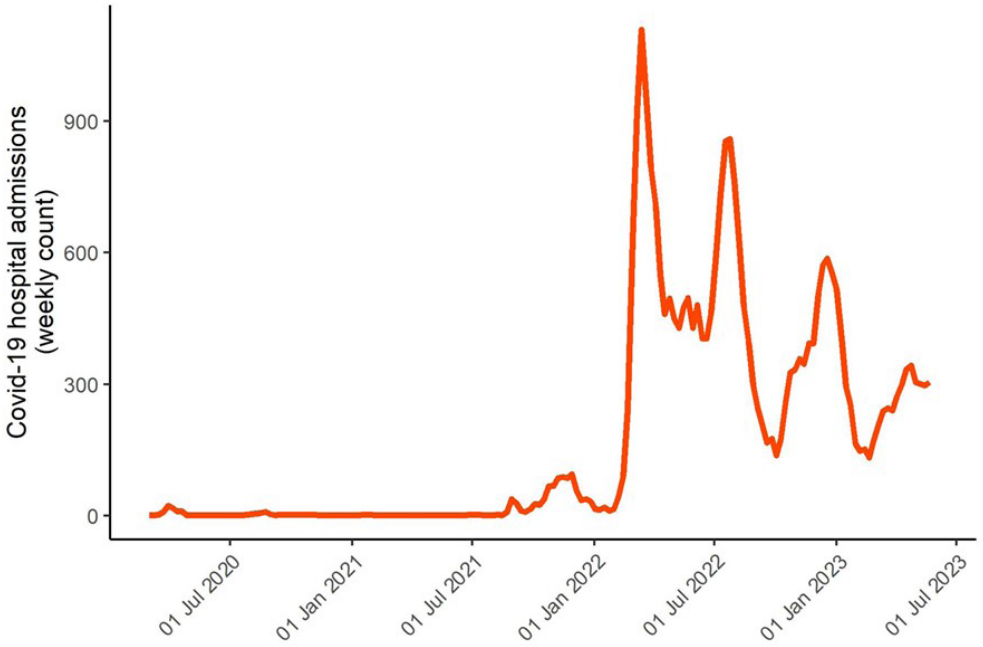
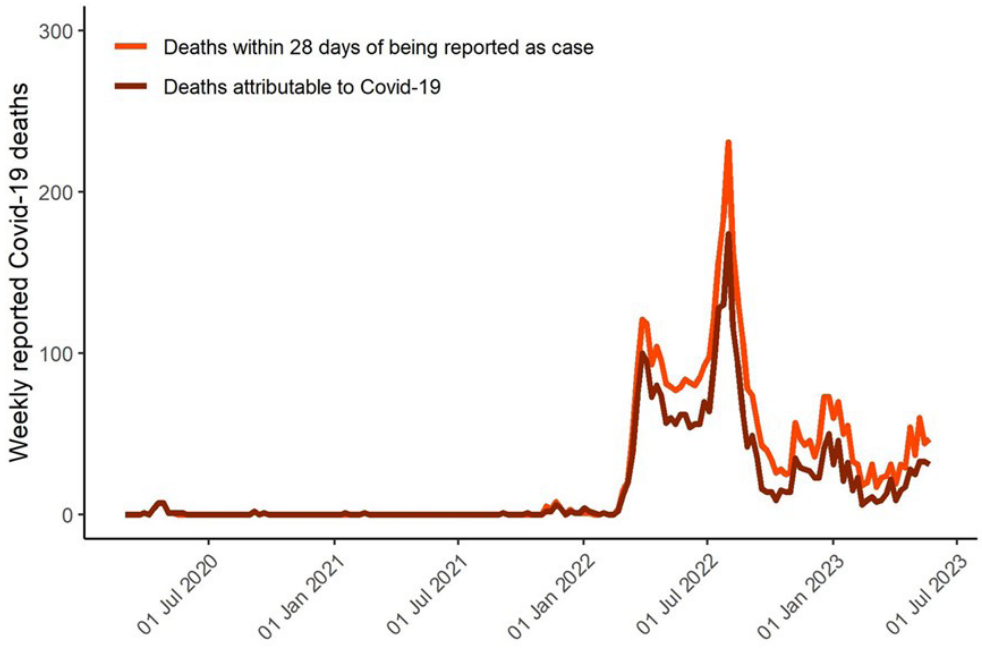


Figure 4: COVID-19 deaths in New Zealand, weekly total, from January 2020 to June 2023. Source: MoH.[4]



deaths within 28 days of COVID-19 infection as a separate category. The COVID-attributed measure may under-estimate mortality, which is substantially raised for at least 2 years following COVID-19 infection, particularly for people reporting long COVID.[9,16,17]

In the second quarter of 2023, deaths attributable to COVID-19 appeared to peak at 33 for the week ending 7 May 2023. Deaths within 28 days of being reported as a case appeared to reach a peak of 60 deaths that week (Figure 4).

Wastewater testing for COVID-19

Specimens are collected from sewerage systems at sites across New Zealand and tested for SARS-CoV-2 RNA.[75] These data are presented on the ESR Wastewater Surveillance Dashboard.[95] Wastewater sites are selected based on several factors including population and geographic coverage. New sites may be added over time and/or sampling may reduce in frequency or cease for other sites.

Results of wastewater testing showed a similar series of four pandemic waves during the 2022–2023 period that corresponded to waves of infection detected through other forms of surveillance. These testing results are likely to provide a relatively consistent indicator of COVID-19 infection levels in the community as they do not depend on levels of testing and reporting by members of the public.

During 2023, this testing showed a rise in SARS-CoV-2 RNA levels in wastewater from a low point of 1.5 million genome copies per person per day on 5 February 2023 to 4.4 million genome copies per person per day on 16 April 2023 before a decline in detections (Figure 5).

Genomic surveillance of COVID-19

Specimens obtained from cases and from wastewater undergo whole genome sequencing and analysis.[69] Results are regularly updated on the ESR COVID-19 Genomics Insights Dashboard (CGID) (Figure 6).[3]

These data show that initially there was a series of dominant Omicron subvariants associated with each wave of infection—notably BA.1/BA.2 with the first wave in 2022, and BA.4/BA.5 with the second wave. More recently the pattern has been characterised as a "swarm" or "soup" of multiple subvariants.[96] New Zealand had a mix of BA.2.75, BA.5, CH.1.1 and BQ.1.1 subvariants associated with the third wave in late 2022. The most recent (fourth) wave in 2023 coincided with a rise in XBB subvariants, which became dominant in human cases and wastewater samples.[3,97] These subvariants had also been associated with waves of infection overseas, notably in Singapore.[98]

Excess mortality

New Zealand sustained low excess mortality through the first 2 years of the pandemic until

Figure 5: COVID-19 wastewater detections and new cases in New Zealand, by day, from January 2020 (cases) and June 2021 (wastewater) to June 2023. Sources: ESR,[90] MoH.[4]

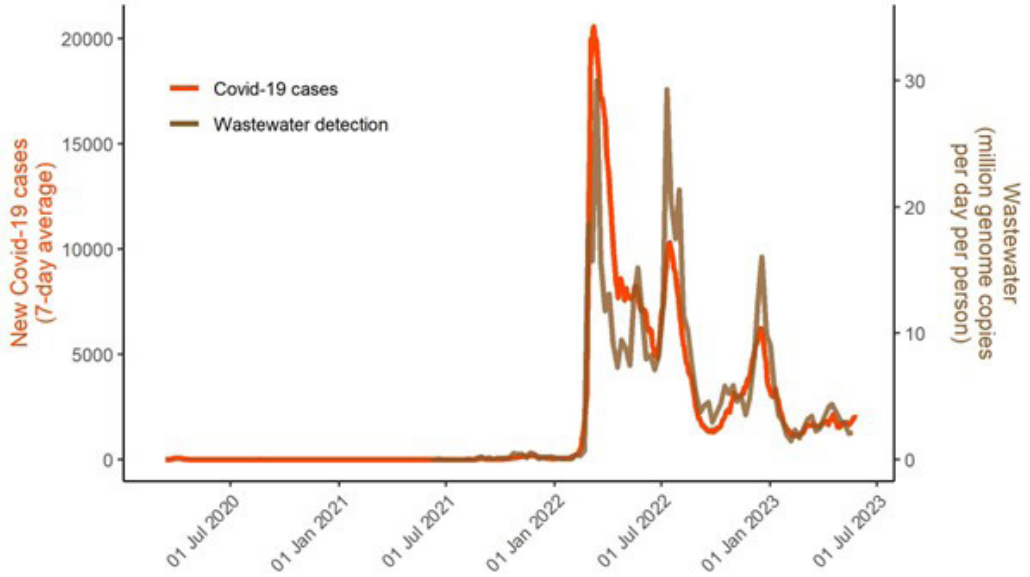


Figure 6: COVID-19 variants and subvariants isolated in New Zealand (including from Managed Isolation and Quarantine at the border), by day, February 2020 to June 2023. Source: ESR.[99]

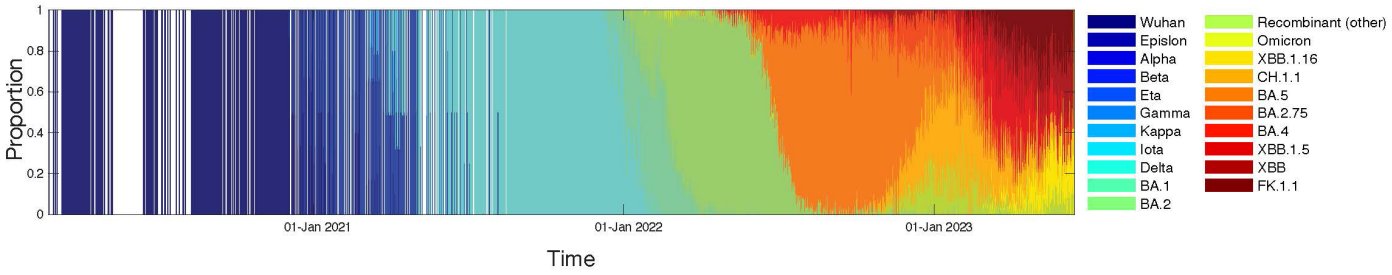
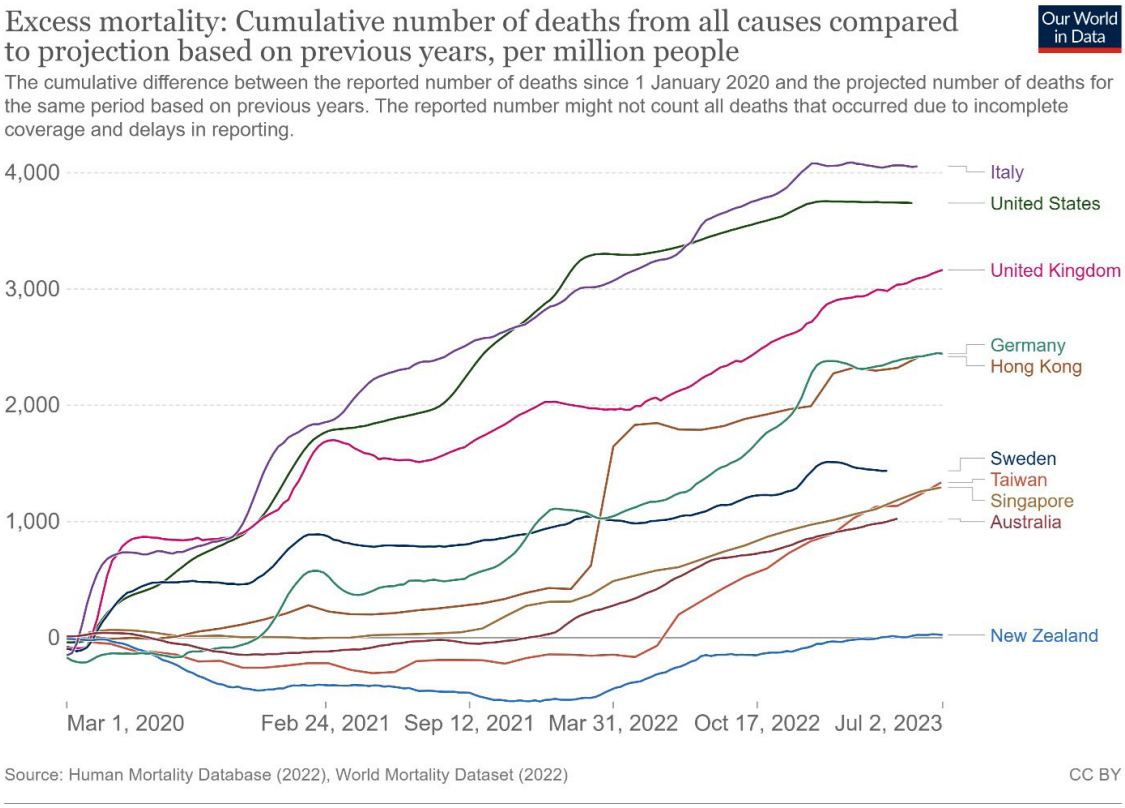


Figure 7: Cumulative excess mortality, expressed as deaths per million people from all causes compared to projected numbers based on previous years, for New Zealand and a selection of other high-income jurisdictions up to June 2023. Source: OWD.[102]



COVID-19 circulated widely in 2022.[62] Several organisations including WHO,[100] The Economist magazine[101] and Our World in Data (OWD)[102] have generated excess mortality estimates. These estimates use similar approaches of comparing total mortality since the start of the pandemic (January 2020) with "expected mortality" based on the pattern of the preceding years (OWD uses the preceding 5 years, 2015–2019[103]). The OWD site shows New Zealand is one of only four remaining countries globally that are estimated to have excess mortality close to zero at the time of writing (Figure 7). The other jurisdictions (Luxembourg, Antigua and Barbuda, and Seychelles) all have small populations (<0.7 million). The COVID-19 pandemic appears to be driving an increase in overall mortality in many countries, including in younger age groups,[104] but these totals do not distinguish between impacts of the infection itself and other factors such as reduced access

to healthcare or suppression of other infectious diseases such as influenza.

