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Anatomy of a health crisis

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Changes in admission rates to an Aotearoa New Zealand hospital general medical service during COVID-19 lockdowns

David Tripp, Allie Eathorne, Xiaohan Bai, Wolf Truong

COVID-19 lockdowns saw a dramatic reduction in the number of people admitted to a hospital general medical service. Some of this reduction was due to reductions in infectious illness (besides COVID-19) as a result of people isolating at home. However, admissions for non-infectious illnesses also declined, raising the concern that people who still should have come to hospital chose not to, or were not able to.

Dispensing of attention-deficit hyperactivity disorder medications for adults in Aotearoa New Zealand

Ben Beaglehole, Stephen Jarman, Chris Frampton

We used a national dispensing database (the Pharmaceutical Collection) to report attention-deficit hyperactivity disorder (ADHD) treatment between 2006 and 2022, focussing on adults. We report a 10-fold increase in dispensing of ADHD medication for adults compared to a three-fold increase for children over the study period. Additionally, new dispensing for adults doubled between 2011 and 2022. We concluded that despite increases, dispensing rates for ADHD remain lower than prevalence estimates, suggesting a significant treatment gap. Addressing the treatment gap for ADHD may reduce negative effects of ADHD but wider social influences should also be considered.

Incorporating patient, nursing and environmental factors into antimicrobial stewardship: effects of simplifying treatment from cefuroxime to ceftriaxone

Michelle Balm, Olivia Bupha-Intr, Tanya Sinha, Matthew Kelly, Lucy Stewart, Ruth Stephen, Tim Blackmore, Max Bloomfield

Several years ago, our hospital changed the main recommended antibiotic from an antibiotic that was given three times a day to a similar antibiotic that was given only once a day. There were concerns that this new antibiotic might cause more side effects, such as severe diarrhoea or antibiotic resistance. This study shows that changing to a once-a-day antibiotic saved a large amount of nursing time, reduced plastic waste and reduced patients being woken during the night. There was no increase in side effects from making this change. The impact on resources (nursing time and plastic waste) is not usually considered when deciding hospital antibiotic guidelines; however, these results suggest this should be considered.

Medication use before and after bariatric surgery: 5-year results from a randomised controlled trial of banded Roux-en-Y gastric bypass versus sleeve gastrectomy in patients with obesity and type 2 diabetes

James Tan, Talat Nur, Bronwen Jones, Rinki Murphy, David Kim, Richard Cutfield, Lindsay D Plank, Michael Booth

In a trial looking at outcomes following different types of bariatric surgery among obese patients who had type 2 diabetes, there were substantial changes in medication usage after surgery. We found that bariatric surgery, regardless of the procedure, resulted in a reduction in diabetic and cardiovascular medication requirements, but increased the requirement for nutritional supplementation, analgesia and psychiatric medications. There was no difference in medication usage between different surgery types, with the exception of diabetic medication, where there was a greater reduction in patients who underwent a gastric bypass compared to a sleeve gastrectomy.

Health impacts of war: case studies of New Zealand veterans of the First World War

Nick Wilson, Jennifer A Summers, Christine Clement, George Thomson

This study examined illustrative cases from a sample of New Zealand First World War (WWI) veterans. We found that the theme of severity of impacts was well illustrated with a case who was severely wounded and died from suicide when back in New Zealand, and another case with severe post-traumatic stress disorder. The theme of the high frequency of non-fatal conditions was revealed with: a case with eight new diagnoses, a case with six hospitalisations for new conditions; a case with three non-fatal injury events; and a case with three sexually transmitted infections. The theme of chronic debility as a consequence of various conditions was illustrated with cases who had suffered from: being gassed, gastroenteritis, malaria and pandemic influenza. In conclusion, these 10 selected cases reiterate how severe and extensive the morbidity burden for military personnel in WWI could be.

Management of chronic kidney disease for Māori in Aotearoa New Zealand: a summary of clinical practice guidelines

Curtis Walker, Susan Reid, Carla White, Merryn Jones, Lee-ora Lusis, Rachael C Walker, John Collins, Helen Rodenburg, David Tunnicliffe, Suetonia C Green

Māori patients in New Zealand have long experienced poorer outcomes of kidney disease, including much higher rates of dialysis and lower rates of kidney transplantation. There is good science on how these statistics can be addressed by the medical system. This paper provides clear and concrete solutions to making the health system better and reducing the burden of kidney disease experienced in our communities.

Navigating challenges: insights into chronic kidney disease care in South Auckland

Kalpa Jayanatha, Viliami Tutone, David Voss, Jamie Kendrick-Jones, Fakaola Otuafi, Fortune Ngwenya, Nogi Eiao, Rachel Spence, Andrew Hill

The burden of chronic kidney disease is increasing throughout New Zealand, resulting in growing strain on patients, families and the healthcare system. The population of South Auckland is the most diverse in New Zealand and it is particularly vulnerable to the effects of chronic kidney disease due to its demography and its many communities that endure significant hardship. This article explores the prevailing challenges experienced by renal physicians and specialist nurses over 35 years of caring for patients with chronic kidney disease in South Auckland. These challenges relate to individual factors (employment, education and culture), healthcare provision (resourcing, models of care and integration) and socio-economic issues (housing, transportation and "food deserts"). The resilient peoples of South

Auckland grapple with significant challenges in obtaining optimal care for chronic kidney disease. However, there is promising potential in implementing a blend of practical health system adjustments in the near-term and strategic structural changes in the long term.

Chronic traumatic encephalopathy—the first neuropathological report in New Zealand

Fen-Lan Cherry Chang, Richard LM Faull, Maurice A Curtis, Andrew M Chancellor, Michael E Buckland, Clinton P Turner

This article describes a case of chronic traumatic encephalopathy (CTE) in a former New Zealand representative rugby league player. This is the first locally diagnosed case of CTE in New Zealand—although other cases have been diagnosed subsequently. In older individuals, CTE is often seen in conjunction with other neurological diseases such as Parkinson's disease and Alzheimer's disease. In these cases, it can be difficult to determine the relative contribution of each process to a patient's symptoms. In younger people, changes of CTE are more likely to be seen in isolation. The only way to definitively diagnose CTE at present is through post-mortem examination of the brain.

Preimplantation diagnosis and embryo selection in a patient with severe hereditary coproporphyria

Gisela A Kristono, Leigh Searle, Cindy Towns

We present the case of a young woman who has had 31 hospital presentations over 11 years due to a rare inherited condition called hereditary coproporphyria (HCP). With the help of assisted reproductive technology, she successfully delivered a baby without passing on her genetic mutation to her child, and is the first person known to use this technology for HCP. We discuss the clinical, ethical and financial reasons justifying the use of assisted reproductive technology in this case.

Anatomy of a health crisis

Lyndon Keene, Harriet Wild, Virginia Mills

Aotearoa New Zealand's public healthcare services are increasingly unable to meet the population's health need, be it in hospital and specialist services, mental health and addiction (MHA) or primary and community care. These findings are traversed in a new report, *Anatomy of a Health Crisis*, produced by Toi Mata Hauora, the Association of Salaried Medical Specialists (ASMS),[1] using official data to assess the condition of Aotearoa New Zealand's public hospital services.

Almost 1.3 million people attended public emergency departments (EDs) in 2022/2023—an increase of 22.5% since 2013/2014, while the population grew by 16%. Compounding the ED pressures, the number of immediately or potentially life-threatening events (triage levels 1–3) is growing at a much higher rate (51.1%) than less-serious events.[2]

Triage levels 1–3 made up just over half of total ED presentations in 2013/2014. By 2022/2023 they amounted to almost two-thirds of total presentations.

Acute inpatient discharges increased by 24% between 2014 and 2023 (28% when adjusted for complexity), while non-acute discharges decreased by 1% (-3% when adjusted for complexity).[2]

These trends indicate publicly provided "elective" services are being displaced by a combination of budget constraints and the rising number of complex acute cases. The widening gap between population growth rates and public hospital discharge rates will be contributing to growing unmet need for elective treatments and, for those who can afford it, growing use of private healthcare.