If New Zealand (resident population 5.185 million in 2022) had experienced the cumulative excess mortality of the US (3,739.3 per million) then we would have had around 19,390 excess deaths up to the end of June 2023. With the United Kingdom (UK) excess mortality (3,164.8 per million), we would have had around 16,410 excess deaths, or using the experience of Sweden (1,436.3 per million) we would have had 7,450 excess deaths. New Zealand's excess was varying around zero in mid-2023 (122 at the time of writing).

Globally, COVID-19 is likely to have been the third leading cause of death in the world for the last 3 years (2020–2022).[105]

Longer-term effects of COVID-19 on population health

COVID-19 is a multi-organ disease with mechanisms of effect that include immune dysregulation, autoimmunity, abnormal neurological signalling and damage to small blood vessels (endothelial dysfunction) causing microclots.[106,107,108] Endothelial dysfunction is considered to be the central underlying mechanism of acute- and post-acute COVID-19 disease.[109]

These cell- and tissue-level impacts may manifest as a post-acute viral syndrome (syndromic long COVID)[110] similar to that caused by a range of other infections.[107,111] Alternatively, health impacts may follow a more organ-specific pattern, presenting as heart attacks, new-onset diabetes including type 1 diabetes in children, decreased lung function, cognitive dysfunction and others.[106,112–115] These types of health conditions do not appear to differ markedly from variant to variant, but the risk is lower in Omicron infections compared with earlier variants and there is evidence of a protective effect of vaccination.[116] Robust evidence of the effect of multiple Omicron reinfections is not yet available.

There appears to be a wide overlap between syndromic and non-syndromic presentations, with over 200 symptoms described to date. Because only a little over 3 years of observation time of this virus is possible, we can expect that different types of longer-term impacts may resolve or emerge in future. For example, there are arguments both for and against a role for COVID-19 in causing or exacerbating cancers.[117]

In this paper we use the term "long COVID" to cover all sequelae of COVID-19 infection. This term includes the alternative names of post-COVID conditions, long-haul COVID, post-acute COVID-19, long-term effects of COVID, chronic COVID and post-acute sequelae of SARS CoV-2 infection (PASC).

Estimating the incidence and prevalence of long COVID in populations is challenging. Studies of syndromic long COVID (i.e., reported symptoms) following infection include the following recent examples that show the wide range of findings from different study designs and measurement approaches. Each of the following cohort designs has potential to both under- and over-estimate the incidence.

- The WHO's current (2023) estimate is that 10–20% of people experience health effects that persist or manifest themselves more than 3 months after recovery from the initial episode; this estimate has not been updated for more recent variants.[8]
- The UK's Office for National Statistics (ONS) estimates that 2.4–4% of adults and 0.6–1% of children report having long COVID 12–20 weeks after infection (and 1.6–2.8% of adults and 0.4–0.6% of children reported having "limited daily activities").[118] The ONS survey is high quality, and the sampling frame and design are extremely robust. There are some measurement aspects (e.g., the timing and questionnaire) in the above estimate that may under-count long COVID.
- The Long COVID in Children and Young People (CloCK) study's most recent estimate for 11–17-year-olds (Omicron; prospective test-negative design; n=886; 5.9% survey response rate) was 12.1% of respondents (first positives), 16.1% (reinfected) and 4.8% (always tested negative) at both 3- and 6-months post-test. The analysis did not show a significant difference in prevalence of long COVID symptoms between first infections and reinfections.[119]
- The most recent estimate for adults from the National Institutes of Health's Researching COVID to Enhance Recovery (RECOVER) Initiative was that 10% (95% confidence interval [CI], 8.8–11%) of study participants were PASC-positive at 6 months (prospectively measured) based on a composite score of a small number of selected symptoms that aimed to optimise sensitivity and specificity. The authors reported that "*among participants with a first infection during the Omicron era, PASC*

frequency was higher among those with recurrent infections" and they reported a "modest reduction" in PASC among vaccinated participants compared with unvaccinated.[120]
- The US Census Bureau (Household Pulse Survey; April/May 2023) estimates that 5.6% (95% CI, 5.3–5.9) of all adults are currently experiencing long COVID.[121]
- In a 2021 New Zealand survey, 22% of respondents who had had a confirmed COVID-19 infection reported symptoms of long COVID.[11] This study had a 12% response rate and recruited participants who tested positive before December 2021, so these results reflect pre-Omicron variants and, in some cases, pre-vaccination infections.

Even at the lowest end of the prevalence range listed here, the impact of COVID-19 on long-term public health is highly concerning. A major reason is that population exposure is high, and continuing, resulting in infections and reinfections that will ultimately be experienced by most people. The long-term trajectory of this disease burden is very hard to predict given the multiple unknown factors. But the precautionary principle suggests we should take a cautious approach and assume the long-term health impact is at least as high as the mid-range estimates are suggesting and respond accordingly, at least until we have high-quality evidence to the contrary.

Therapeutic strategies to prevent and treat long COVID are an active area of research. A recently reported randomised controlled trial tested outpatient treatment options in a cohort of adults with overweight or obesity.[122] Randomisation took place between 30 December 2020 and 28 January 2022 with a 10-month follow-up. Only one treatment, metformin, showed a significant improvement over placebo in cumulative incidence of long COVID at day 300. The incidence of long COVID was 6.3% (95% CI, 4.2–8.2) in participants who received metformin and 10.4% (7.8–12.9) in those who received identical metformin placebo (hazard ratio [HR], 0.59; 95% CI, 0.39–0.89; p=0.012). Among the vaccinated subgroup, incidence was 6.1% and 7.2% respectively in the treatment and control groups (HR, 0.85; 95% CI, 0.46–1.57). This finding also provides additional therapeutic validation of long COVID as a clinical condition to add to the symptom data reported by those living with long COVID[123] and the large literature reporting radiological and immuno-pathological evidence of end-organ damage.[108]

Vaccination surveillance

The systems for surveillance of key aspects of vaccination include vaccine coverage surveillance conducted by the MoH[58] and vaccine adverse event surveillance conducted by MedSafe.[61]

Vaccination coverage data provide multiple measures of the time distribution of vaccination doses (Figure 8) and who is receiving vaccines, including breakdowns by place and person (age, ethnicity).[58]

Adverse event surveillance also includes multiple measures of vaccine safety. For example, it shows that the risk of sudden death in the 21 days following receipt of the main COVID-19 vaccine used in New Zealand (the Pfizer/BioNTech mRNA vaccine Comirnaty) is reduced to about half of the expected background rate.[61] This reduction is likely due to a *healthy vaccinee effect* where healthy people are preferentially vaccinated compared with those who are unwell with comorbidities. Serious adverse events are rare following vaccination. Of the deaths that occurred following administration of the Pfizer vaccine up to 30 November 2022, two were determined by the coroner to be due to myocarditis, of which one was likely vaccine-induced myocarditis and for one a link to the vaccine could not be excluded.[61] A total of around 11.9 million doses were given during this time.[61]

Other forms of COVID-19 surveillance

There are multiple additional forms of surveillance that have been used to better understand the COVID-19 pandemic and response. Some surveillance makes use of existing data gathering processes such as use of Google Global Mobility data.[124] Other surveillance is specifically designed to gather data on COVID-19. An example is behavioural risk factor surveillance conducted by the MoH.[125]

Stringency of COVID-19 restrictions in New Zealand

The OWD site also reports the level of COVID-19 restrictions for jurisdiction across the globe. They use the Oxford Stringency Index, a composite based on nine measures (school closures; workplace closures; cancellation of public events; restrictions on public gatherings; closures of public transport; stay-at-home requirements; public information campaigns; restrictions on internal movements; and international travel controls). The index is

Figure 8: Count of vaccinations administered by week from the COVID-19 Immunisation Register. Source: MoH.[58]

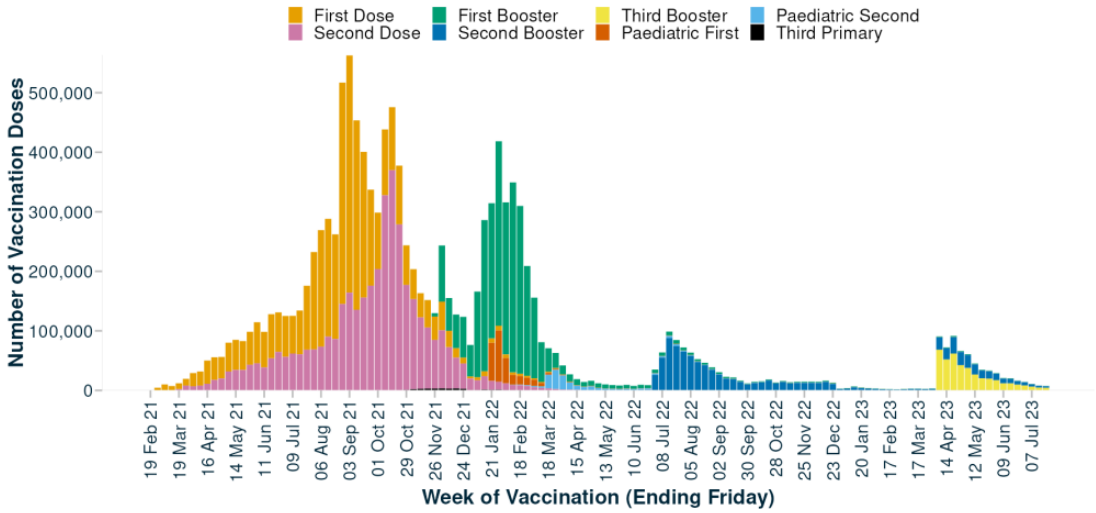
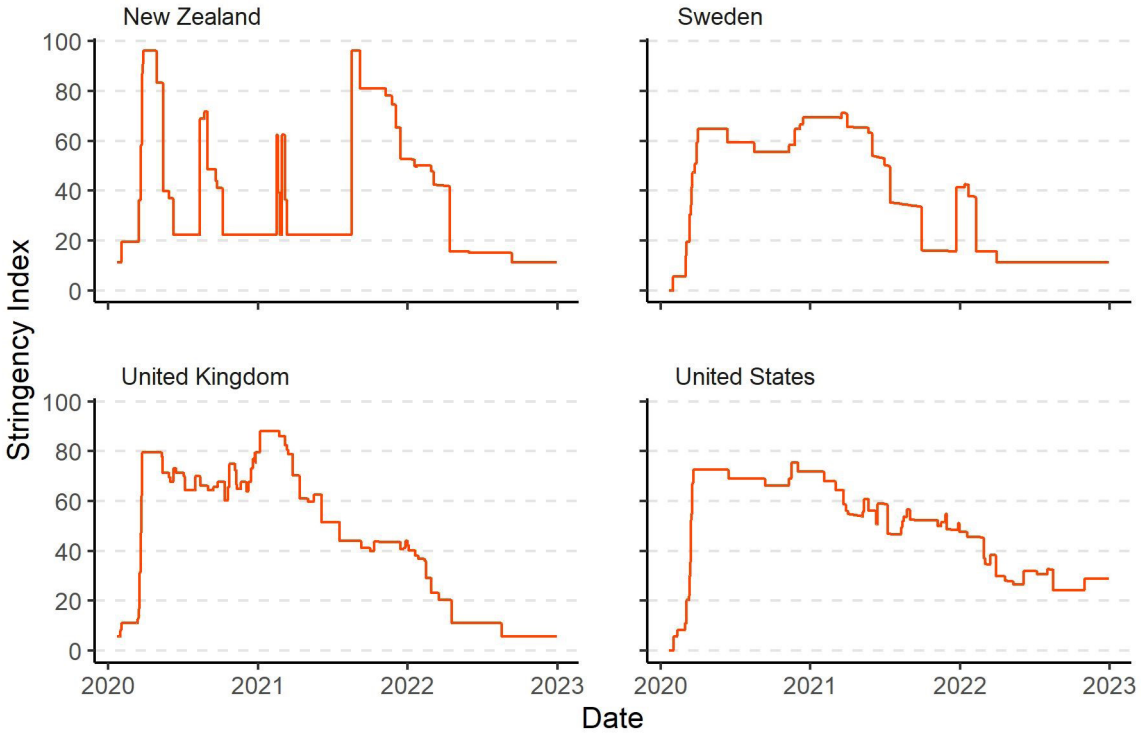