Rising unmet need is also evident for mental health and addiction (MHA) services. The proportion of adults reporting high and very high levels of psychological distress skyrocketed by 72.5% between 2016/2017 and 2022/2023.[3] Meanwhile, the number of clients accessing MHA services increased by 10.4% from 2016/2017 and 2021/2022, while the workforce grew by just 5% from 2017/2018 to 2021/2022.[4–6]

MHA vacancy rates have more than doubled between 2018 and 2022, and nearly 20% of psychiatrist positions were vacant in 2022. Unpublished Te Whatu Ora – Health New Zealand forecasts of public and private employment for psychiatrists show a decline per capita to 2033, while unpublished Medical Council of New Zealand data show a shift towards private employment.[7,8]

The shift towards more private sector employment is also evident across the spectrum of specialties, with several recent ASMS surveys of its 6,500 members indicating low job satisfaction and poor working conditions, as well as an ageing workforce, as key drivers behind medical specialists either moving away from the public health system or leaving medicine entirely.[9,10]

The shift to private practice has significant implications for the provision of planned care, on top of an already-chronically understaffed Senior Medical Officer (SMO) workforce. Based on a national survey of clinical directors accounting for access, quality, safety and unmet need, Aotearoa New Zealand has a shortfall of approximately 1,140 public hospital SMO FTEs.[11]

The shortages mean access to hospital specialists across many specialties is declining. Te Whatu Ora – Health New Zealand data show more than 68,000 patients were waiting more than 4 months for a first specialist assessment as of December 2023. That's a 55% increase in 12 months and almost a six-fold increase since (pre-COVID) September 2019.[12]

Further, the number of patients who are deemed unwell enough to exceed "clinical" thresholds and given a commitment to treatment but don't receive it within 4 months increased six-fold between July 2019 and September 2023—from 4,685 reported by the Planned Care taskforce, to 29,266 reported by Te Whatu Ora – Health New Zealand.[13,14]

As access to hospital specialists declines, growing numbers of patients are left in limbo under the care of their GPs, adding further to the pressures on access to primary care services, and risks patients' condition deteriorating and quality of life worsening.[15–17]

The extent to which Aotearoa New Zealand's primary healthcare sector is under unsustainable strain is starkly illustrated when unmet need data from the European Commission's Eurostat survey and the New Zealand Health Survey (NZHS) are compared.[18]

The 2023 Eurostat survey found self-reported unmet need for GP or hospital specialist care due to wait time, cost or travel distance ranged from less than 1% of the adult population in eight countries, including the Netherlands, Germany and Switzerland, to 12.9% in Estonia.

In Aotearoa New Zealand, self-reported unmet need over a 12-month period for GP services alone due to these three criteria was estimated by the NZHS as 34.3% of the adult population. In addition, limited official data show an estimated 5.1% adult unmet need over 12 months for a hospital specialist.[3,12–14]

The economic costs of unmet health need, whether it is for primary care, community care, hospital care or combinations of these, are unknown. For successive governments, such matters have remained largely out of sight and out of mind. What is clear is that the broader economic costs of ill health are large. Costs outside of the health system were conservatively estimated by Treasury in 2010 to be between 2.7% and 7.6% of GDP (about $10 billion to $30 billion today). At the upper end of the scale, that is well over the annual Vote Health budget.[19]

It is increasingly recognised that to assess the efficacy of a country's health system—and have a better understanding of investment needs—you need to know how many people have a need for health treatment that is not being met. Hence a resolution adopted by the Seventy-sixth World Health Assembly in 2023 requested the World Health Organization's (WHO) director general review the importance and feasibility of using unmet need for health services as an additional indicator to monitor universal health coverage nationally and globally.[20,21]

Similar calls have been made locally to monitor how well our public health system is serving the population.[22,23] The information presented in the ASMS report indicates Aotearoa New Zealand's unmet health need is far more serious than comparable countries and warrants urgent investigation to produce a strong evidence base for eliminating inequitable barriers to access, unmet need and informing decisions on health service investment. Chronic workforce shortages, long waiting lists and cost-barriers to healthcare won't be fixed until governments widen the policy lens on health and recognise that investing in wellbeing is also an investment in the economy.

COMPETING INTERESTS
Nil.

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Changes in admission rates to an Aotearoa New Zealand hospital general medical service during COVID-19 lockdowns

David Tripp, Allie Eathorne, Xiaohan Bai, Wolf Truong

ABSTRACT

AIM: To better understand the reasons for reduced hospital admissions to a hospital general medicine service during COVID-19 lockdowns.

METHODS: A statistical model for admission rates to the General Medicine Service at Wellington Hospital, Aotearoa New Zealand, since 2015 was constructed. This model was used to estimate changes in admission rates for transmissible and non-transmissible diagnoses during and following COVID-19 lockdowns for total admissions and various sub-groups.

RESULTS: For the 2020 lockdown (n=734 admissions), the overall rate ratio of admissions was 0.71 compared to the pre-lockdown rate. Non-transmissible diagnoses, which constitute 87% of admissions, had an admission rate ratio of 0.77. Transmissible diagnoses, constituting 13% of admissions, had an admission rate ratio of 0.44. Reductions in admissions did not exacerbate existing ethnic disparities in access to health services. The lag in recovery of admission rates was more pronounced for transmissible than non-transmissible diagnoses. The 2021 lockdown (n=105 admissions) followed this pattern, but was of shorter duration with small numbers, and therefore measures were frequently not statistically significant.

CONCLUSIONS: The biggest relative reduction in hospital admission was due to a reduction in transmissible illness admissions, likely due to COVID-related public health measures. However, the biggest reduction in absolute terms was in non-transmissible illnesses, where hospital avoidance may be associated with increased morbidity or mortality.

Significant decreases in admissions were anecdotally observed in acute hospital general medical services (known as "internal medicine" in some jurisdictions) in Aotearoa New Zealand during the COVID-19 lockdowns of 2020 and 2021.

This trend has been reported as affecting emergency department presentations, hospital admissions and specific disease categories (such as acute myocardial infarction and stroke) across a number of countries.[1–6] These studies illustrate reductions in both urgent and routine medical encounters across all age groups, with, in some cases, a greater impact on minority ethnic groups. Reduced presentations of transmissible compared to non-transmissible medical illnesses in this setting has not been previously studied.

This reduction in overall admissions was also observed in the General Medicine Service (GMS) of Wellington Regional Hospital (WRH)—a service covering Aotearoa New Zealand's capital that admits, on average, approximately 7,500 adult patients a year. Admissions are for a wide variety of medical diagnoses, but exclude acute coronary syndromes, strokes and most admissions for the treatment of cancer.

Possible reasons for this reduction in admissions during these lockdowns are wide ranging and not well understood. In Aotearoa New Zealand, lockdown rules[7] prohibited leaving home except for workers in specifically defined essential services and to obtain essential household supplies. Masks were mandatory outside of home. Hospital attendance was an acceptable exception to lockdown rules. Lower rates of all transmissible diseases due to public health measures aimed at reducing COVID-19 transmission could have led to reduced admissions (a positive impact). Reduced admissions could also have resulted from, for example, a fear of contracting COVID-19 in the process of getting to or being admitted to hospital ("hospital avoidance"),[8,9] or from difficult access to primary care resulting in reduced referral to hospital (negative impacts). Services normally provided in a hospital setting could also have been specifically organised in a

community setting or via telehealth as an alternative to hospital admission ("hospital diversion").

We undertook a retrospective cohort study on admission data to the WRH GMS. In this study, we aimed to delineate admissions for transmissible infectious diseases and non-transmissible illnesses to better understand the impact of lockdowns on access to hospital services. We modelled long-term rates of admission for both transmissible and non-transmissible diagnoses and examined how these rates were affected by the 2020 and 2021 lockdowns. We further evaluated if there were lags in changes to these rates during and after these lockdowns, and also if these rates varied by sub-groups; specifically, ethnicity, socio-economic deprivation, rest home residents, age groups and those who died while in hospital compared to those who did not.

Methods

Anonymised data for all admissions to the WRH GMS from January 2015 to January 2022 were obtained from the electronic patient management system. This period included two lockdowns: 23 March to 13 May 2020 (52 days, n=734 admissions) and 31 August to 7 September 2021 (8 days, n=105 admissions). For the purposes of this study, Alert Levels 3 and 4 were considered "lockdown", as these were the levels that imposed significant, population-wide restrictions. The difference between total admission rates for Alert Level 3 and Alert Level 4 was not statistically significant (p=0.50); thus, combining these periods for analysis was considered appropriate. Resident population estimates were sourced from Statistics New Zealand | Tatauranga Aotearoa.[10]

The principal diagnosis for each admission was determined from Diagnostic Related Group (DRG) codes.[11] Each principal diagnosis was categorised as "transmissible", "non-transmissible" or "mixed" by a manual categorisation of the approximately 500 DRG codes in the dataset.

For example, transmissible diagnoses included gastroenteritis (G67A) and respiratory infections (E62A). Cellulitis (J645A) was considered non-transmissible, as, in the adult setting, it is infrequently associated with inter-personal transmission despite being an infectious illness. Some diagnoses, particularly non-specific respiratory illnesses (e.g., Other Respiratory System Disorders [E75B]) were considered as "mixed" and excluded from the analysis, as a transmissible infection may precipitate the illness, but this is often uncertain even at discharge. For the purposes of this study "total" admissions refers only to admissions able to be categorised as "transmissible" or "non-transmissible" and excludes mixed diagnoses.

A statistical model was developed. Input data included age, sex, ethnicity, rest home status, New Zealand Index of Deprivation (based on the patient's postcode), season and transmissibility status.

Poisson regression was initially used to model weekly GMS admission rates. Predictor variables included season (summer, autumn, winter, spring), lockdown period (pre-lockdown, 2020 lockdown, 2021 lockdown), and an interaction between disease classification and lockdown. Population size was used as an offset variable. This model showed significant evidence of over-dispersion ($\phi = 2.6$).[12]

A negative binomial model was therefore used, including the same input variables (the primary model).