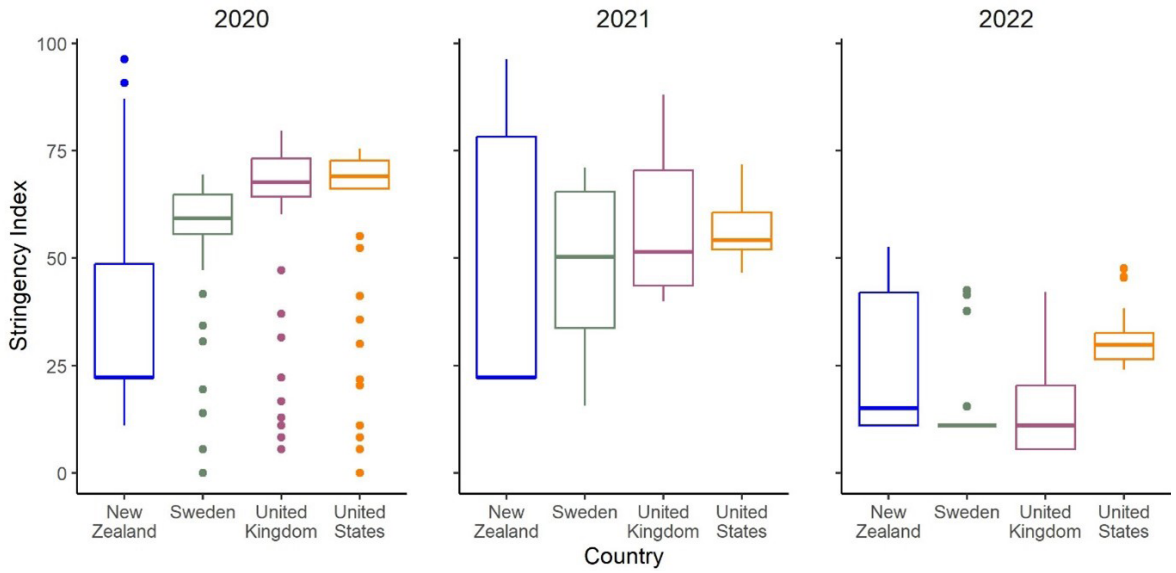
Figure 9: Level of COVID-19 restrictive policies during the pandemic in selected countries (22 January 2020 to 31 December 2022). The Stringency Index is based on nine response indicators including school and workplace closures and travel bans. Source: OWD.[102]



Appendix Table 1: Proportion of days per year spent above policy restriction thresholds (22 January 2020 to 31 December 2022; 1,075 days total). Source: OWD.[102]

Country	Percentage of days each year spent below/above Stringency Index thresholds (%)											
	2020				2021				2022			
	<30	≥30	≥50	≥70	<30	≥30	≥50	≥70	<30	≥30	≥50	≥70
New Zealand	59.4	40.6	21.2	17.4	57.0	43.0	40.3	29.6	72.1	27.9	14.2	0.0
Sweden	14.5	85.5	81.7	0.0	23.3	76.7	52.3	3.8	89.3	10.7	0.0	0.0
United Kingdom	16.2	83.8	82.6	37.1	0.0	100.0	54.5	27.7	87.7	12.3	0.0	0.0
United States	14.5	85.5	84.3	38.3	0.0	100.0	80.3	9.0	55.9	44.1	0.0	0.0

Figure 10: Median COVID-19 policy stringency for selected countries. Boxplots detail median, inter-quartile range, range and outliers (based on daily data, 22 January 2020 to 31 December 2022; 1,075 days total). Source: OWD.[102]



scaled from 0–100, with higher values indicating a greater level of restrictions.[126]

Figures 9 and 10 and Appendix Table 1 show a comparison of New Zealand with three other countries (a full range of country comparisons can be generated on the OWD website). This comparison shows how New Zealand used restrictions, such as stay-at-home orders (lockdowns), for relatively short periods during the elimination phase to "stamp out" COVID-19 outbreaks before returning to periods with few restrictions except at borders. Then during the suppression phase, it used them for a sustained period at a less intense level to minimise the transmission of COVID-19, before using them at a lower intensity during the mitigation phase.

By comparison, countries such as the US, UK and Sweden used moderate to high levels of restrictions continuously for much of the first 18 months of the pandemic to suppress transmission to minimise the health burden and avoid overwhelming health services. The net effect was markedly less time living with restrictions (≥50 stringency) in New Zealand during the first 2

years of the pandemic, particularly in 2020. All countries greatly reduced controls following arrival and spread of the Omicron variant in late 2021 or early 2022.

Reassuringly for New Zealand, periods of relatively high stringency of pandemic controls in 2000 and 2001 were associated with negative excess mortality, i.e., low and decreasing mortality (Figure 7). Excess mortality increased in 2022 corresponding to less stringent controls and high COVID-19 infection. This evidence suggests COVID-19 infection has been the main cause of an increase in excess mortality in 2022 rather than the effects of pandemic control measures and vaccination.[62]

Limitations of surveillance data

All of the data presented here have important limitations. In general, disease surveillance systems have sensitivity that is less than 100%, so under-count cases. This is particularly the situation with systems that require an active reporting process, such testing and reporting of positive RAT results by members of the public. Systems based on well-recorded events, such as hospitalisations and deaths, are likely to be far more sensitive to COVID-19 but still have limitations because of requirements for clinical judgement, testing and accurate recording. Active surveillance based on wastewater testing is also likely to provide consistent measurement of the presence of COVID-19 infections in a community.

Similarly, it is difficult to estimate the future course of the pandemic as it transitions to being an endemic infection. As noted (under *Future course of the pandemic*), there are multiple contributing factors to these future epidemiological scenarios. The limitations of current surveillance data add further uncertainties.

International assessments depend on countries having at least a moderate degree of comparability of data collection and reporting. Measures like excess mortality may be more valid in some situations than routine reporting of specific outcomes, such as COVID-19 mortality. However, excess mortality is also an imperfect measure because it is sensitive to the estimated baseline, which is becoming increasingly difficult to reliably extrapolate from pre-pandemic trends, and it cannot distinguish between deaths that are directly related, indirectly related and unrelated to the pandemic. Composite indexes, such as the Oxford Stringency Index, inevitably involve simplification of the policy responses in different countries (particularly for countries with very heterogeneous response across jurisdictions such as the US) to provide a single measure that can be used for comparison purposes.

Appendix 2: Timing of transitions through different COVID-19 response strategies

Here we summarise when New Zealand transitioned through different pandemic response strategies, from elimination to mitigation. We provide a rationale for assigning a date for each transition based on when the strategy was implemented.

It is important to note the limitations of this process. Government officials did not necessarily use standard terms for describing disease control strategies, so we have to infer them from the description of the measures being used and their aims. Suppression and mitigation strategies are on a spectrum rather than having a precise definition. Also, the implementation of specific strategies often included multiple incremental steps. For these reasons, the transition dates are indicative rather than being precise.

Elimination strategy

The elimination strategy aims to reduce transmission of an infectious disease to zero for a defined geographic area and time period.[28,87]

The elimination strategy was effectively announced on 23 March 2020, with New Zealand placed on Alert Level 3 immediately and a proposal to move to Alert Level 4 at 11:59 pm on 25 March. Government leaders and officials did not use the term elimination until several weeks later, but there was a strong implication that the intent was to eliminate COVID-19 from New Zealand.

We have therefore set the start day of the elimination strategy as **26 March 2020.**

The strategy achieved its aim of eliminating COVID-19 infection with the last case identified in early May and a move to Alert Level 1 on 8 June 2020, effectively declaring the end of person-to-person transmission within New Zealand.[127] Elimination continued successfully across New Zealand, with occasional small outbreaks, until the Delta variant outbreak was detected in Auckland on 17 August 2021, with New Zealand being placed back on Alert Level 4. This outbreak proved difficult to eliminate in Auckland, necessitating a change in strategy.

Suppression strategy

The suppression strategy aims to reduce the transmission of an infectious disease and the consequences of infection to minimise its health burden.[26,87]

The transition from elimination to suppression was signalled on 4 October 2021 when the Government announced that the elimination strategy would be phased out.[128] It would be replaced with the COVID-19 Protection Framework or "traffic lights" system.[129] Implementation happened at 11:59 pm on 2 December 2021, when the Alert Level System was retired and the COVID-19 Protection Framework was introduced.[129]

We have therefore set the start day for the suppression strategy as **3 December 2021**.

The strategy achieved its aim of suppressing the Delta variant wave of infection in both size and geographic spread.[30]

Mitigation strategy

The mitigation strategy provides a lower level of disease reduction than suppression, with a particular aim of protecting the health system from being overwhelmed.[87]

The transition from suppression to mitigation was signalled on 26 January 2022 with the Government announcing its three-phase public health response to Omicron.[130] The first phase articulated a suppression approach: "*Phase One is where we are now, and we are doing what we have successfully done with Delta—taking a 'stamp it out' approach ... Our objective is to keep cases as low as possible for as long as possible to allow people to be boosted and children to be vaccinated without Omicron being widespread*." This phase retained PCR testing and a 14-day isolation period for cases. Phases Two and Three signalled a shift away from identifying all cases and attempting to interrupt transmission. Implementation of this shift in strategy occurred with the move to Phase Two of the Omicron response at 11:59 pm on 16 February 2022.

We have therefore set the start day for the mitigation strategy as **17 February 2022.** Other measures associated with elimination and suppression were removed after this date, notably a phased reduction in border controls.[131]

This change to mitigation was also a pragmatic response to the introduction and rapid spread of Omicron cases. The first case of community transmission of Omicron in New Zealand was reported on 18 January 2022. Cases accelerated from 28 January and steeply during February, with a peak of almost 24,000 reported cases on 8 March. Arguably, the mitigation strategy achieved its aim, as the New Zealand healthcare system was stressed but not overwhelmed.

COMPETING INTERESTS
Nil.

ACKNOWLEDGEMENTS
We thank our many colleagues across the public sector, health system and universities who have contributed to the high quality of COVID-19 surveillance in New Zealand. We also acknowledge the extraordinary effort across New Zealand society to formulate and deliver a highly effective pandemic response.

AUTHOR INFORMATION
Michael G Baker: Epidemiologist and Public Health Physician, University of Otago Wellington.
Amanda Kvalsvig: Epidemiologist, University of Otago Wellington.
Michael J Plank: Mathematical Modeler, School of Mathematics and Statistics, University of Canterbury, Co-lead Covid-19 Modelling Aotearoa.
Jemma L Geoghegan: Molecular biologist, Department of Microbiology and Immunology, University of Otago Dunedin.
Teresa Wall: Consultant on strengthening Māori health and equity, Wellington.
Collin Tukuitonga: Public Health Physician, Pacific Health Researcher, The University of Auckland.
Jennifer Summers: Epidemiologist, University of Otago Wellington.
Julie Bennett: Epidemiologist, University of Otago Wellington.
John Kerr: Senior Research Fellow, University of Otago Wellington.
Nikki Turner: General Practitioner and Medical Director of the Immunisation Advisory Centre, The University of Auckland.
Sally Roberts: Clinical Microbiologist, Clinical Head of Microbiology and Infection Prevention and Control, Auckland Hospital, Te Whatu Ora – Health New Zealand, Te Toka Tumai Auckland.
Kelvin Ward: Urgent Care Physician, Wellington.
Bryan Betty: General Practitioner and Chair, General Practice New Zealand, Wellington.
Q Sue Huang: Virologist, Director of WHO National Influenza Centre, Institute of Environmental Science and Research, Wellington.
Nigel French: Epidemiologist, Massey University of New Zealand, Palmerston North.
Nick Wilson: Epidemiologist and Public Health Physician, University of Otago Wellington.

CORRESPONDING AUTHOR
Michael Baker: Department of Public Health, University of Otago, Wellington, Level 4, Harbour City Centre, 29 Brandon Street, Wellington, New Zealand 6011.
E: michael.baker@otago.ac.nz

REFERENCES
1. Lenharo M. WHO declares end to COVID-19's emergency phase. Nature. 2023;882(10.1038). doi: 10.1038/d41586-023-01559-z.
2. Unite against COVID-19. All COVID-19 requirements removed [Internet]. Wellington: New Zealand Government; 2023 [cited 2023 Aug 15]. Available from: https://covid19.govt.nz/news-and-data/latest-news/all-covid-19-requirements-removed/.
3. Institute of Environmental Science and Research (ESR). Genomics Insights Dashboard [Internet]. New Zealand: Institute of Environmental Science and Research (ESR); 2023 [cited 2023 Jul 17]. Available from: https://www.esr.cri.nz/our-expertise/covid-19-response/covid19-insights/genomics-insights/.
4. Manatū Hauora – Ministry of Health. New Zealand COVID-19 Data 2023 [Internet]. Wellington: Manatū Hauora – Ministry of Health; 2023 [cited 2023 Jul 3]. Available from: https://github.com/minhealthnz/nz-covid-data.
5. Stats NZ. Births and deaths: Year ended December 2022 (including abridged period life table) [Internet]. Wellington: Stats NZ; 2023 [cited 2023 Jul 3]. Available from: https://www.stats.govt.nz/information-releases/births-and-deaths-year-ended-december-2022-including-abridged-period-life-table/.
6. Public Health Agency. COVID-19 Trends and Insights Report [Internet]. Wellington: Manatū Hauora – Ministry of Health; 2022 [cited 2023 Jul 3]. Available from: https://www.tewhatuora.govt.nz/assets/Our-health-system/Data-and-statistics/Covid-19/Covid-trends/COVID-19-Trends-and-Insights-Report-7-October-2022-PDF-1.7-MB.pdf.
7. Deputy Director-General, Public Health Agency. Memo: Review of COVID-19 Protection Framework settings – 27 July 2022: Appendix 2: Outbreak analysis and modelling. Wellington: Manatū Hauora – Ministry of Health; 2022 [cited 2023 Jul 3]. Available from: https://fyi.org.nz/request/20877/response/79906/attach/5/H2022014882%20documents.pdf.
8. World Health Organization. Coronavirus disease (COVID-19): Post COVID-19 condition [Internet]. Geneva: World Health Organization; 2023 [cited 2023 May 20]. Available from: https://www.who.int/news-room/questions-and-answers/item/coronavirus-disease-(covid-19)-post-covid-19-condition.
9. Bowe B, Xie Y, Al-Aly Z. Postacute sequelae of COVID-19 at 2 years. Nat Med. 2023. doi: 10.1038/s41591-023-02521-2.
10. Morton J. 'Occupational hazard': The teachers battling Long Covid. NZ Herald [Internet].