This primary model is presented. To investigate whether the findings were consistent across various predefined sub-groups, additional models were fitted with the specified sub-groups as interaction terms with lockdown. Sub-groups were pre-defined as:

- Ethnicity (Māori/Pacific/Other)
- Socio-economic status (very deprived/deprived/not deprived; based on postcode-derived New Zealand Deprivation Index groupings of 1–2, 3–5 and 6–10, from NZDep13 and NZDep18)
- Age group (16–64/≥65)
- Rest home resident (yes/no, derived from the WRH patient management system)
- Died as an inpatient (yes/no)

Analysis of the primary model was again repeated using fortnightly periods throughout the lockdowns and immediately following to investigate potential tapering off and on of admissions. Our hypothesis was that rates of admission for:

- transmissible diseases would initially be sustained by the incubation time and infectious period of already circulating infectious illnesses or in-home transmission, and then taper off during and beyond lockdown due to the sustained interruption to transmission of infectious diseases;
- non-transmissible diseases would initially decline, but then drift back up, as initial

anxiety about contracting COVID-19 lessened, and the need of addressing serious illness forced admission.

All applicable tests have been performed using a 5% significance level. Analysis was performed using SAS version 9.4 and R version 4.0.4. Charts were produced in SAS.

Ethics

This study was out of scope for the Health and Disability Ethics Committee. Approval was obtained by the WRH Clinical Audit Committee.

Results

The dataset used for analysis contained 47,407 records, as in the STROBE diagram (Figure 1).

Data summary

The 47,407 admissions used to construct the primary model exclude 4.8% of the provided admission records that had no DRG, and 3.7% whose primary DRG was classified as mixed (i.e., transmissible/non-transmissible status unable to be determined from the diagnostic code). Of the admissions included in the primary model, 13% were for transmissible diagnoses and 87% for non-transmissible.

Both lockdowns saw statistically significant decreases in admissions for transmissible and non-transmissible causes (Figure 2). The second lockdown was very brief, and the impact is therefore attenuated.

The patient characteristics of the 47,407 analysed admissions are shown in Table 1.

The primary model showed a significant effect for season ($p<0.001$). Overall rates of admission in summer and autumn were statistically significantly lower than winter: rate ratios were 0.88 (95% confidence interval [CI] 0.84–0.92, $p<.0001$) and 0.93 (95% CI 0.88–0.98, $p=0.006$) respectively. There was not a significant difference in rate between spring and winter: the rate ratio was 0.98 (95% CI 0.92–1.03, $p=0.35$).

Sub-group and lag analysis for the 2021 lockdown is not presented. While the overall pattern was similar, small numbers made results largely not statistically significant.

Impact of lockdowns on adjusted admission rates

Adjusted admission rates per 100,000 population were estimated using the primary model (Table 2). Compared to the pre-lockdown period, rates of admission were significantly lower during the 2020 lockdown for each of total transmissible and non-transmissible diagnoses, and during the 2021 lockdowns for transmissible diagnoses only.

For the 2020 lockdown, the percent decrease in admission rate due to transmissible causes was statistically significantly larger than the percent decrease for rates of non-transmissible causes, with the transmissible rate ratio being 1.77 (95% CI 1.30–2.42, $p=0.0003$) times larger than non-transmissible rate ratio. For the 2021 lockdown, the non-transmissible rate ratio was 1.58 (95% CI 0.7–3.60, $p=0.27$) times larger than transmissible rate ratio (Figure 3).

Sub-group analyses for the 2020 lockdown

Figure 4 presents the sub-group analysis for the 2020 lockdown by transmissible and non-transmissible disease. A statistically significant interaction term suggests that the lockdown response differs in relation to the sub-group. The interaction plots show the estimate rate ratios with 95% CI for each sub-group.

There was a significant interaction with the lockdown period for ethnicity overall ($p=0.015$), but with Māori and Pacific peoples not having a statistically significant decrease in non-transmissible admissions during the 2020 lockdown. Likewise, patients who died during their admission for non-transmissible cases also did not decrease. There were no significant differences for total admissions between age groups, socio-economic status and rest home status.

Lags within and following the 2020 lockdown

Figures 5 and 6 show the fortnightly trend within and following the 2020 lockdown for transmissible and non-transmissible diagnoses respectively.

The admission rate for transmissible illnesses declined through the lockdown and remained low following. For non-transmissible illness, the admission rate declined for the first month, but had returned to be consistent with the baseline well before the end of the lockdown.

Discussion

This discussion focusses on the 2020 lockdown. While the 2021 lockdown in general mimicked the

Figure 1: STROBE diagram.

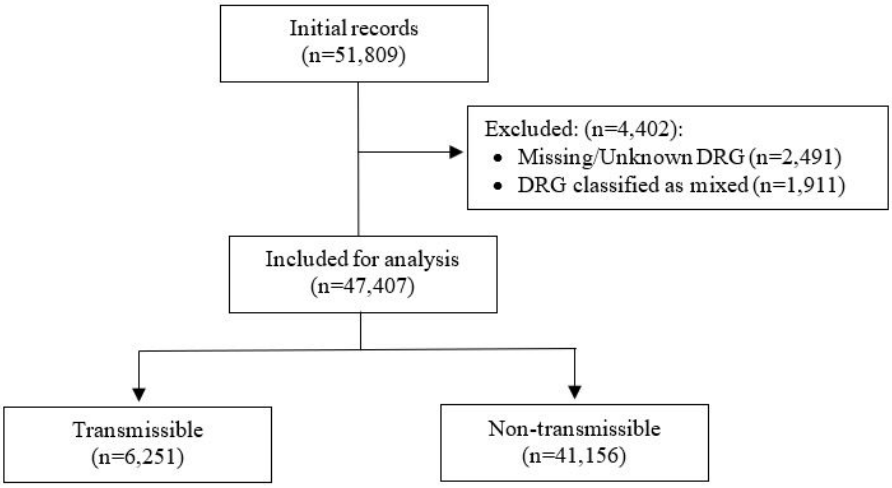


Figure 2: Monthly admissions to WRH GMS by disease type. Shaded areas represent the two lockdowns.

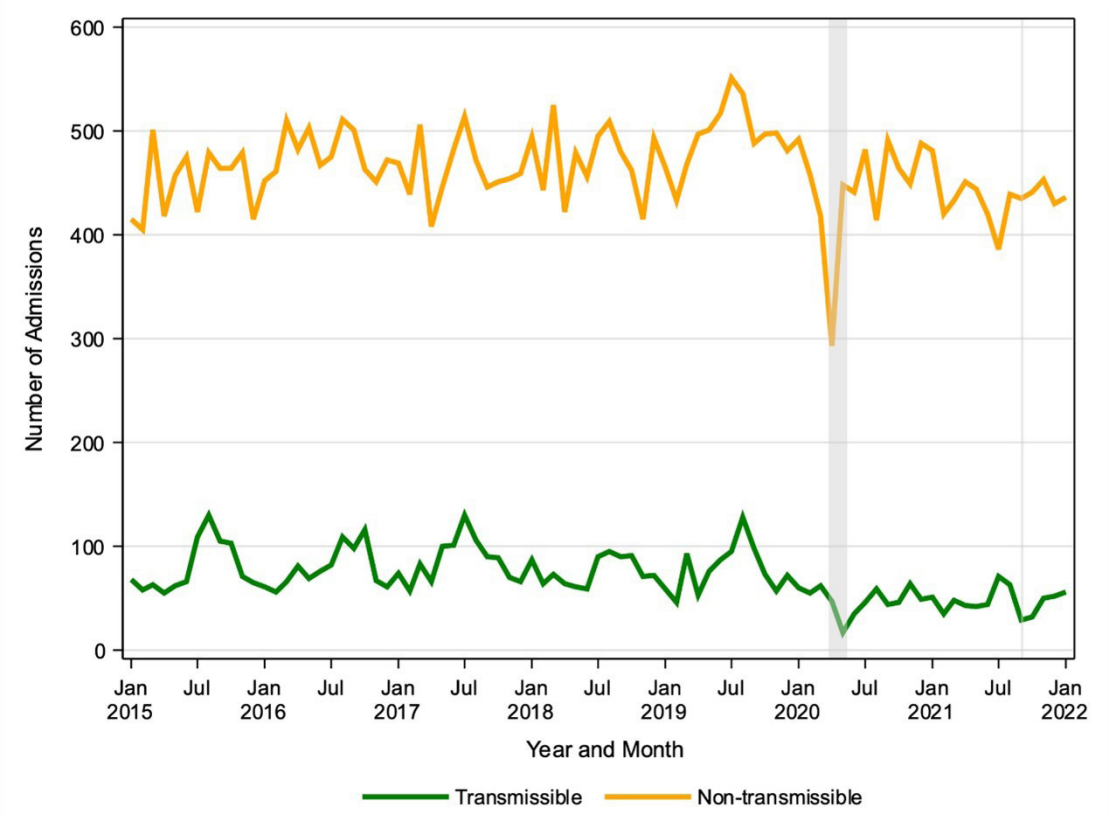


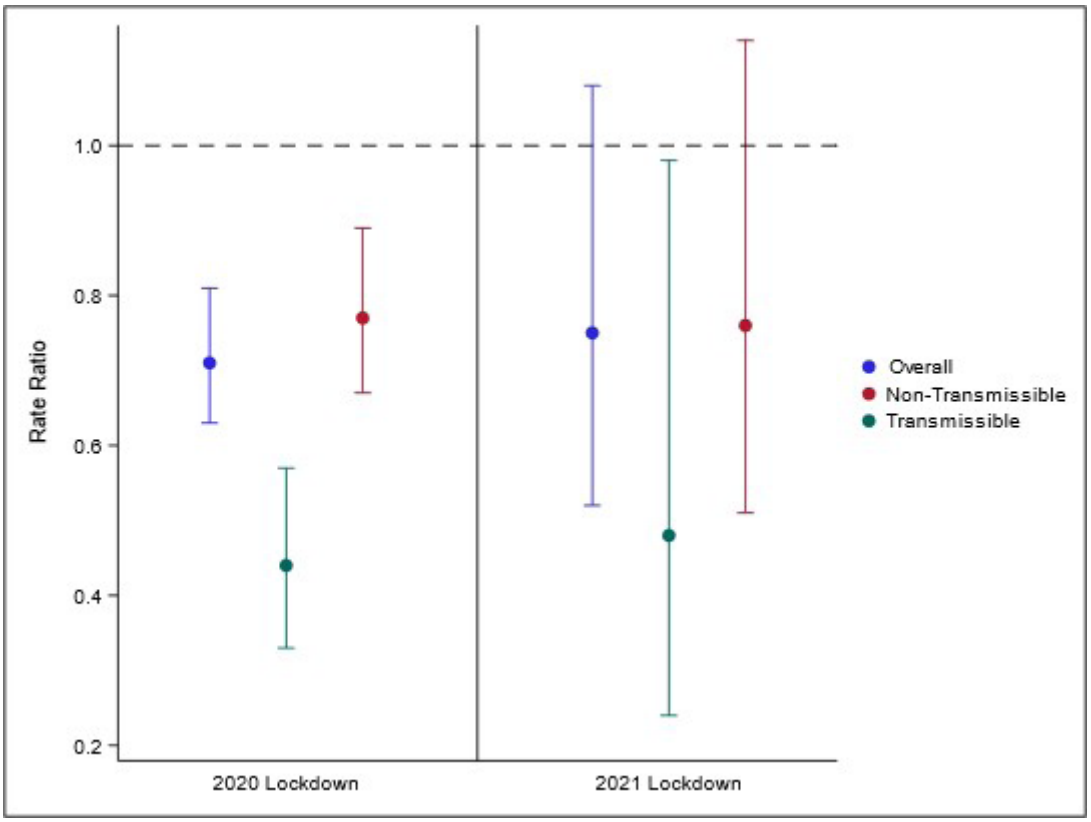
Table 1: Summary statistics for variables.

Variable	Overall N=47,407 (%)	Pre-lockdown N=34,581 (%)	2020 lockdown N=734 (%)	2021 lockdown N=105 (%)
Gender				
Female	26,293 (55.5)	19,325 (55.9)	404 (55.0)	56 (53.3)
Male	21,106 (44.5)	15,256 (44.1)	330 (45.0)	49 (46.67)
Ethnicity				
Māori	4,950 (10.4)	3,551 (10.3)	84 (11.4)	12 (11.4)
Pacific peoples	4,345 (9.2)	3,104 (9.0)	66 (9.0)	4 (3.8)
Other	38,112 (80.4)	27,926 (80.8)	584 (80.0)	89 (84.76)
Age				
16–64	16,623 (35.1)	12,040 (34.8)	247 (33.7)	35 (33.3)
≥65	30,784 (64.9)	22,541 (65.2)	487 (66.3)	70 (66.7)
Died inpatient	1,401 (3.0)	1,019 (2.9)	25 (3.4)	1 (1.0)
Living in a rest home	2,952 (6.2)	2,193 (6.3)	35 (4.8)	8 (7.6)
NZDep category				
Not deprived	29,433 (62.1)	21,367 (61.8)	460 (62.7)	72 (68.6)
Deprived	11,239 (23.7)	8,239 (23.8)	181 (24.7)	19 (18.1)
Very deprived	6,479 (13.7)	4,727 (13.7)	93 (12.7)	14 (13.3)
Missing	256 (0.5)	248 (0.7)	0 (0.0)	0 (0.0)
Transmissible disease	6,251 (13.2)	4,956 (14.3)	63 (8.6)	10 (9.5)

Table 2: Admission rates per 100,000 population for 2020 and 2021 lockdowns.

	Pre-lockdown (baseline)	2020 lockdown			2021 lockdown		
Classification	**Rate (95% CI)**	**Rate (95% CI)**	**Rate ratio (95% CI)**	**P**	**Rate (95% CI)**	**Rate ratio (95% CI)**	**P**
Overall	24.08 (23.59–24.58)	17.16 (15.07–19.53)	0.71 (0.63–0.81)	<.0001	18.14 (12.63–26.04)	0.75 (0.52–1.08)	0.13
Transmissible	3.44 (3.33–3.56)	1.50 (1.14–1.96)	0.44 (0.33–0.57)	<.0001	1.66 (0.81–3.38)	0.48 (0.24–0.98)	0.004
Non-transmissible	20.69 (20.21–21.18)	15.97 (13.82–18.45)	0.77 (0.67–0.89)	0.0005	15.74 (10.48–23.64)	0.76 (0.51–1.14)	0.19

Figure 3: Admission rate ratios for the 2020 and 2021 lockdowns compared to pre-lockdown rates.



2020 lockdown, the much shorter duration and consequent lower number of admissions (n=735 versus n=105) made results frequently not statistically significant.

During the 2020 lockdown, rates of both transmissible and non-transmissible admissions to the WRH GMS were significantly lower than the pre-lockdown rates. Rate ratios were 0.71 and 0.44 respectively compared to pre-lockdown levels. While both decreased, the decrease in admissions due to transmissible diagnoses was significantly larger than that of non-transmissible diagnoses by a factor of 1.77.

We presume that the factors leading to the decrease in admissions for non-transmissible diseases (i.e., hospital avoidance or hospital diversion) would also have a similar impact on transmissible disease. The impact of public health measures on reducing admissions for transmissible illness is therefore best estimated by the transmissible admission rate *minus* the non-transmissible admission rate (0.71–0.44=0.36).

The imposition of lockdowns in Aotearoa New Zealand to control COVID-19 was effective.[14] Based on this study, they also significantly reduced hospital admissions for other transmissible diseases. However, admissions for transmissible diseases only accounted for 8.6% of analysed admissions during the 2020 lockdown and 14.4% of pre-2020 lockdown admissions.

The lockdowns also led to a significant reduction in admissions due to non-transmissible disease, which in absolute terms constitute most admissions to the WRH GMS. This is a potentially negative impact. We are not able to estimate the impact on mortality or morbidity of this reduction in hospital treatment from this dataset. While reports suggest that Aotearoa New Zealand did not experience any excess mortality during or in the time since the 2020 and 2021 lockdowns[14] it remains a reasonable concern that people may have experienced harm from not accessing appropriate care. It is possible, although beyond the scope of this study to assess, that hospital avoidance dominated hospital diversion given the very significant difficulties that primary care services also had operating under lockdown conditions. Further assessment of this potential impact, and how to ensure continued access to medical care despite lockdowns in a future pandemic, warrants further research.

Figure 4: Interaction plot for relative rate of transmissible and non-transmissible admissions during the 2020 lockdown compared to baseline by sub-group.