2022 3 Aug [cited 2022 Aug 3]. Available from: https://www.nzherald.co.nz/nz/occupational-hazard-the-teachers-battling-long-covid/EIOUOTLCGUDH6XSS6AP7KBB4MQ/.
11. Russell L, Jeffreys M, Churchward M, et al. Cohort profile: Ngā Kawekawe o Mate Korona | Impacts of COVID-19 in Aotearoa – a prospective, national cohort study of people with COVID-19 in New Zealand. BMJ Open. 2023;13(7):e071083. doi: 10.1136/bmjopen-2022-071083.
12. Cao X, Li Y, Zi Y, Zhu Y. The shift of percent excess mortality from zero-COVID policy to living-with-COVID policy in Singapore, South Korea, Australia, New Zealand and Hong Kong SAR. Front Public Health. 2023;11:108541. doi: 10.3389/fpubh.2023.1085451.
13. Callaway E. COVID's future: mini-waves rather than seasonal surges. Nature. 2023;617(7960):229-230. doi: 10.1038/d41586-023-01437-8.
14. Porta M. A Dictionary of Epidemiology. 6th ed. Oxford (UK): Oxford University Press; 2014.
15. Callaway E. Why a highly mutated coronavirus variant has scientists on alert. Nature. 2023.620(7976):934. doi: 10.1038/d41586-023-02656-9.
16. Wang W, Wang CY, Wang SI, Wei JC. Long-term cardiovascular outcomes in COVID-19 survivors among non-vaccinated population: A retrospective cohort study from the TriNetX US collaborative networks. EClinicalMedicine. 2022;53:101619. doi: 10.1016/j.eclinm.2022.101619.
17. DeVries A, Shambhu S, Sloop S, Overhage JM. One-Year Adverse Outcomes Among US Adults With Post-COVID-19 Condition vs Those Without COVID-19 in a Large Commercial Insurance Database. JAMA Health Forum. 2023;4(3):e230010. doi: 10.1001/jamahealthforum.2023.0010.
18. Te Whatu Ora – Health New Zealand. COVID-19 Trends and Insights [Internet]. Wellington: Te Whatu Ora – Health New Zealand; 2023 [cited 2023 Jul 3]. Available from: https://www.tewhatuora.govt.nz/our-health-system/data-and-statistics/covid-19-data/covid-19-trends-and-insights/.
19. Burkholz S, Rubsamen M, Blankenberg L, et al. Analysis of well-annotated next-generation sequencing data reveals increasing cases of SARS-CoV-2 reinfection with Omicron. Commun Biol. 2023;6(1):288. doi: 10.1038/s42003-023-04687-4.
20. Wang H, Wright T, Everhart K, et al. SARS-CoV-2 Reinfection With Different SARS-CoV-2 Variants in Children, Ohio, United States. J Pediatric Infect Dis Soc. 2023;12(4):198-204. doi: 10.1093/jpids/piad017.
21. Tokars JI, Olsen SJ, Reed C. Seasonal Incidence of Symptomatic Influenza in the United States. Clin Infect Dis. 2018;66(10):1511-1518. doi: 10.1093/cid/cix1060.
22. Huang QS, Bandaranayake D, Wood T, et al. Risk factors and attack rates of seasonal influenza infection: Results of the Southern Hemisphere Influenza and Vaccine Effectiveness Research and Surveillance (SHIVERS) Seroepidemiologic Cohort Study. J Infect Dis. 2019;219(3):347-357. doi: 10.1093/infdis/jiy443.
23. Bowe B, Xie Y, Al-Aly Z. Acute and postacute sequelae associated with SARS-CoV-2 reinfection. Nat Med. 2022;28(11):2398-2405. doi: 10.1038/s41591-022-02051-3.
24. Stein C, Nassereldine H, Sorensen RJD, et al. Past SARS-CoV-2 infection protection against re-infection: a systematic review and meta-analysis. Lancet. 2023;401(10379):833-842. doi: 10.1016/s0140-6736(22)02465-5.
25. Deng J, Ma Y, Liu Q, et al. Severity and Outcomes of SARS-CoV-2 Reinfection Compared with Primary Infection: A Systematic Review and Meta-Analysis. Int J Environ Res Public Health. 2023;20(4):3335. doi: 10.3390/ijerph20043335.
26. Baker MG, Kvalsvig A, Crengle S, et al. The next phase in Aotearoa New Zealand's COVID-19 response: a tight suppression strategy may be the best option. N Z Med J. 2021;134(1546):8-16.
27. Carvalho N, Sousa TV, Mizdrak A, et al. Comparing health gains, costs and cost-effectiveness of 100s of interventions in Australia and New Zealand: an online interactive league table. Popul Health Metr. 2022;20(1):17. doi: 10.1186/s12963-022-00294-3.
28. Baker M, Kvalsvig A, Verrall AJ, et al. New Zealand's elimination strategy for the COVID-19 pandemic and what is required to make it work. N Z Med J. 2020;133(1512):10-14.
29. Baker MG, Wilson N, Blakely T. Elimination could be the optimal response strategy for covid-19 and other emerging pandemic diseases. BMJ. 2020;371:m4907. doi: 10.1136/bmj.m4907.
30. Baker M, Summers J, Kvalsvig A, et al. Preparing for Omicron: A proactive Government response is urgently needed to minimise harms [Internet]. Wellington: Public Health Communication Centre Aotearoa. 2022 Jan [cited 2023 Jul 3]. Available from: https://www.phcc.org.nz/briefing/preparing-omicron-proactive-government-response-urgently-needed-minimise-harms.
31. Greenhalgh T, Griffin S, Gurdasani D, et al. Covid-19: An urgent call for global "vaccines-plus" action. BMJ. 2022;376:o1. doi: 10.1136/bmj.o1.
32. Sachs JD, Karim SSA, Aknin L, et al. The Lancet Commission on lessons for the future from the

COVID-19 pandemic. Lancet. 2022;400(10359):1224-1280. doi: 10.1016/s0140-6736(22)01585-9.
33. Lazarus JV, Romero D, Kopka CJ, et al. A multinational Delphi consensus to end the COVID-19 public health threat. Nature. 2022;611(7935):332-345. doi: 10.1038/s41586-022-05398-2.
34. Davies C, Timu-Parata C, Stairmand J, et al. A kia ora, a wave and a smile: an urban marae-led response to COVID-19, a case study in manaakitanga. Int J Equity Health. 2022;21(1):70. doi: 10.1186/s12939-022-01667-8.
35. Kvalsvig A, Barnard LT, Summers J, Baker MG. Integrated Prevention and Control of Seasonal Respiratory Infections in Aotearoa New Zealand: next steps for transformative change. Policy Quarterly. 2022;18(1):44-51. doi: 10.26686/pq.v18i1.7500.
36. Khieu TQT, Pierse N, Telfar-Barnard LF, et al. Modelled seasonal influenza mortality shows marked differences in risk by age, sex, ethnicity and socioeconomic position in New Zealand. J Infect. 2017;75(3):225-233. doi: 10.1016/j.jinf.2017.05.017.
37. Khieu TQ, Pierse N, Telfar-Barnard LF, et al. Estimating the contribution of influenza to hospitalisations in New Zealand from 1994 to 2008. Vaccine. 2015;33(33):4087-92. doi: 10.1016/j.vaccine.2015.06.080.
38. Huang QS, Wood T, Jelley L, et al. Impact of the COVID-19 nonpharmaceutical interventions on influenza and other respiratory viral infections in New Zealand. Nat Commun. 2021;12(1):1001. doi: 10.1038/s41467-021-21157-9.
39. Szanyi J, Wilson T, Howe S, et al. Epidemiologic and economic modelling of optimal COVID-19 policy: public health and social measures, masks and vaccines in Victoria, Australia. Lancet Reg Health West Pac. 2023;32:100675. doi: 10.1016/j.lanwpc.2022.100675.
40. Banholzer N, Zürcher K, Jent P, et al. SARS-CoV-2 transmission with and without mask wearing or air cleaners in schools in Switzerland: A modeling study of epidemiological, environmental, and molecular data. PLoS Med. 2023;20(5):e1004226. doi: 10.1371/journal.pmed.1004226.
41. Harvey EP, Looker J, O'Neale DR, et al. Quantifying the Impact of Isolation Period and the Use of Rapid Antigen Tests for Confirmed COVID-19 Cases [Internet]. New Zealand: COVID-19 Modelling Aotearoa, The University of Auckland; 2022 [cited 2023 Jul 3]. Available from: https://bpb-ap-se2.wpmucdn.com/blogs.auckland.ac.nz/dist/c/828/files/2022/10/quantifying-the-impact-of-isolation-period-v2.pdf.
42. Stevenson A, Freeman J, Jermy M, Chen J. Airborne transmission: a new paradigm with major implications for infection control and public health. N Z Med J. 2023;136(1570):69-77.
43. Buonanno G, Ricolfi L, Morawska L, et al. Increasing ventilation reduces SARS-CoV-2 airborne transmission in schools: A retrospective cohort study in Italy's Marche region. Front Public Health. 2022;10:1087087. doi: 10.3389/fpubh.2022.1087087.
44. Bennett J, Shorter C, Kvalsvig A, et al. Indoor air quality, largely neglected and in urgent need of a refresh. N Z Med J. 2022;135(1559):136-39.
45. Kvalsvig A, Wilson N, Chan L, et al. Mass masking: an alternative to a second lockdown in Aotearoa. N Z Med J 2020;133(1517):8-13.
46. Matheis C, Norrefeldt V, Will H, et al. Modeling the airborne transmission of SARS-CoV-2 in public transport. Atmos. 2022;13(3):389. doi: 10.3390/atmos13030389.
47. Wilson N, Telfar Barnard L, Bennett J, et al. Poor ventilation in public transport settings in Aotearoa NZ: New data for buses and trains. Wellington: Public Health Communication Centre Aotearoa; 2023 Jul 10 [cited 2023 Jul 3]. Available from: https://www.phcc.org.nz/briefing/poor-ventilation-public-transport-settings-aotearoa-nz-new-data-buses-and-trains.
48. Kvalsvig A, Tuari-Toma B, Timu-Parata C, et al. Protecting school communities from COVID-19 and other infectious disease outbreaks: the urgent need for healthy schools in Aotearoa New Zealand. N Z Med J. 2023;136(1571):7-19.
49. Watson OJ, Barnsley G, Toor J, et al. Global impact of the first year of COVID-19 vaccination: a mathematical modelling study. Lancet Infect Dis. 2022;22(9):1293-302. doi: 10.1016/S1473-3099(22)00320-6.
50. Arbel R, Peretz A, Sergienko R, et al. Effectiveness of a bivalent mRNA vaccine booster dose to prevent severe COVID-19 outcomes: a retrospective cohort study. Lancet Infect Dis. 2023;23(8):914-921. doi: 10.1016/S1473-3099(23)00122-6.
51. Lin DY, Xu Y, Gu Y, et al. Effectiveness of Bivalent Boosters against Severe Omicron Infection. N Engl J Med. 2023;388(8):764-766. doi: 10.1056/NEJMc2215471.
52. Vashishtha VM, Kumar P. Looking to the future: is a universal coronavirus vaccine feasible? Expert Rev Vaccines. 2022;21(3):277-280. doi: 10.1080/14760584.2022.2020107.
53. Dhama K, Dhawan M, Tiwari R, et al. COVID-19 intranasal vaccines: current progress, advantages, prospects, and challenges. Hum Vaccin Immunother. 2022;18(5):2045853. doi: 10.1080/21645515.2022.2045853.