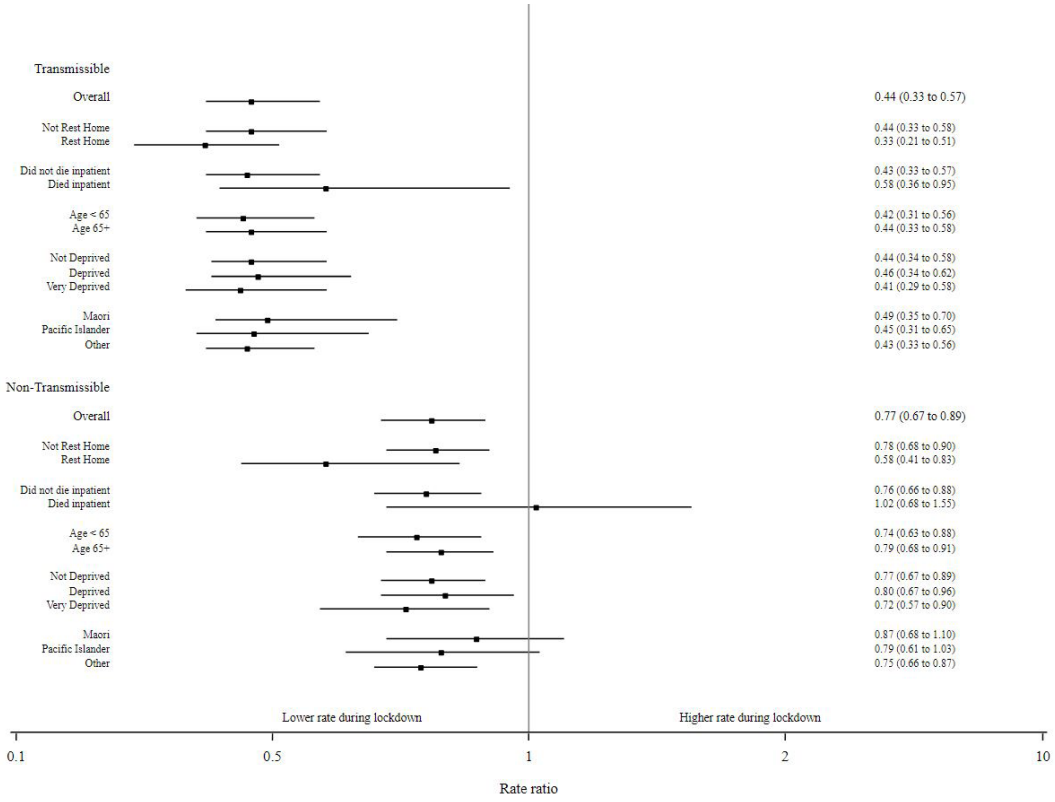


Figure 5: Transmissible admission rate per 100,000 population for fortnightly periods during and immediately after the 2020 lockdown.

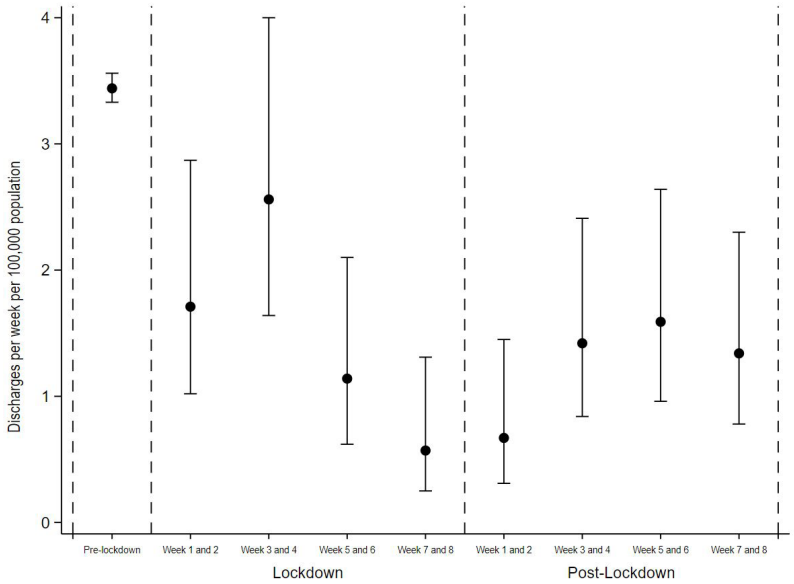
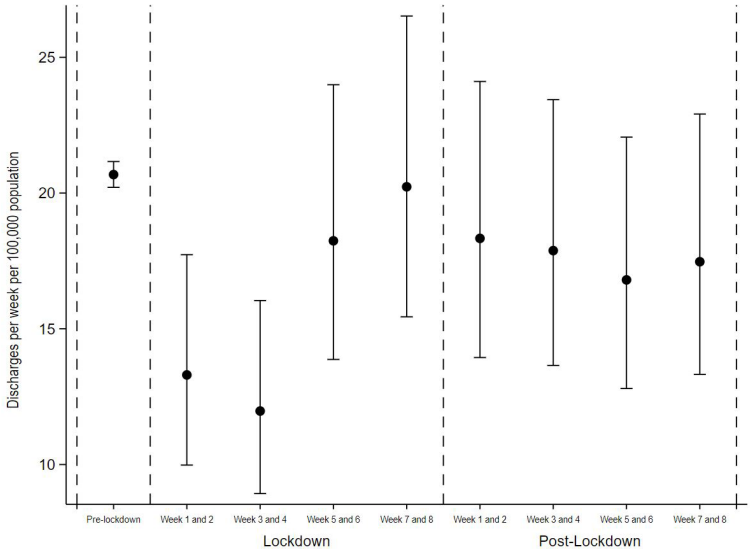


Figure 6: Non-transmissible admission rate per 100,000 population for fortnightly periods during and immediately after the 2020 lockdown.



Of the predefined sub-groups assessed, three findings are noteworthy. Firstly, the decrease in rate of admission for non-transmissible conditions appears to have been driven by the non-Māori and non-Pacific population, with rates not being statistically lower than pre-lockdown for either Māori or Pacific populations. Given existing barriers to Māori and Pacific populations in accessing health services,[15] this provides some reassurance that COVID-19 lockdowns did not further exacerbate inequities in access to hospital services.

Secondly, reductions in admission rates were similar across deprivation cohorts. This also supports the above finding that lockdowns did not exacerbate inequities that already exist in access to health services.

Thirdly, in respect to patients who died in hospital, there was no statistically significant reduction in overall admission rates. This suggests that the added difficulties of being present with dying relatives imposed by lockdown restrictions[16] did not affect admissions with palliative intent or outcome.

The time course of changes in transmissible and non-transmissible admission rates differed. Apart from the 2nd fortnight for transmissible diseases, the data conforms to our hypothesis, with:

- a gradual and sustained reduction in transmissible diseases. This suggests that there was a reduction in all transmissible conditions throughout the duration of the lockdown and beyond. With the Aotearoa New Zealand border remaining closed and the associated lack of introduction of new strains of transmissible diseases, such as seasonal influenza, disease transmission was considerably suppressed;
- an initial but short-lived reduction in non-transmissible diseases, which by week 5 was not significantly different from the baseline. Initially this decrease is likely to have been hospital avoidance, with the potential for hospital diversion measures, as they were introduced, to mitigate this over the following weeks, or for hospital avoidance itself to reduce.

The study has several limitations. This analysis only included data for patients presenting to WRH GMS. Caution is appropriate in applying these conclusions more generally to different services within WRH, or to the country more broadly. The study is based on an analysis of retrospectively coded data. This has inherent limitations. The categorisation of DRG diagnoses into transmissible or non-transmissible causes is somewhat arbitrary. Further, around 4.8% of admissions were uncoded, but these occurred consistently over the study period and showed no association with lockdown periods. Also, admissions were classified only on the primary

diagnosis, so may have omitted comorbid transmissible diagnoses. Postcode data were used to derive socio-economic status and therefore only approximate actual socio-economic status.

In summary, the biggest relative reduction in hospital admission over the two COVID-19 lockdowns was due to a reduction in transmissible illness, likely due to COVID-related public health measures. However, the biggest reduction in absolute terms was in non-transmissible illnesses, where hospital avoidance could potentially be associated with increased morbidity or mortality.

COMPETING INTERESTS
Nil.

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Dispensing of attention-deficit hyperactivity disorder medications for adults in Aotearoa New Zealand

Ben Beaglehole, Stephen Jarman, Chris Frampton

ABSTRACT

AIM: To report dispensing trends for attention-deficit hyperactivity disorder (ADHD) in Aotearoa New Zealand, focussing on adults in order to highlight increasing demand for ADHD treatment by adults and to prompt discussion.

METHOD: Demographic and dispensing data for ADHD were obtained from the Pharmaceutical Collection between the years 2006 and 2022. This was stratified according to child (<18 years) and adult (≥18 years) populations. Population dispensing rates for methylphenidate and atomoxetine were calculated. Key findings are reported to reveal demographic and dispensing trends for medication treated ADHD in Aotearoa New Zealand.

RESULTS: More males are dispensed ADHD medication than females, although this is less evident for adults (54.8% male). Māori adults are dispensed ADHD medication at a lower rate (10.1%) than Māori children (22.9%). There was a 10-fold increase in dispensing of ADHD medication for adults compared to a three-fold increase for children over the study period. New dispensing for adults doubled between 2011 and 2022.

CONCLUSION: Medication treatment for adult ADHD is increasing in Aotearoa New Zealand and includes treatment for persisting childhood ADHD and new diagnoses made in adulthood. Despite increases, dispensing rates for ADHD remain lower than prevalence estimates, suggesting a significant treatment gap. Addressing the treatment gap for ADHD may reduce negative effects of ADHD, but wider social influences should also be considered.