54. Arevalo CP, Bolton MJ, Le Sage V, et al. A multivalent nucleoside-modified mRNA vaccine against all known influenza virus subtypes. Science. 2022;378(6622):899-904. doi: 10.1126/science.abm0271.
55. Papi A, Ison MG, Langley JM, et al. Respiratory Syncytial Virus Prefusion F Protein Vaccine in Older Adults. N Engl J Med. 2023;388(7):595-608. doi: 10.1056/NEJMoa2209604.
56. Gatt D, Martin I, AlFouzan R, et al. Prevention and Treatment Strategies for Respiratory Syncytial Virus (RSV). Pathogens. 2023;12(2):154. doi: 10.3390/pathogens12020154.
57. Love AS, Love RJ. Considering needle phobia among adult patients during mass COVID-19 vaccinations. J Prim Care Community Health. 2021;12:21501327211007393. doi: 10.1177/21501327211007393.
58. Te Whatu Ora – Health New Zealand. COVID-19 vaccine data [Internet]. Wellington: Te Whatu Ora – Health New Zealand; 2023 [cited 2023 Jul 17]. Available from: https://www.tewhatuora.govt.nz/our-health-system/data-and-statistics/covid-vaccine-data/.
59. Burke PF, Masters D, Massey G. Enablers and barriers to COVID-19 vaccine uptake: An international study of perceptions and intentions. Vaccine. 2021;39(36):5116-5128. doi: 10.1016/j.vaccine.2021.07.056.
60. The Immunisation Advisory Centre. Myocarditis and the COVID-19 vaccines in New Zealand [Internet]. Auckland: The Immunisation Advisory Centre; 2022 [cited 2023 Jul 3]. Available from: https://covid.immune.org.nz/sites/default/files/2022-08/Myocarditis_COVID19-vaccines_for_HP_v5-Aug22.pdf.
61. Medsafe | New Zealand Medicines and Medical Devices Safety Authority. COVID-19 Safety Monitoring [Internet]. Wellington: Medsafe; 2023 [cited 2023 Jul 3]. Available from: https://www.medsafe.govt.nz/COVID-19/safety-monitoring.asp.
62. Kung S, Hills T, Kearns N, Beasley R. New Zealand's COVID-19 elimination strategy and mortality patterns. Lancet. 2023:S0140-6736(23)01368-5. doi: 10.1016/S0140-6736(23)01368-5.
63. Wikaire E, Harwood M, Wikaire-Mackey K, et al. Reducing healthcare inequities for Māori using Telehealth during COVID-19. N Z Med J. 2022;135:112-119.
64. Wilson G, Windner Z, Bidwell S, et al. 'Here to stay': changes to prescribing medication in general practice during the COVID-19 pandemic in New Zealand. J Prim Health Care. 2021;13(3):222-230. doi: 10.1071/HC21035.
65. Amani B, Amani B. Efficacy and safety of nirmatrelvir/ritonavir (Paxlovid) for COVID-19: A rapid review and meta-analysis. J Med Virol. 2023 Feb;95(2):e28441. doi: 10.1002/jmv.28441.
66. Australian Commission on Safety and Quality in Health Care. Optimising ventilation for infection prevention and control in healthcare settings [Internet]. Sydney: Australian Commission on Safety and Quality in Health Care; 2023 [cited 2023 Jul 3]. Available from: https://www.safetyandquality.gov.au/our-work/infection-prevention-and-control/optimising-ventilation-infection-prevention-and-control-healthcare-settings.
67. Kvalsvig A, Wilson N, Davies C, et al. Expansion of a national Covid-19 alert level system to improve population health and uphold the values of Indigenous peoples. Lancet Reg Health West Pac. 2021;12:100206. doi: 10.1016/j.lanwpc.2021.100206.
68. Wilhelm E, Ballalai I, Belanger ME, et al. Measuring the Burden of Infodemics: Summary of the Methods and Results of the Fifth WHO Infodemic Management Conference. JMIR Infodemiology. 2023;3:e44207. doi: 10.2196/44207.
69. Geoghegan JL, Ren X, Storey M, et al. Genomic epidemiology reveals transmission patterns and dynamics of SARS-CoV-2 in Aotearoa New Zealand. Nat Commun. 2020;11(1):6351. doi: 10.1038/s41467-020-20235-8.
70. Douglas J, Geoghegan JL, Hadfield J, et al. Real-Time Genomics for Tracking Severe Acute Respiratory Syndrome Coronavirus 2 Border Incursions after Virus Elimination, New Zealand. Emerg Infect Dis. 2021;27(9):2361-68. doi: 10.3201/eid2709.211097.
71. Eichler N, Thornley C, Swadi T, et al. Transmission of Severe Acute Respiratory Syndrome Coronavirus 2 during Border Quarantine and Air Travel, New Zealand (Aotearoa). Emerg Infect Dis. 2021;27(5):1274-78. doi: 10.3201/eid2705.210514.
72. Geoghegan JL, Douglas J, Ren X, et al. Use of Genomics to Track Coronavirus Disease Outbreaks, New Zealand. Emerg Infect Dis. 2021;27(5):1317-22. doi: 10.3201/eid2705.204579.
73. Swadi T, Geoghegan JL, Devine T, et al. Genomic Evidence of In-Flight Transmission of SARS-CoV-2 Despite Predeparture Testing. Emerg Infect Dis. 2021;27(3):687-93. doi: 10.3201/eid2703.204714.
74. Douglas J, Winter D, McNeill A, et al. Tracing the international arrivals of SARS-CoV-2 Omicron variants after Aotearoa New Zealand reopened its border. Nat Commun. 2022;13(1):6484. doi: 10.1038/s41467-022-34186-9.
75. Gilpin BJ, Carter K, Chapman JR, et al. A pilot study of wastewater monitoring for SARS-CoV-2 in New

Zealand. Journal of Hydrology (New Zealand). 2022;61(1):45-57.
76. Huang QS, Wood T, Jelley L, et al. Impact of the COVID-19 nonpharmaceutical interventions on influenza and other respiratory viral infections in New Zealand. Nat Commun. 2021;12(1):1001. doi: 10.1038/s41467-021-21157-9.
77. WellKiwis. WellKiwis influenza study [Internet]. 2023 [cited 2023 Jul 3]. Available from: https://www.wellkiwis.co.nz/.
78. Manatū Hauora – Ministry of Health. COVID-19 prevalence survey update [Internet]. 2023 [cited 2023 Jul 3]. Available from: https://www.health.govt.nz/news-media/news-items/covid-19-prevalence-survey-update.
79. Angus DC, Berry S, Lewis RJ, et al. The REMAP-CAP (Randomized Embedded Multifactorial Adaptive Platform for Community-acquired Pneumonia) Study. Rationale and Design. Ann Am Thorac Soc. 2020;17(7):879-91. doi: 10.1513/AnnalsATS.202003-192SD.
80. Boyd M, Baker MG, Wilson N. Border closure for island nations? Analysis of pandemic and bioweapon-related threats suggests some scenarios warrant drastic action. Aust N Z J Public Health. 2020;44(2):89-91. doi: 10.1111/1753-6405.12991.
81. Abbasi J. Bird Flu Has Begun to Spread in Mammals-Here's What's Important to Know. JAMA. 2023;329(8):619-21. doi: 10.1001/jama.2023.1317.
82. Ardern J, Tinneti J. Royal Commission to draw lessons from pandemic response [Internet]. New Zealand Government; 2022 Dec 5 [2023 Jul 3]. Available from: https://www.beehive.govt.nz/release/royal-commission-draw-lessons-pandemic-response.
83. Kvalsvig A, Baker MG. How Aotearoa New Zealand rapidly revised its Covid-19 response strategy: lessons for the next pandemic plan. Journal of the Royal Society of New Zealand. 2021;51:1-24.
84. Ministry of Business, Innovation and Employment. Budget initiatives [Internet]. 2023 [cited 2023 Jul 3]. Available from: https://www.mbie.govt.nz/science-and-technology/science-and-innovation/agencies-policies-and-budget-initiatives/budget-initiatives/.
85. Bansal A. Vaccine equity: there is no time to waste. Bull World Health Organ. 2022;100(1):2-2A. doi: 10.2471/blt.21.287655.
86. Clark H, Cárdenas M, Dybul M, et al. Transforming or tinkering: the world remains unprepared for the next pandemic threat. Lancet. 2022;399(10340):1995-99. doi: 10.1016/S0140-6736(22)00929-1.
87. Baker MG, Durrheim D, Hsu LY, Wilson N. COVID-19 and other pandemics require a coherent response strategy. Lancet. 2023;401(10373):265-66. doi: 10.1016/S0140-6736(22)02489-8.
88. Karger E, Rosenberg J, Jacobs Z, et al. Forecasting Existential Risks: Evidence from a Long-Run Forecasting Tournament [Internet]. Forecasting Research Institute; 2023 [cited 2023 Jul 3]. Available from: https://forecastingresearch.org/s/XPT.pdf.
89. Te Whatu Ora – Health New Zealand. COVID-19: Surveillance strategy [Internet]. Manatū Hauora – Ministry of Health; 2021 [cited 2023 Jul 3]. Available from: https://www.tewhatuora.govt.nz/for-the-health-sector/covid-19-information-for-health-professionals/covid-19-surveillance-strategy/.
90. Institute of Environmental Science and Research (ESR). Aotearoa Wastewater Surveillance Programme [Internet]. 2023 [cited 2023 Jul 17]. Available from: https://github.com/ESR-NZ/covid_in_wastewater.
91. Te Whatu Ora – Health New Zealand. Case definition and clinical testing guidelines for COVID-19 [Internet]. 2023 [cited 2023 Jul 3]. Available from: https://www.tewhatuora.govt.nz/for-the-health-sector/covid-19-information-for-health-professionals/case-definition-and-clinical-testing-guidelines-for-covid-19/.
92. Unite against COVID-19. How to report your RAT results [Internet]. 2023 [cited 2023 Jul 3]. Available from: https://covid19.govt.nz/testing-and-isolation/covid-19-testing/report-your-rat-with-my-covid-record/.
93. Te Whatu Ora – Health New Zealand. Recording COVID-19: Information for recording COVID-19 in a patient's health record [Internet]. 2023 [cited 2023 Jul 3]. Available from: https://www.tewhatuora.govt.nz/for-the-health-sector/covid-19-information-for-health-professionals/recording-covid-19/.
94. Public Health Agency. COVID-19 Mortality in Aotearoa New Zealand: Inequities in Risk. Wellington: Ministry of Health; 2022.
95. Institute of Environmental Science and Research. Wastewater Surveillance Dashboard [Internet]. 2023 [cited 2023 Jul 17]. Available from: https://www.esr.cri.nz/our-expertise/covid-19-response/covid19-insights/wastewater-surveillance-dashboard/.
96. Callaway E. COVID 'variant soup' is making winter surges hard to predict. Nature. 2022;611(7935):213-14. doi: 10.1038/d41586-022-03445-6.
97. Baker M, Summers J, Kerr J, Wilson N. Aotearoa New Zealand's fourth wave of Covid-19 and why we should care [Internet]. Public Health

Communications Centre Aotearoa; 2023 [cited 2023 Jul 3]. Available from: https://www.phcc.org.nz/briefing/aotearoa-new-zealands-fourth-wave-covid-19-and-why-we-should-care.
98. Goh AXC, Chae SR, Chiew CJ, et al. Characteristics of the omicron XBB subvariant wave in Singapore. Lancet. 2023;401(10384):1261-62. doi: 10.1016/S0140-6736(23)00390-2.
99. Institute of Environmental Science and Research. Prevelence of SARS-CoV-2 Variants of Concern in Aoteoroa New Zealand [Internet]. 2023 [cited 2023 Jul 17]. Available from: https://github.com/ESR-NZ/nz-sars-cov2-variants.
100. Msemburi W, Karlinsky A, Knutson V, et al. The WHO estimates of excess mortality associated with the COVID-19 pandemic. Nature. 2023;613(7942):130-37. doi: 10.1038/s41586-022-05522-2.
101. The Economist. Our model suggests that global deaths remain 5% above pre-covid forecasts [Internet]. 2023 [cited 2023 Jul 3]. Available from: https://www.economist.com/graphic-detail/2023/05/23/our-model-suggests-that-global-deaths-remain-5-above-pre-covid-forecasts.
102. Our World in Data. Coronavirus Pandemic (COVID-19) [Internet]. 2023 [cited 2023 Aug 7]. Available from: https://ourworldindata.org/coronavirus.
103. Our World in Data. Excess mortality during the Coronavirus pandemic (COVID-19) [Internet]. 2023 [cited 2023 Aug 7]. Available from: https://ourworldindata.org/excess-mortality-covid.
104. Statistics Netherlands. Excess mortality for the third consecutive year in 2022 [Internet]. 2023 [cited 2023 Jul 3]. Available from: https://www.cbs.nl/en-gb/news/2023/04/excess-mortality-for-the-third-consecutive-year-in-2022.
105. Troeger C. Just How Do Deaths Due to COVID-19 Stack Up? [Internet]. Think Global Health; 2023 [cited 2023 Jul 3]. Available from: https://www.thinkglobalhealth.org/article/just-how-do-deaths-due-covid-19-stack.
106. Davis HE, McCorkell L, Vogel JM, Topol EJ. Long COVID: major findings, mechanisms and recommendations. Nat Rev Microbiol. 2023;21:133-146. doi: 10.1038/s41579-023-00896-0.
107. Iwasaki A, Putrino D. Why we need a deeper understanding of the pathophysiology of long COVID. Lancet Infect Dis. 2023;23(4):393-95. doi: 10.1016/S1473-3099(23)00053-1.
108. Altmann DM, Whettlock EM, Liu S, et al. The immunology of long COVID. Nat Rev Immunol. 2023. doi: 10.1038/s41577-023-00904-7.
109. Xu SW, Ilyas I, Weng JP. Endothelial dysfunction in COVID-19: an overview of evidence, biomarkers, mechanisms and potential therapies. Acta Pharmacol Sin. 2023;44(4):695-709. doi: 10.1038/s41401-022-00998-0.
110. Turner S, Khan MA, Putrino D, et al. Long COVID: pathophysiological factors and abnormalities of coagulation. Trends Endocrinol Metab. 2023;34(6):321-44. doi: 10.1016/j.tem.2023.03.002.
111. Nalbandian A, Sehgal K, Gupta A, et al. Post-acute COVID-19 syndrome. Nat Med. 2021;27(4):601-15. doi: 10.1038/s41591-021-01283-z.
112. Sidik SM. Heart disease after COVID: what the data say. Nature. 2022;608(7921):26-28. doi: 10.1038/d41586-022-02074-3.
113. Torres-Castro R, Vasconcello-Castillo L, Alsina-Restoy X, et al. Respiratory function in patients post-infection by COVID-19: a systematic review and meta-analysis. Pulmonology. 2021;27(4):328-37. doi: 10.1016/j.pulmoe.2020.10.013.
114. Xu E, Xie Y, Al-Aly Z. Long-term neurologic outcomes of COVID-19. Nat Med. 2022;28(11):2406-15. doi: 10.1038/s41591-022-02001-z.
115. Weiss A, Donnachie E, Beyerlein A, et al. Type 1 Diabetes Incidence and Risk in Children With a Diagnosis of COVID-19. JAMA. 2023 ;329(23):2089-2091. doi: 10.1001/jama.2023.8674.
116. Kuodi P, Gorelik Y, Zayyad H, et al. Association between BNT162b2 vaccination and reported incidence of post-COVID-19 symptoms: cross-sectional study 2020-21, Israel. NPJ Vaccines. 2022;7(1):101. doi: 10.1038/s41541-022-00526-5
117. Amiama-Roig A, Pérez-Martínez L, Rodríguez Ledo P, et al. Should We Expect an Increase in the Number of Cancer Cases in People with Long COVID? Microorganisms. 2023;11(3):713. doi: 10.3390/microorganisms11030713.
118. Office for National Statistics. New-onset, self-reported long COVID after coronavirus (COVID-19) reinfection in the UK: 23 February 2023. [Internet]. United Kingdom: Office for National Statistics (ONS); 2023 [cited 2023 Jul 3]. Available from: https://www.ons.gov.uk.
119. Pinto Pereira SM, Mensah A, Nugawela MD, et al. Long COVID in Children and Youth After Infection or Reinfection with the Omicron Variant: A Prospective Observational Study. Journal Pediatr. 2023;259:113463. doi: 10.1016/j.jpeds.2023.113463.
120. Thaweethai T, Jolley SE, Karlson EW, et al. Development of a Definition of Postacute Sequelae of SARS-CoV-2 Infection. JAMA. 2023;329(22):1934-1946. doi: 10.1001/jama.2023.8823.
121. Centers for Disease Control and Prevention. Long COVID: Household Pulse Survey [Internet]. 2023 [cited 2023 May 19]. Available from: https://www.cdc.gov/nchs/covid19/pulse/long-covid.htm.
122. Bramante CT, Buse JB, Liebovitz DM, et al.

Outpatient treatment of COVID-19 and incidence of post-COVID-19 condition over 10 months (COVID-OUT): a multicentre, randomised, quadruple-blind, parallel-group, phase 3 trial. Lancet Infect Dis. 2023 Jun 8:S1473-3099(23)00299-2. doi: 10.1016/S1473-3099(23)00299-2
123. Faust JS. The therapeutic validation of long COVID. Lancet Infect Dis. 2023:S1473-3099(23)00355-9. doi: 10.1016/S1473-3099(23)00355-9.
124. Oh J, Lee HY, Khuong QL, et al. Mobility restrictions were associated with reductions in COVID-19 incidence early in the pandemic: evidence from a real-time evaluation in 34 countries. Sci Rep. 2021;11(1):13717. doi: 10.1038/s41598-021-92766-z.
125. Manatū Hauora – Ministry of Health. Evaluation and Behavioural Science [Internet]. 2023 [cited 2023 Jul 3]. Available from: https://www.health.govt.nz/covid-19-novel-coronavirus/covid-19-data-and-statistics/evaluation-and-behavioural-science.
126. Our World in Data. COVID-19: Stringency Index [Internet]. 2023 [cited 2023 Aug 7]. Available from: https://ourworldindata.org/covid-stringency-index.
127. Baker MG, Wilson N, Anglemyer A. Successful Elimination of Covid-19 Transmission in New Zealand. N Engl J Med. 2020:383(8):e56. doi: 10.1056/NEJMc2025203
128. Corlett E. New Zealand Covid elimination strategy to be phased out, Ardern says [Internet]. The Guardian; 2021 [cited 2023 Jul 3]. Available from: https://www.theguardian.com/world/2021/oct/04/new-zealand-covid-strategy-in-transition-ardern-says-as-auckland-awaits-lockdown-decision.
129. Unite against COVID-19. History of the COVID-19 Protection Framework (traffic lights) [Internet]. New Zealand Government; 2022 [cited 2023 Jul 3]. Available from: https://covid19.govt.nz/about-our-covid-19-response/history-of-the-covid-19-protection-framework-traffic-lights/.
130. Unite against COVID-19. Government announces three phase public health response to Omicron [Internet]. New Zealand Government; 2022 [cited Jul 2023]. Available from: https://covid19.govt.nz/news-and-data/latest-news/government-announces-three-phase-public-health-response-to-omicron/.
131. Unite against COVID-19. New Zealand border to reopen in stages from 27 February [Internet]. New Zealand Government; 2022 [cited 2023 Jul 3]. Available from: https://covid19.govt.nz/news-and-data/latest-news/new-zealand-border-to-reopen-in-stages-from-27-february/.

Watch that bite: syncope versus seizure

Tony Zhang

Clinical details

A referral was received from the emergency department for review of a middle-aged woman who presented with several months of recurrent unwitnessed "blackouts". Upon direct questioning, the patient admitted to occasionally waking up after these events with a sore tongue and the taste of blood in her mouth. In addition, she noticed the gradual development of a lump on her tongue with did not interfere with speech or swallowing. No collateral history was available at the time of presentation. Neurological exam was normal.

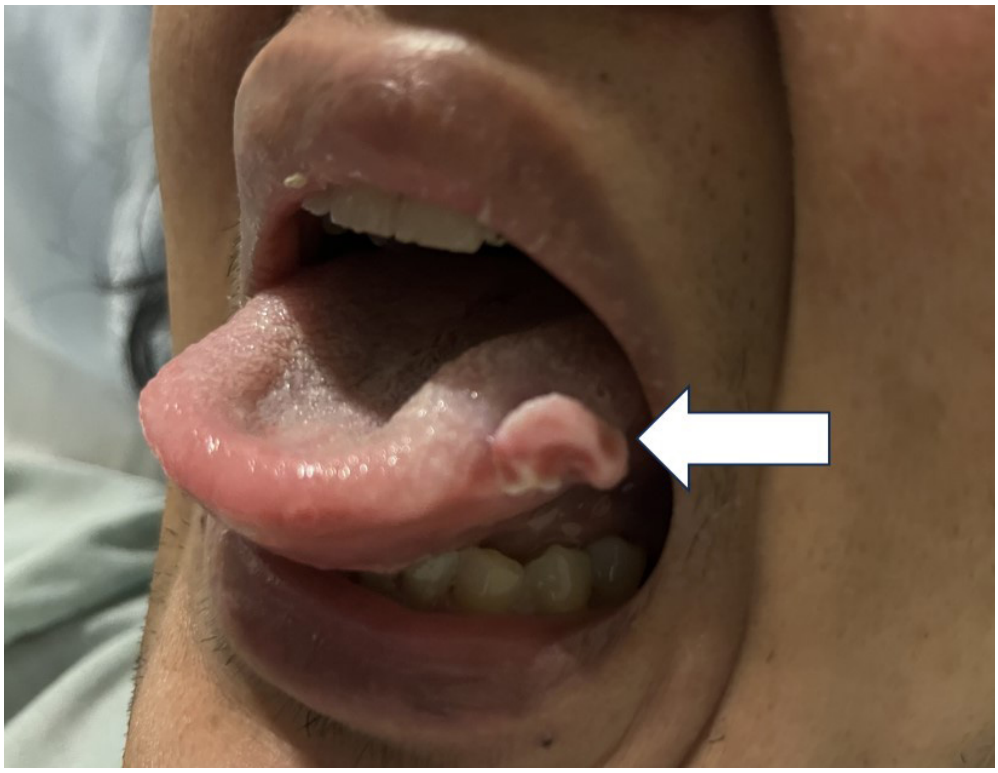
The clinical question was: syncope, vs seizure?

The following finding was discovered on examination of the tongue.

Discussion

After the above observation, seizures were immediately suspected as the culprit of her recurrent blackouts. Subsequent investigations confirmed a diagnosis of epilepsy, and she was commenced on appropriate treatment for this. The conclusion was that repeated tongue biting in the context of seizures had resulted in formation of accessory tissue on the left lateral aspect of her tongue. The absence of acute bleeding at presentation and the presence of granulation tissue at the stalk suggested a more chronic process. As was the case here, it is important to acknowledge that not all patients may associate tongue biting as an important clue to the aetiology of their "blackouts" and therefore may not volunteer this information if not specifically asked.

Figure 1: This demonstrates accessory tongue tissue extruding from the left lateral side of the patient's tongue via a granulated stalk. There was no evidence of acute bleeding.



The presence of lateral tongue biting is strongly suggestive of a generalised tonic-clonic seizure, initially reported in 1995 to have a specificity of 99%.[1] This was supported by a more recent systematic review in 2012 confirming lateral tongue biting to have a specificity of 100% when differentiating seizures from non-epileptic seizures, but a sensitivity of only 22%. Therefore, lateral tongue biting is a good "rule in" sign; however, the absence of this sign cannot be used to "rule out" seizures.[2] One can also see tongue biting in syncope or non-epileptic seizures, but this is more often at the tip of the tongue.[1–3]

Although this case represents an exaggerated example of a relatively common clinical sign, careful examination of the tongue should always be performed in instances of unexplained loss of consciousness. The presence of lateral tongue biting highly supports the diagnosis of seizures; however, all clinical signs need to be interpreted in the context of the patient as whole.

COMPETING INTERESTS
None.

CORRESPONDING AUTHOR
Tony Zhang: Department of Neurology, Auckland City Hospital, 2 Park Road Grafton Auckland 1023, New Zealand. Ph: +64212505886; E: tonyz@adhb.govt.nz

REFERENCES

1. Benbadis SR, Wolgamuth BR, Goren H, et al. Value of tongue biting in the diagnosis of seizures. Arch Intern Med. 1995;155(21):2346-2349.
2. Brigo F, Storti M, Lochner P, et al. Tongue biting in epileptic seizures and psychogenic events: an evidence-based perspective. Epilepsy Behav. 2012;25(2):251-255. doi: 10.1016/j.yebeh.2012.06.020.
3. van der Sluijs BM, Bloem BR. Neurological picture. Diagnosis at the tip of the tongue. J Neurol Neurosurg Psychiatry. 2006;77(6):718. doi: 10.1136/jnnp.2005.084996.

Physician associates as a potential win for the Aotearoa New Zealand healthcare workforce

Victoria Oberzil

ABSTRACT

A recent proposal by Manatū Hauora – Ministry of Health to regulate the physician associate (PA) profession has been put forth, coinciding with a much-lamented Aotearoa New Zealand healthcare workforce crisis. PAs are clinicians educated in the medical model who practise in dependent partnership with physicians. Introduction of PAs to the healthcare workforce is globally considered a success by multiple metrics. While important considerations to meet the needs of Aotearoa New Zealand should involve crucial stakeholders, adding PAs under the *Health Practitioners Competence Assurance Act* (HPCAA) should be considered as an evidence-based step towards alleviating the healthcare workforce crisis in Aotearoa New Zealand.

As of July 2023, a proposal to regulate the physician associate (PA) profession under the *Health Practitioners Competence Assurance Act* (HPCAA) has been put forth by Manatū Hauora – Ministry of Health.[1]

This proposal coincides with a much-lamented crisis in the Aotearoa New Zealand healthcare workforce as severe acute-on-chronic staffing issues plague both primary and secondary health sectors.[2] Mental health and addiction care in Aotearoa New Zealand is particularly vulnerable, with a dire urgency to both retain existing tertiary educated workforce and add new qualified clinicians.[3]

PAs are licensed clinicians who practise across all specialties of medicine under physician supervision. PAs conduct physical examinations, diagnose and manage illnesses, order and interpret laboratory tests and imaging, counsel on preventive health care, assist in surgery and write prescriptions. While PAs practise primarily in the United States, 15 other countries utilise PAs including the United Kingdom, Canada and Germany. Because of their close relationships with physicians, PAs train in the medical model at the Master's level, typically at an established medical school. Entrants to PA education typically have over 3,000 hours of hands-on patient care experience such as paramedic, surgical technician, nursing, or medical assistant. Most PA programmes are approximately 27 months (3 academic years) and include classroom instruction followed by 2,000 hours of supervised practicum in the core disciplines of medicine. PAs work across all medical specialties in a complementary role to a supervising physician or group of physicians and share panels of patients to expand clinical workforce. A key aspect to PA training is knowing the limits of their medical knowledge and to seek help when needed. Supervisory requirements for PAs typically vary by region; most American state laws dictate the physician must either be available on-site or by phone for consultation, and a small percentage of the PA's charts are reviewed per year.