Attention-deficit hyperactivity disorder (ADHD) is a neurodevelopmental disorder characterised by persistent patterns of inattention and/or hyperactivity-impulsivity that impairs functioning or development.[1] ADHD is associated with major health, societal and economic burdens through negative impacts on healthcare utilisation, work and social service utilisation, and crime and incarcerations.[2,3]

For ADHD to be diagnosed, several symptoms are required to be present before the age of 12 years,[1] and the traditional conceptualisation of ADHD is that of a childhood disorder with impacts that lessen with age. However, adult ADHD is now increasingly recognised.[4] Adult ADHD includes childhood ADHD that persists into adulthood and those with ADHD first diagnosed as an adult. The issue of whether childhood ADHD and adult ADHD constitute continuous populations is debated. Longitudinal cohort studies have reported that if the requirement for symptoms to be present before the age of 12 years is not applied, then childhood ADHD and adult ADHD appear to be largely non-overlapping populations.[5,6] In contrast, the Multimodal Treatment Study of ADHD made repeated rigorous ADHD assessments through childhood and reported that substantial proportions of young adult ADHD diagnoses without childhood onset were false positives confounded by comorbidity and substance use.[7]

The reported prevalence rates for ADHD vary substantially. A systematic review by Polanczyk et al. reported that more than 5% of the population experience ADHD globally and considered whether rates of ADHD varied geographically and were increasing over time.[8] This review concluded that variance in prevalence rates related to methodological characteristics in included studies and that increasing rates of diagnosis and treatment were explained by increased awareness, access to treatment or changing clinical practice as opposed to increased prevalence.[8] Song et al. reported that the global prevalence of ADHD persisting into adulthood is 2.58% and the prevalence of symptomatic ADHD in adulthood (regardless of childhood onset) is 6.76%, suggesting substantial health burden globally.[9] We are unaware of epidemiological studies reporting national prevalence data for ADHD in Aotearoa New Zealand, although the Dunedin Multidisciplinary

Health and Development Study reported a cohort prevalence of ADHD in childhood of 6% that had reduced to 3% by the age of 38 years.[5]

Treatment for ADHD includes behavioural and pharmacological options. Medications include stimulants and non-stimulant options such as atomoxetine and clonidine. The evidence base for stimulants is greater than for non-stimulants, and stimulants result in larger clinical improvements.[10] However, non-stimulant options are preferred in cases when there are concerns about the potential for substance misuse or the risk of destabilising comorbid conditions such as bipolar disorder or schizophrenia with stimulants.[10] In Aotearoa New Zealand, the stimulant methylphenidate is most commonly used and is dispensed at a rate of 9–11 times other options.[11]

Our clinical impression is that demand for ADHD assessments and treatment by adult specialist mental health services is increasing markedly. Demand appears to be driven by patients with childhood ADHD seeking treatment as adults, and adults without previous ADHD diagnoses seeking assessment and treatment. D'Souza et al. have already reported on longitudinal trends in medication dispensing for young people in Aotearoa New Zealand but did not include data for adults older than 24 years.[11] In this study we report longitudinal dispensing trends for ADHD treatment in Aotearoa New Zealand. We focus on adults with ADHD in order to raise awareness of demand for treatment in this group and to prompt discussion.

Methods

This study underwent Māori consultation and was granted ethical approval by the University of Otago Ethics Committee (approval HD23/002).

The Pharmaceutical Collection is the national dispensing database for Aotearoa New Zealand.[12] Data for individuals dispensed methylphenidate (any formulation) and atomoxetine from 2006 (when data from the Pharmaceutical Collection are first available) to September 2022 were requested from the Pharmaceutical Collection. Methylphenidate data were requested because this is the first-choice stimulant treatment for ADHD in Aotearoa New Zealand. Atomoxetine was requested because we were interested in rates of non-stimulant treatment for adults and its sole indication is for ADHD, unlike other non-stimulant treatments. This data included gender, ethnicity, level of deprivation measured in deciles using the New Zealand Index of Deprivation (NZDep) scale (with higher numbers indicating greater deprivation) and age. Data were provided after anonymisation using a unique encrypted identifier. For each calendar year an individual was counted as having a dispensing if they received at least one dispensing of any methylphenidate formulation or atomoxetine. Data for 2022 were extrapolated to year's end. Population data were obtained from Stats NZ using their website Infoshare. Population estimates for the years 2006 to 2022 were obtained and stratified based on <18 or ≥18 years to describe a child and adult population.

Dispensing prevalence rates were calculated for each year by dividing the number of individuals dispensed ADHD treatment by the number of individuals in the population that year, and are presented per 100,000 population. This was further stratified by age (<18 or ≥18 years) to capture age-related differences in prescribing, and the ratio of child to adult dispensing is reported. We also report first dispensing of an ADHD medication for adults to differentiate from childhood ADHD that persists into adulthood. This measure captures those not previously dispensed to in the database. It is only reported from 2011 onwards, providing a 5-year lag period to avoid including those who could have been dispensed a medication prior to establishment of the Pharmaceutical Collection.

Results

Table 1 reports the demographic characteristics of the 76,922 individuals who were dispensed methylphenidate or atomoxetine between 2006 and September 2022. There were more males dispensed ADHD treatment than females and the gender gap was most evident in the child population (75.4% of the child population were males compared to 54.8% adults). Māori were 22.9% of the child population but only 10.1% of the adult population. The mean NZDep index was 5.48 (standard deviation [SD] 2.9) for the overall population and this was similar for children and adults.

Dispensing for ADHD medication increased from 188/100,000 population in 2006 to 819/100,000 population in 2022. Figure 1 reports the dispensing rates for the total population and for children (<18 years) and adults (≥18 years). The dispensing rate for children increased from 566 per 100,000 in 2006 to 1,722 per 100,000 in 2022, representing a

Table 1: Characteristics of the study population.

Category		<18 years	≥18 years	Total
Gender	Male (%)	35,745 (75.4)	16,168 (54.8)	51,913 (67.5)
	Female (%)	11,586 (24.4)	13,229 (44.8)	24,815 (32.3)
Ethnicity	NZ European (%)	28,138 (59.3)	19,115 (64.8)	47,253 (61.4)
	Māori (%)	10,874 (22.9)	2,970 (10.1)	13,844 (18.0)
	Pacific peoples (%)	1,633 (3.4)	484 (1.6%)	2,117 (2.8)
	Asian (%)	1,645 (3.5)	1,501 (5.1)	3,146 (4.1)
	Other (%)	5,129 (10.8)	5,433 (18.4)	10,562 13.7)
NZDep	Mean (SD)	5.64 (2.9)	5.22 (2.8)	5.48 (2.9)
Age when first dispensed medication	Mean (SD)	9.82 (3.5)	32.47 (11.8)	18.51 (13.5)

Figure 1: Dispensing of ADHD medication per 100,000 population.

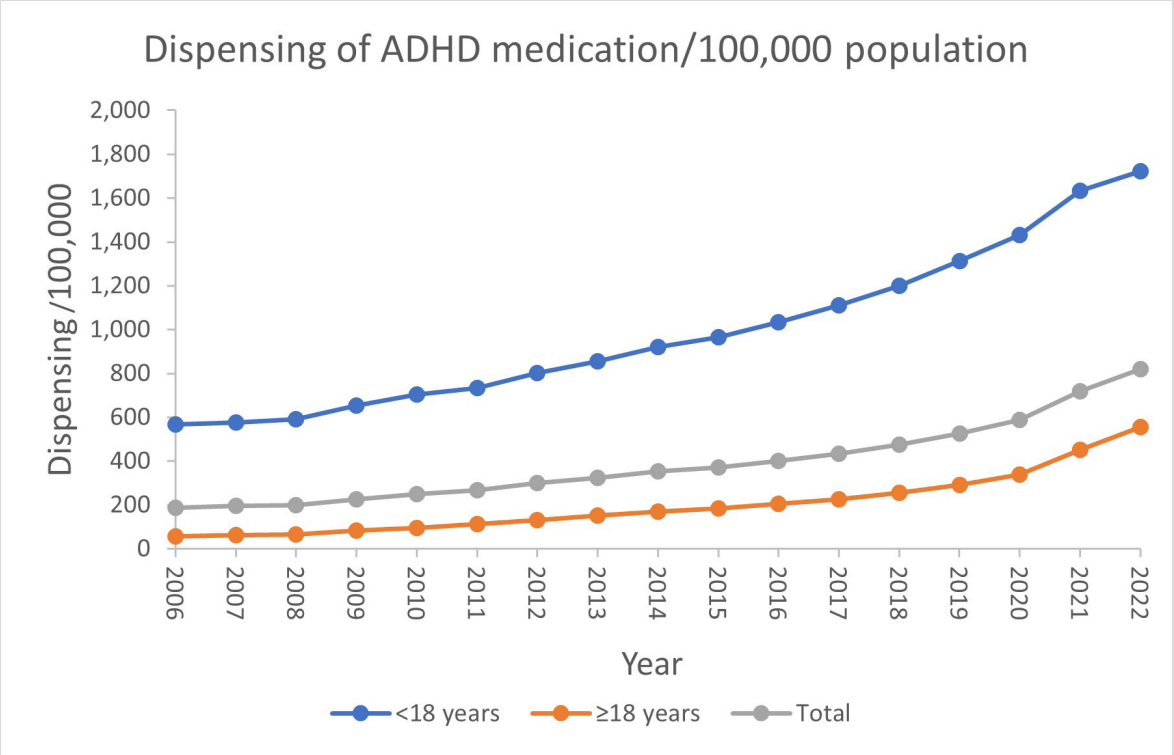


Figure 2: Ratio of child:adult dispensing for ADHD over time.

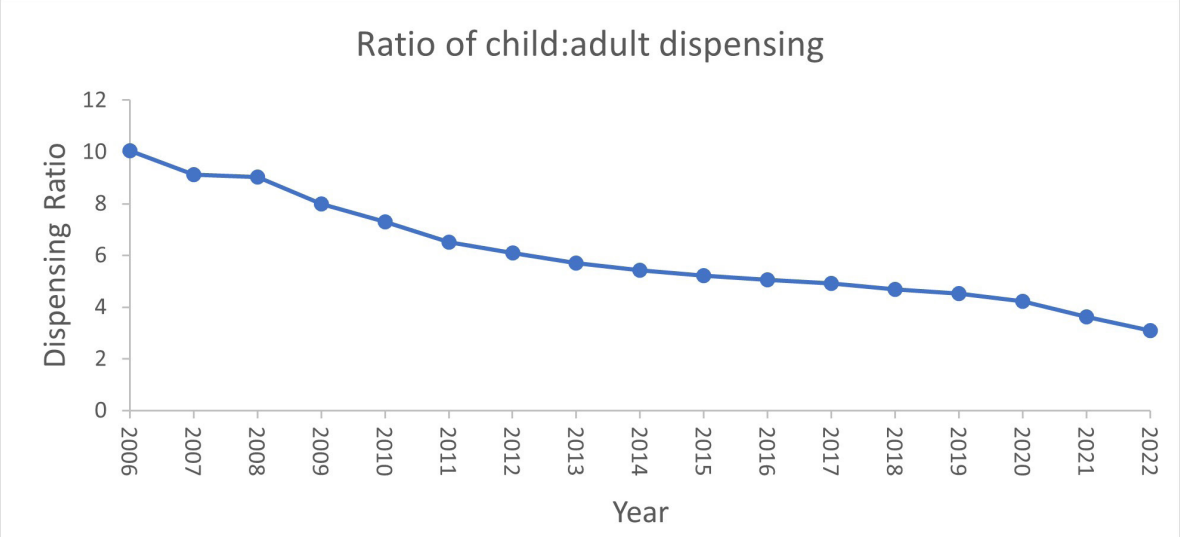
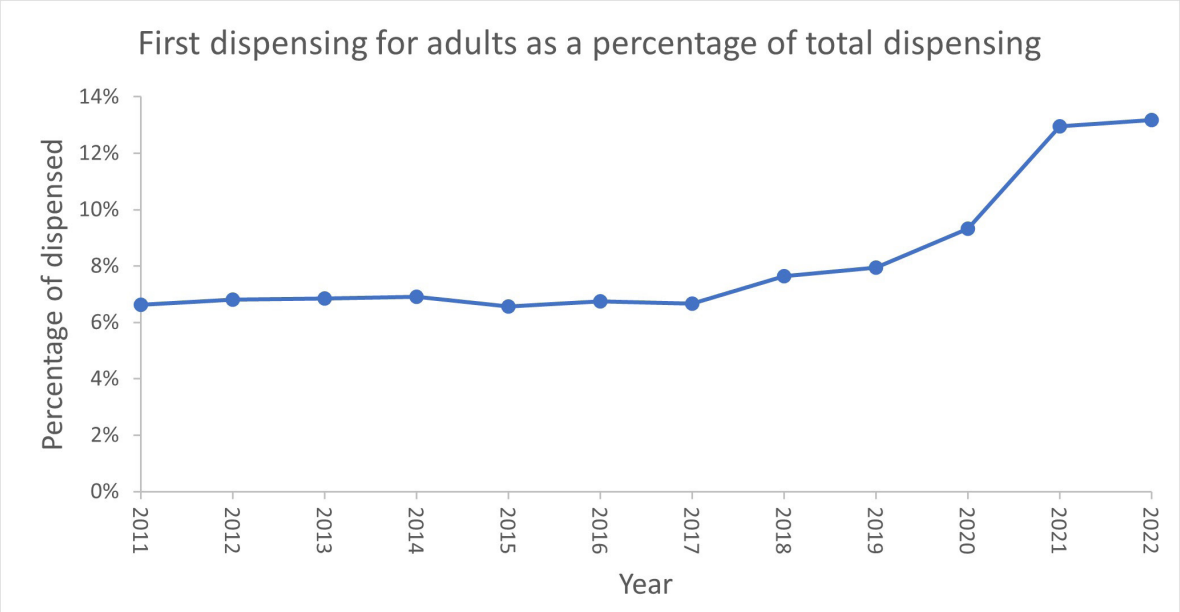


Figure 3: First dispensing of ADHD medication for adults as a percentage of total dispensing.



three-fold increase. The dispensing rate for adults increased from 55 per 100,000 in 2006 to 556 per 100,000 in 2022, representing a 10-fold increase.

The ratio of childhood to adult prescribing reduced markedly over the study period. In 2006, there were approximately 10 child prescriptions to every adult prescription, dropping to 3.1 child prescriptions for every adult by 2022. Figure 2 demonstrates the change in this ratio over time.

First dispensing of ADHD medication as an adult represented 6.6% of the total dispensing in 2006. This rose to 13.2% by 2022. Figure 3 reports first dispensing for adults over the study period.

Atomoxetine became available for use in Aotearoa New Zealand in 2009. The percentage of the adult study population who were dispensed atomoxetine rose from 2.5% in 2009 to 5.2% in 2022. Atomoxetine use was largely stable in the child population, varying between 2.1% and 3.2% of this population.

Discussion

This study confirms the presence of increasing treatment of ADHD in adults in Aotearoa New Zealand over time. From 2006 to 2022, there was a 10-fold increase in dispensing of ADHD medications to adults. Despite corresponding increases in dispensing for children, the ratio of child:adult dispensing fell during the study period. New dispensing for adults also increased over the study period, suggesting that the group receiving treatment as adults consists of those with a diagnosis of ADHD made in adulthood in addition to childhood ADHD persisting into adulthood.

The highest rates of treatment prevalence were observed in 2022 for both age groups. This was 1.72% in the child category and 0.56% in adults. These rates should be compared with the population prevalence for ADHD, which is estimated to be more than 5% of the total population with 2.58% persisting into adulthood.[8,9] This suggests that a large treatment gap exists for New Zealanders with ADHD. Receiving treatment for ADHD relies upon access to assessment and treatment options. The prescription of methylphenidate requires special authority from Pharmac (the government body overseeing funding and supply of medications in Aotearoa New Zealand) and endorsement by a paediatrician or psychiatrist. In Aotearoa New Zealand, access to public mental health services is heavily restricted due to a mental health workforce facing considerable strain.[13] This means that many ADHD assessments are now undertaken in the private sector, leaving access and equity issues for those unable to afford expensive assessments. It is possible that if there were greater access to ADHD assessments and treatment that individual and societal harms would reduce given the known burdens associated with ADHD.[2,3] However, increasing access to ADHD assessments and treatment is not straightforward. It requires increasing the pool and range of professionals with the skill sets to complete ADHD assessment. Additionally, reducing structural barriers to prescribing by reviewing Pharmac prescribing restrictions would also need to occur.

The presence of a large ADHD treatment gap is undesirable, particularly when there are inequities of access to ADHD assessments and treatment. However, it is possible that some unintended negative consequences would follow increased ADHD treatment in the community. A qualitative study of general practitioners and community pharmacists assessing prescribed drug misuse identified that stimulants were one of the main treatments of concern.[14] Would this issue increase with greater access to stimulant medications or would it reduce as the pool of people with undiagnosed ADHD seeking treatment reduces? A database study such as ours is unable to provide answers to this question. The highlighting of under-treatment of ADHD in Aotearoa New Zealand is not without some misgivings on our behalf. Rising rates of antidepressant treatment and mental health service use have not been accompanied by reductions in psychological distress.[15] It is therefore possible that greater treatment of ADHD may not be accompanied by expected societal benefits and that focussing on other factors such as deprivation with psychosocial responses is more fruitful.[15]

There were noteworthy gender and ethnicity differences across the age span. Three quarters of children dispensed ADHD medication were male, whereas the gender split was more even for adults. There is debate about the relative prevalence of ADHD according to gender with some suggesting that males with ADHD are more easily recognised due to hyperactivity and females are relatively under-recognised due to greater levels of inattention.[16,17] The trends we report for gender are consistent with longitudinal trends reported internationally.[18] Dispensing of ADHD medication for Māori for all ages was commensurate with the population prevalence of Māori.[19] However, adult Māori only constituted 10% of this treatment group, consistent with ethnic disparities with respect to Māori accessing treatment for ADHD as an adult.

We focussed our attention on dispensing of methylphenidate and atomoxetine. Methylphenidate is the recommended first-line medication for ADHD in Aotearoa New Zealand and use of the alternative stimulant dexamphetamine is minimal.[11] We did not attempt to link dispensing data to a database with diagnostic information, such as PRIMHD, because this primarily captures secondary care service provision and would not include those treated privately.[20] Accordingly, we could not confirm that methylphenidate use was for ADHD but we expect use for other indications like narcolepsy to be minimal. Alternative non-stimulant options to atomoxetine are available (modafinil and clonidine). We chose not to request data for these because we expected the frequency of their use for non-ADHD indications to be significant, meaning frequency of use could

not be solely attributed to ADHD.