Adding qualified PAs to the Aotearoa New Zealand healthcare workforce under HPCAA could potentially reduce dual burdens of patients awaiting medical care and physicians struggling to meet their needs. A mixed-method study of PAs in 15 countries concluded "*the utilisation of PAs, particularly in primary healthcare roles, increases access to services, is cost-beneficial, and shows a physician-equivalent quality of care*".[4] Given their physician-dependent role, PAs are largely introduced successfully into existing health systems as non-threatening to physician practice. PAs have been well studied to decrease acute care utilisation and hospital length-of-stay, improve patient safety and quality of care, increase access to services and may help decrease physician burnout.[5] PAs frequently deliver care to populations that are traditionally under-served or rural.[6] Patients are overall satisfied by PA care.[5,7]

While PAs are not a one-size-fits-all response to the Aotearoa New Zealand healthcare workforce

crisis, they can perhaps be part of the solution. A struggling mental health and addiction sector in Aotearoa New Zealand could certainly stand to benefit from an influx of experienced foreign PAs. In the United States, the National Commission on Certification of Physician Assistants (NCCPA) offers an optional specialty certification in psychiatry[8] and PAs play a crucial role in treating substance use disorders, particularly in rural locations.[9]

Introducing foreign-trained PAs to Aotearoa New Zealand's workforce must be given rigorous oversight and input from all key stakeholders. Māori cultural competency education with guidance from Te Aka Whai Ora – Māori Health Authority would need to be incorporated into the PA licensure process. Supervisory regulations under HCPAA, particularly for rural locations, should be established with input from both physician and PA organisations. Research on introduction of PAs in the United Kingdom notes that their lack of ability to prescribe and order radiographs limits their ability to ease primary and secondary care pressures if they are not able to fully utilise their skillset.[10]

Once structures and regulations are in place for foreign PAs to join Aotearoa New Zealand's healthcare workforce, partnerships with existing PA programmes and organisations from overseas could be a means to introduce qualified clinicians. Rotations in under-served regions of Aotearoa New Zealand would introduce PA students until a local PA programme is established. A registry (such as through the New Zealand Physician Associate Society) that lists interested PAs by medical specialty could be a means to link under-staffed clinics and hospitals with new, qualified clinicians.

While introducing foreign-trained PAs under HCPAA would also introduce new sets of concerns and considerations, deployment of PAs globally into the healthcare workforce is largely considered a success. Aotearoa New Zealand's struggling healthcare workforce could certainly stand to benefit from an influx of well-educated clinicians as a means to improve access and equity of care for patients. Evidence supports the introduction of PAs as beneficial to patients, physicians and healthcare systems worldwide, and Manatū Hauora – Ministry of Health would be wise to move forward with their proposed regulation.

COMPETING INTERESTS
Nil.

ACKNOWLEDGEMENTS
James A Foulds, Department of Psychological Medicine, University of Otago, Christchurch, New Zealand.

CORRESPONDING AUTHOR INFORMATION
Victoria Oberzil, MPAS, PA-C: Addiction Medicine Physician Associate, Peace Health Hospital System, Sober Living Oregon, Portland, Oregon, United States of America. Ph: +01 503-709-1846.
E: victoriaoberzil@gmail.com

REFERENCES

1. Mantaū Hauora – Ministry of Health. Regulating the Physician Associate profession under the Health Practitioners Competence Assurance Act 2003 [Internet]. 2023 [cited 2023 Jul 3]. Available from: https://www.mcnz.org.nz/assets/News-and-Publications/Consultations/Ministry-of-Health-PA-Consultation-document.pdf.
2. Frizelle F. The present healthcare crises and the delusion of looking for an answer to this in the restructuring of the health system. N Z Med J. 2022 Sep 2;135(1561):12-14.
3. Foulds JA, Beaglehole B, Mulder RT. Time for action, not words: the urgent rebuilding of New Zealand's mental health workforce. N Z Med J. 2023 May 26;136(1576):8-10.
4. Cawley JF, Hooker SR. Determinants of the Physician Assistant/associate Concept in Global Health Systems. Int J Healthc Inf Syst and Inform. 2018;4 (1):50.
5. Chenevert L, Bascombe K. Physician associates advance patient safety. Future Healthc J. 2021 Nov;8(3):e613-e615. doi: 10.7861/fhj.2021-0178.
6. Henry LR, Hooker RS, Yates KL. The role of physician assistants in rural health care: a systematic review of the literature. J Rural Health. 2011 Spring;27(2):220-9. doi: 10.1111/j.1748-0361.2010.00325.x.
7. Hooker RS, Moloney-Johns AJ, McFarland MM. Patient satisfaction with physician assistant/associate care: an international scoping review. Hum Resour Health. 2019 Dec 27;17(1):104. doi: 10.1186/s12960-019-0428-7.
8. National Commission on Certification of Physician Assistants. Psychiatry CAQ [Internet]. 2020 [cited 2023 Jul 10]. Available from: https://www.nccpa.net/specialty-certificates/#psychiatry.
9. Barnett ML, Lee D, Frank RG. In Rural Areas, Buprenorphine Waiver Adoption Since 2017 Driven By Nurse Practitioners And Physician Assistants. Health Aff (Millwood). 2019 Dec;38(12):2048-2056. doi: 10.1377/hlthaff.2019.00859.
10. Curran A, Parle J. Physician associates in general practice: what is their role? Br J Gen Pract. 2018 Jul;68(672):310-311. doi: 10.3399/bjgp18X697565.

A review of 19 years of anaphylaxis cross-reactivity data to muscle relaxants in New Zealand

Zyllan P Spilsbury, Han Truong

Anaphylaxis is "a severe, potentially fatal, systemic allergic reaction that occurs suddenly after contact with an allergy causing substance".[1] A complex immunological response (usually involving immunoglobulin E [IgE] antibodies) results in the secretion of multiple, biologically active products that cause characteristic multisystem signs and symptoms.[2] Anaphylaxis remains a major cause of anaesthesia attributable death, with a reported mortality rate between 1% and 3.5%.[3–5]

The incidence of anaesthesia associated anaphylaxis varies between countries (1:1,250 to 1:13,000).[6] The National Audit Project data (UK) reports that neuromuscular blocking agents (NMBAs) are used in approximately 50% of anaesthetics and are the second most common trigger agent for anaphylaxis associated with anaesthesia after antibiotics.[4]

The quaternary ammonium epitope has a recurring presence throughout the different NMBA classes (suxamethonium, steroid and benzylisoquinolinium). This similarity predisposes NMBAs to significant cross-reactivity between the classes.

Our aim is to estimate the rates of cross-reactivity between the different NMBAs.

Method

This is a minimal risk observational study and therefore did not require ethical approval. These data include consecutive patients with intradermal tests (IDT) data sent to New Zealand's Centre for Adverse Reactions Monitoring (CARM) retrospective database for collation between February 2000 and June 2019. All the patients were diagnosed with NMBA anaphylaxis because of a suggestive clinical event and followed-up by an allergy testing service who adhere to the Australian and New Zealand Anaesthetic Allergy Group (ANZAAG) allergy testing guidelines. The referral data includes demographics, a clinically suspected trigger NMBA (as the trigger for anaphylaxis) and the positive results of IDT. We included all patients who received IDT for a NMBA panel, including a combination of steroid NMBAs (rocuronium, vecuronium, pancuronium), benzylisoquinolinium NMBAs (mivacurium and atracurium) and suxamethonium during their follow-up. A Fisher's exact test was used to test for an association between the trigger NMBA and cross-reactivity (positive for the trigger and at least one other agent).

Results

Five hundred and one patients were referred to the CARM database between 2000 and 2019 with a confirmed diagnosis of NMBA anaphylaxis. Forty-four patients were excluded for incomplete IDT data. Three patients were excluded because the NMBA is no longer relevant to modern practice (gallamine or alcuronium).

The number of patients included for cross-reactivity analysis was 454. The population included 343 female and 111 male patients. The median (IQR) age was 52 (37–64) years.

Of the 454 patients diagnosed with NMBA anaphylaxis, the number of events for each trigger NMBA was rocuronium (n=242), suxamethonium (n=143), atracurium (n=42), mivacurium (n=7), pancuronium (n=3) and vecuronium (n=17). One hundred and ninety-six patients (43.2%) demonstrated no cross-reactivity beyond the trigger NMBA. Thirty-two patients had a negative IDT for the trigger NMBA despite a clinical diagnosis of NMBA anaphylaxis, including: suxamethonium (n=9), rocuronium (n=17), atracurium (n=4), mivacurium (n=2). Twenty-five patients had negative cross-reactivity patterns, including being negative for the trigger NMBA.

There is a statistically significant association between the trigger agent and cross-reactivity (testing positive for the trigger and at least one other agent), $p < .0001$. Those with suxamethonium

Table 1: The positive intradermal cross-sensitivity testing results.

				Cross reactivity; n(%)					
Index NMBA	**(Events)**	**Negative skin test for index agent**	**No cross-reactivity**	**Suxamethonium**	**Rocuronium**	**Atracurium**	**Vecuronium**	**Mivacurium**	**Pancuronium**
Suxamethonium	143	9 (6.29)	94 (65.73)	134 (93.71%)	27 (18.88)	9 (6.29)	10 (6.99)	10 (6.99)	6 (4.20)
Rocuronium	242	17 (7.02)	79 (32.64)	107 (44.21%)	225 (92.98)	15 (6.20)	68 (28.10)	10 (4.13)	49 (20.25)
Atracurium	42	4 (9.52)	18 (42.86)	7 (16.67%)	9 (21.43)	38 (90.48)	2 (4.76)	17 (40.48)	0 (0)
Vecuronium	17	0 (0)	3 (17.65)	5 (29.41)	7 (41.18)	3 (17.65)	17 (100)	4 (23.53)	8 (47.06)
Mivacurium	7	2 (28.57)	1 (14.29)	1 (14.29%)	1 (14.29)	5 (71.43)	1 (14.29)	5 (71.43)	1 (14.29)
Pancuronium	3	0 (0)	1 (33.33)	1 (33.3%)	1 (33.33)	0 (0)	0 (0)	1 (33.33)	3 (100)
Total	454	32	196	255	270	70	98	47	67

Figure 1: Rates of cross-reactivity for patients diagnosed with anaphylaxis according to triggering NMBA.

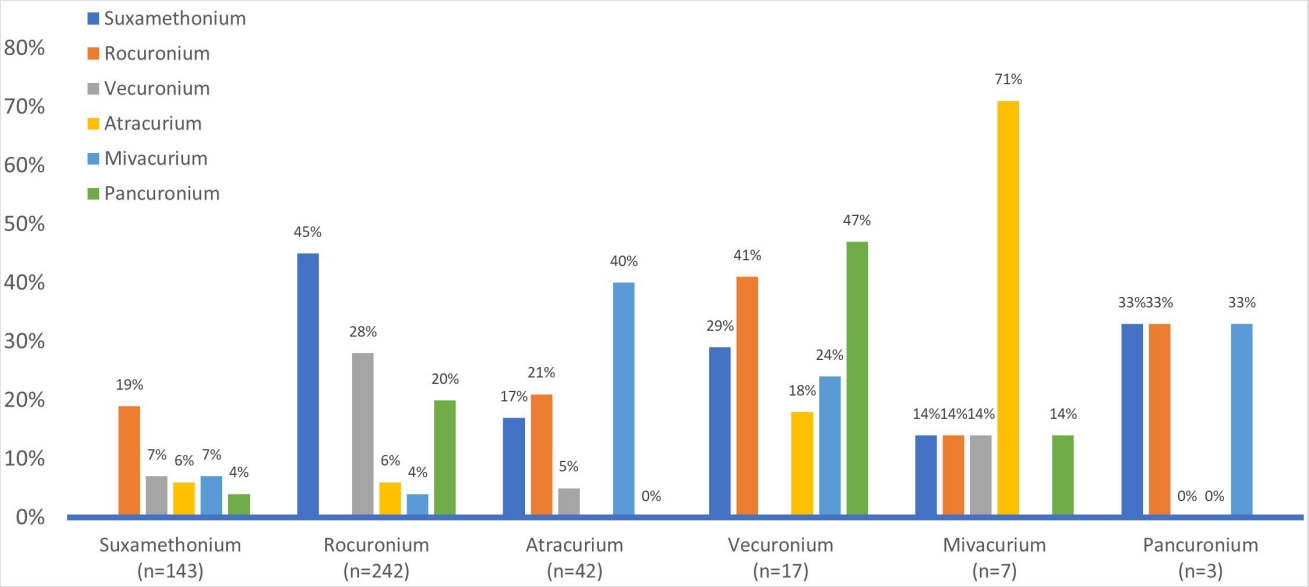
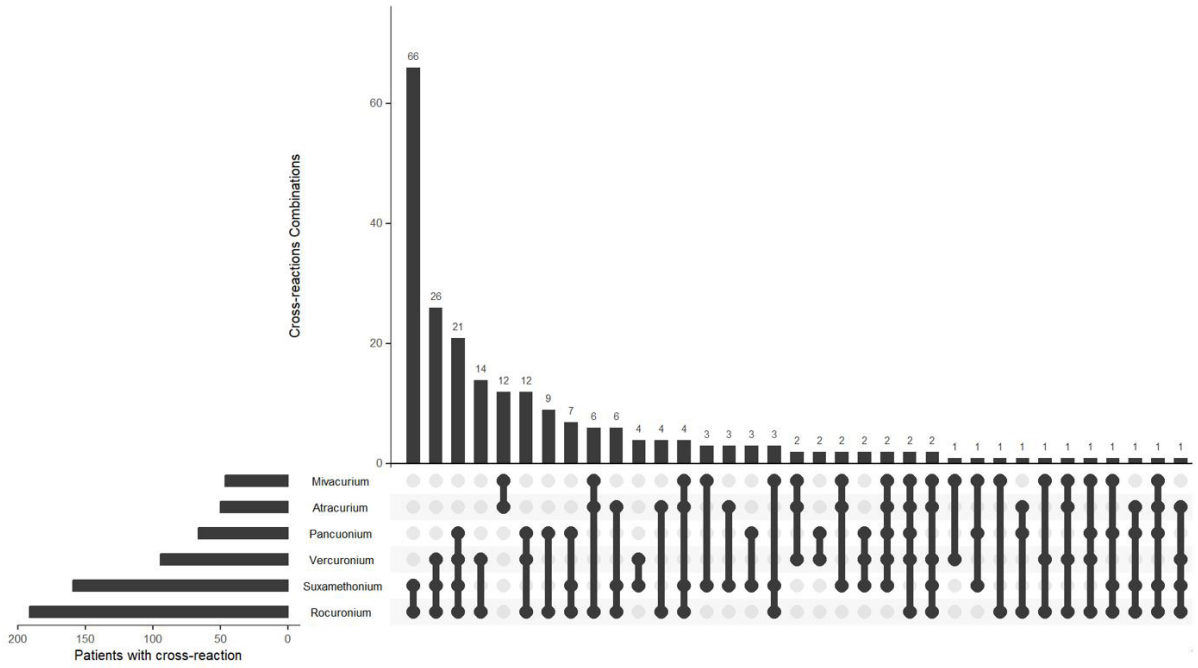


Figure 2: The common patterns of cross-reactivity seen on IDTs for NMBAs.



as the trigger NMBA were significantly less likely to have cross-reactivity than those with rocuronium or vecuronium as the trigger agent ($p < .05$).

The cumulative number of positive IDT reactions for each NMBA was rocuronium (n=270), suxamethonium (n=255), vecuronium (n=98), atracurium (n=70), pancuronium (n=67) and mivacurium (n=47).

Discussion

These data are in keeping with the current evidence which suggests that suxamethonium and rocuronium are high-risk for isolated and cross-reactive anaphylaxis because one or both were positive on IDT in 85% (386/454) of patients in this population.[7–9] Atracurium and mivacurium demonstrate high cross-reactivity, in keeping with their similar benzylisoquinolinium structure.

Vecuronium as a trigger NMBA had the highest percentage cross-reactivity with other steroid NMBAs (88.2%) compared to rocuronium (48.8%) and pancuronium (33.3%). Although the total number of presentations as the trigger NMBA are low, vecuronium consistently appears to be more likely to cross react with other steroid NMBAs.[8] It is possible that the mono-quaternary ammonium epitope and adjoining structures found on vecuronium act to sensitise IgE antibodies to a broad spectrum of molecules.

National estimates of usage for each NMBA to inform a true denominator for risk of anaphylaxis are unavailable. Our cross-reactivity data suggest a lower rate of cross-reactivity of atracurium compared with suxamethonium and rocuronium, which is in keeping with Reddy et al., who report a lower anaphylaxis rate and a higher exposure rate to atracurium compared to other NMBAs.[7]

The voluntary referral bias to the CARM database limits the data's accuracy as a numerator for anaphylaxis risk to NMDA. The database may be subject to referral bias because patients are referred to CARM without accompanying clinical notes to validate the diagnosis.

Predicting cross-reactivity based on trigger NMBA or class of NMBA is not a reliable way to inform NMBA selection in patients who have previously experienced anaphylaxis under anaesthesia. Any cases of suspected anaphylaxis under general anaesthesia should be referred for specialised allergy testing. ANZAAG provides an evidence-based approach to this process with guidelines for the follow-up and testing of suspected cases of anaesthesia associated anaphylaxis.[10]

Once an allergy to a NMBA is confirmed, it is often recommended that all NMBAs should be avoided in future due to some uncertainty with interpreting IDT results and variability in cross-sensitivity patterns. However, increasing experience with basophil activation tests and direct awake intravenous provocation testing of NMBA may soon enable the safe recommendation of a specific NMBA to use in patients that have experienced previous NMBA anaphylaxis.[8,11]

If NMBAs cannot be avoided following an anaphylaxis event, atracurium shows positive IDT results in only 15% (70/454) of the study population and therefore could be considered the most appropriate first line NMBA. Caution should be maintained for class effect cross-reactivity in the benzylisoquinolinium group. The risk of inducing anaphylaxis with NMBAs should be a consideration for all physicians caring for patients under general anaesthetic.

COMPETING INTERESTS
Nil.

ACKNOWLEDGEMENTS
The authors would like to thank Janelle Ashton, Manager Information Systems, New Zealand Pharmacovigilance and the New Zealand Centre for Adverse Reaction Monitoring for their assistance with data collation, and Lisa Woods PhD, Statistical Consultant in the School of Mathematics and Statistics at Victoria University of Wellington for their assistance with data analysis.

AUTHOR INFORMATION
Zyllan P Spilsbury: Department of Anaesthesia, Hutt Valley District Health Board, New Zealand; Department of Anaesthesia, Swansea Bay University Health Board, Heol Maes Eglwys, Morriston, Swansea, SA6 6NL.
Han Truong: Department of Anaesthesia, Hutt Valley District Health Board, New Zealand.

CORRESPONDING AUTHOR
Zyllan P Spilsbury: Department of Anaesthesia, Swansea Bay University Health Board, Heol Maes Eglwys, Morriston, Swansea, SA6 6NL. Ph: +44 179 270 2222. E: Zyllan.spilsbury@wales.nhs.uk

REFERENCES
1. Sampson HA, Muñoz-Furlong A, Campbell RL, et al. Second Symposium on the Definition and Management of Anaphylaxis: Summary Report-Second National Institute of Allergy and Infectious Disease/Food Allergy and Anaphylaxis Network Symposium. J Allergy Clin Immunol. 2006;117(2):391-7. doi: 10.1016/j.jaci.2005.12.1303.
2. Reber LL, Hernandez JD, Galli SJ. The pathophysiology of anaphylaxis. J Allergy Clin Immunol. 2017; 140(2):335-348. doi: 10.1016/j.jaci.2017.06.003.
3. Mertes PM, Aimone-Gastin I, Guéant-Rodriquez RM, et al. Hypersensitivity reactions to neuromuscular blocking agents. Curr Pharm Des. 2008;14(27):2809-25. doi: 10.2174/138161208786369704.
4. Cook TM, Harper NJN, Farmer L, et al. Anaesthesia, surgery, and life-threatening allergic reactions: protocol and methods of the 6th National Audit Project (NAP6) of the Royal College of Anaesthetists. Br J Anaesth. 2018;121(1):124-133. doi: 10.1016/j.bja.2018.04.001.
5. Jenkins S. Safety of anaesthesia: A review of anaesthesia-related mortality reporting in Australia and New Zealand 2015-2017 [Internet]. Melbourne (AU): Australian and New Zealand College of Anaesthetists, Mortality Sub-Committee; 2021 [cited 2023 May 27]. Available from: https://www.anzca.edu.au/resources/incident-reporting-docs/safety-of-anaesthesia-(mortality)-reports/safety-of-anaesthesia-report-2015-2017.pdf.
6. Peroni DG, Sansotta N, Bernardini R, et al. Muscle Relaxants Allergy. Int J Immunopathol Pharmacol. 2011;24(3 Suppl):S35-46. doi: 10.1177/03946320110240s306.
7. Reddy JI, Cooke PJ, van Schalkwyk JM, et al. Anaphylaxis is more common with rocuronium and succinylcholine than with atracurium. Anesthesiology. 2015;122(1):39-45. doi: 10.1097/ALN.0000000000000512.
8. Li J, Best OG, Rose MA, et al. Assessing cross-reactivity to neuromuscular blocking agents by skin and basophil activation tests in patients with neuromuscular blocking agent anaphylaxis. Br J Anaesth. 2019;123(1):e144-e150. doi: 10.1016/j.bja.2019.03.001.
9. Sadleir PH, Clarke RC, Bunning DL, Platt PR. Anaphylaxis to neuromuscular blocking drugs: incidence and cross-reactivity in Western Australia from 2002 to 2011. Br J Anaesth. 2013;110(6):981-7. doi: 10.1093/bja/aes506.
10. Scolaro RJ, Crilly HM, Maycock EJ, et al. Australian and New Zealand Anaesthetic Allergy Group Perioperative Anaphylaxis Investigation Guidelines. Anaesth Intensive Care. 2017;45(5):543-555. doi: 10.1177/0310057X1704500504.
11. van Cuilenborg VR, Hermanides J, Bos EME, et al. Awake intravenous provocation with small doses of neuromuscular blocking agent in patients with suspected allergy: experiences from the Dutch Perioperative Allergy Centre. Br J Anaesth. 2019;123(1):e153-155. doi: 10.1016/j.bja.2019.03.038.

Medical Spiritual Healing.

NZMJ, 1923

The attitude of the medical profession as a body toward the Hickson Spiritual Healing Mission has been set forth by *Dr. J. Hardie Neil*, President of the Auckland Division of the New Zealand Branch of the British Medical Association, and as *Dr. Neil's* opinion coincides with our own and is a fair presentation of the views commonly held by the medical profession, we think it advisable and opportune to place this aspect of the question before our readers.

Auckland was particularly well served at the present time, *Dr. Hardie Neil* pointed out, by keen and honourable medical men, many of whom were possessed of academic qualifications which were the best obtainable in the English-speaking world. It was possible for a patient to obtain general and consultative opinions equal to those to be had in any other city of its size in the world. They had been assured, he said, that Mr. Hickson came "with clean hands and a pure heart," and in certain cases of illness he was very likely to do good. For example, there were people who were mentally afflicted, and whose physical processes were thereby vitiated. In cases of that type, the healing mission would undoubtedly bring benefit.

About 20 per cent. of those seeking medical advice had merely imaginary ills, based possibly on transient symptoms, and, after making a proper investigation, the medical practitioners sent them away with that assurance. Often those people were obsessed with the idea that they had some grave malady, and under that belief they became the prey of some of the quacks and charlatans who made up what might be called the "medical underworld." Such people, if they attended the Hickson mission, would undoubtedly in many cases gain benefit from it. And they were not the only ones whom Mr. Hickson would probably benefit.

There was a certain class of practitioner of the irregular type, *Dr. Hardie Neil* continued, who made use of machines which had a camouflage of electrical terms. It was on record that a lady undergoing that treatment with others had gratuitously mentioned that the most devout seemed to derive the greatest benefit. There they had another instance of the power of suggestion.

The reason why the British Medical Association did not cooperate with the Spiritual Healing Mission, *Dr. Hardie Neil* said, was that they felt it would be obviously a fruitless effort. The medical profession would demand scientific investigation of a number of cases, and thus discredit would fall upon the mission. In the state of our present knowledge it could hardly be said that the mission's operations could influence the general work of medical and surgical practice, except in those cases of physical vitiation following upon or associated with mental or nervous trouble.

The medical profession had never known an instance where spiritual healing, either by Mr. Hickson or any other spiritual healer, had effected a cure of malignant organic disease. But in cases of obsession as to as disease, rising from some slight ailment, Mr. Hickson, by giving ease to the mind through spiritual administration, might help the patient to become mentally normal. Thereafter he would be able to carry on with a minimum of discomfort in regard to the real ailment, and in time that disability itself might, by adaption, practically disappear.

At the present time, said *Dr. Hardie Neil*, in the various hospitals in New Zealand the medical profession restored sight, gave hearing and prolonged life. That was regarded as purely routine work, and was not advertised, because it was a commonplace, and the profession expected such results to follow if ordinary modern methods were carried out. In those hospitals many gratifying results were accomplished. If Mr. Hickson were to bring to pass even *one* such good result, that fact would be broadcasted over the world. Such information as the medical profession now had in its possession showed that results such as were obtained by the ordinary methods of medical and surgical practice in organic disease were unobtainable by any other methods.

There was one very important point to be remembered, and that was that early diagnosis would permit modern medicine and surgery to cope successfully with most of the known diseases. These were generally heralded by danger signals, which were easily recognised by trained observers, and preventative treatment could be instituted

with success. Most of the tragedies encountered in practice occurred in those cases where there had been delay in diagnosis, through ignorance in the appreciation of the portent of the early signs of the disease. No person should consult any healing mission until the case had been properly considered from a modern medical standpoint.

Hysteria was a condition implanted in the body by suggestion, and removed by the same means. The medical profession of the world claimed that hysteria was the basis of some of the marvellous cures reported from time to time as being the result of psychic influences.

"The medical profession is not antagonistic to the healing mission, and certainly it in no way desired to be associated with those who wish to cast stones," *Dr. Hardie Neil* concluded. "Rather would the profession express the hope that those placing themselves in Mr. Hickson's hands will receive such benefits as are expedient for them."