In conclusion, rates of medication treatment for ADHD in Aotearoa New Zealand are rising and dispensing of ADHD treatment for adults is becoming more substantial over time. The group receiving treatment as adults includes children with persisting ADHD in adulthood and adults who have not previously received treatment. Despite increasing treatment, there remains a significant treatment gap when global prevalence rates of ADHD are considered. Greater treatment may reduce some of the negative impacts associated with ADHD although other societal issues may emerge in this context.

COMPETING INTERESTS
The authors have no competing interests to declare.

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Incorporating patient, nursing and environmental factors into antimicrobial stewardship: effects of simplifying treatment from cefuroxime to ceftriaxone

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ABSTRACT

AIM: Our antimicrobial guidelines (AGs) were changed in 2021 to recommend once-daily ceftriaxone in place of three-times-daily cefuroxime as preferred cephalosporin. This analysis sought to assess the effects of this on incidence of *Clostridioides difficile* infection (CDI), third-generation cephalosporin-resistant Enterobacterales (3GCR-E) and resource utilisation.

METHOD: Before and after analysis of 30-day CDI and 3GCR-E incidence following receipt of cefuroxime/ceftriaxone pre- and post-AG change. Total nursing time and waste production relating to cefuroxime/ceftriaxone delivery were calculated pre- and post-change.

RESULTS: CDI incidence was 0.6% pre- and 1.0% post-change (adjusted odds ratio [aOR] 1.44, p=0.07) and 3GCR-E incidence 3.5% and 3.1% (aOR 0.90, p=0.33). Mean per-quarter estimated nursing administration time decreased from 2,065 to 1,163 hours (902 nurse-hour reduction) and antibiotic-related waste generation from 1,131kg to 748kg (383kg reduction). Overall days of therapy per-quarter of cefuroxime/ceftriaxone were unchanged between periods.

CONCLUSION: This simplification of our AG from a three-times-daily to a once-daily antibiotic resulted in considerable savings for our hospital (roughly 1.7 full-time equivalent nurses and over a tonne of waste yearly), with no significant increases in CDI or 3GCR-E. The impact of dosing schedules on non-antibiotic-spectrum factors, such as nursing time and resource usage, is worthy of consideration when designing AGs.

A core tool in hospital antimicrobial stewardship (AMS) is the development of syndrome-specific antimicrobial guidelines (AGs).[1] Guideline-adherent empirical therapy is associated with reduced treatment failure, length of stay (LOS) and mortality.[2] Guideline development typically focusses on antimicrobial spectrum, route of administration, dose and duration. We believe that AMS should also promote responsible and sustainable use of limited resources, including nursing time, patient comfort and convenience, and consumption of single-use plastic destined for landfill. This has parallels to the business concept of the "triple bottom line," whereby success is measured not solely based on profit, but also in relation to the impact on people and the planet.

Using these principles, the AMS Committee at our institution changed the AGs in quarter 4 (Q4) 2021 to replace cefuroxime 1.5g intravenous (IV) 8-hourly with ceftriaxone 2g IV once daily as the preferred cephalosporin for empiric treatment of a number of indications. Ceftriaxone was already the recommended beta-lactam for moderate–severe community-acquired pneumonia. This change generated considerable debate within the committee, particularly regarding the potential to drive antimicrobial resistance and *Clostridioides difficile* infection (CDI). Balancing this potential risk were the likely benefits to the hospital system in terms of simplicity (to promote adherence), nursing time saved and reduction in consumables. Convenience for patients was a major consideration, with less disruption to rest and fewer missed or late doses. The aim of this report is to describe the positive and negative impacts of the change 2 years after implementation.

Methods

Setting

Wellington Regional Hospital (WRH) is a 484-bed acute care tertiary hospital which covers all

specialties except plastic surgery and rheumatology, and Kenepuru Community Hospital (KPH) is a 131-bed community hospital. These hospitals service a population of around 500,000 people, and both follow our AGs.

In Q4 2021, in addition to the AG changes described above, piperacillin-tazobactam was changed to cefepime for febrile neutropenia and severe hospital-acquired infection, and piperacillin-tazobactam changed to amoxicillin-clavulanate for mild–moderate hospital-acquired infection. There was widespread internal communication regarding these changes, and our AGs were updated on our hospital intranet and mobile app.[3]

Data extraction and creation of cohorts

Medication dispensing at WRH/KPH uses BD Pyxis™, which permits data extraction for all individual dispensing events. The exception to this is the Emergency Department (ED), for which dispensing records were unavailable. The Pyxis data were used to create two cohorts for analysis: 1) patients aged >16 years who received at least 2 consecutive days of either IV cefuroxime or IV ceftriaxone, and 2) patients aged >16 years who received at least 2 consecutive days of any other antibiotic via any route. Patients were excluded from this group if they had received cefuroxime, ceftriaxone, piperacillin-tazobactam, cefepime or amoxicillin-clavulanate within 30 days before or after the start of their course. The intention of the second cohort was to provide a comparator group with antibiotic use that was relatively unaffected by AG changes. Patient demographics and admission information were extracted from the hospital data warehouse, and microbiology data were extracted from the Awanui Laboratories Wellington laboratory information system, which provides both hospital and community microbiology services for the region.

Definitions

The pre-change period was defined as Q1 2019 to Q3 2021, and the post-change period as Q1 2022 to Q3 2023. Q4 2021 was excluded because the new AGs were only partially embedded at this time. For each patient, incident CDI was defined as either a positive direct faecal toxin enzyme immunoassay result or a positive toxigenic culture result within 2–30 days of the start of the antibiotic course. Incident ESBL/third-generation cephalosporin-resistant Enterobacterales (ESBL/3GCR-E) were defined as isolation of one of these organisms from any sample type within the same time window. An overnight dose of an antibiotic was defined as a dispensing event between 10 pm and 6 am.

Estimates of administration time and waste

The time taken to administer a dose of IV antibiotics was estimated at 22 minutes.[4] Weight estimates were obtained by collecting all the waste (antibiotic vials, giving sets, tubing, syringes, gloves, etc) associated with delivery of each antibiotic over a 24-hour period and then dividing by the number of doses to generate an average weight per dose. Given the scarcity of patients on cefuroxime in the hospital, these weights were estimated from IV amoxicillin-clavulanate, which has the same dose frequency and almost exactly the same use of vials and consumables. This gave a weight of 84.5g and 239.1g for a 2g dose of ceftriaxone via push and infusion, respectively, and 103.3g and 195.6g for cefuroxime. The infusion weight was used to estimate the overall waste generation because this is the predominant mode of delivery in our institution.

Analysis

Outcomes of interest were: 1) the 30-day incidence of CDI and ESBL/3GCR-E in each cohort, and 2) estimated total nursing time spent administering IV antibiotics, estimated total IV-associated waste generation and total overnight doses administered in the cephalosporin cohort. These outcomes were compared across the time periods, with the Chi-squared test used to compare categorical variables, and the Mann–Whitney U test for continuous variables. A multivariate logistic regression model was created to determine which covariates in the cephalosporin cohort were independently associated with increased odds of CDI and ESBL/3GCR-E. Analysis was performed in Stata 17 (College Station, Texas).

Ethics

This analysis was part of the routine ongoing monitoring activities undertaken at our hospital by the AMS committee, which is an ongoing Continuous Quality Improvement project to inform future guidelines. It was therefore out of scope for Health and Disability Ethics Committee review, as this analysis is classified as an “audit or related activity”. Hospital Clinical Audit Committee approval was gained.

Results

The characteristics of the cephalosporin cohort are shown in Table 1.

In the pre-change period, 85.7% of the cohort received cefuroxime, whereas in the post-change period 94.2% received ceftriaxone, consistent with the change in AGs. The pre- and post-change groups were otherwise broadly similar, other than a decrease in general surgical patients and an increase in general medical patients in the post-change period. Mean days of therapy (DOT) with cefuroxime/ceftriaxone within 30 days of the initial dose were similar across time periods (4.1 vs 4.0, p=0.01). CDI incidence was 0.6% in the pre-change, versus 1.0% in the post-change period (p=0.02). Isolation of ESBL/3GCR-E within 30 days was 3.5% pre-change versus 3.1% (p=0.31) post-change. Characteristics of the comparator group are shown in Table 2.

The major difference compared to the cephalosporin cohort was that there were fewer

Table 1: Characteristics and outcomes of the cephalosporin cohort pre- and post-change in antimicrobial guidelines.

	Pre-change		Post-change		p-value
	N	%	N	%	
Total patients	8,342		5,107		
Received cefuroxime	7,150	85.7%	296	5.8%	
Received ceftriaxone	1,192	14.3%	4,811	94.2%	
Age (years), median, IQR	60.3	(39.3, 75.5)	64.9	(47.1, 76.9)	<0.01
Female	4,616	55.3%	2,675	52.5%	<0.01
Ethnicity					0.01
Other or unknown	1,486	17.8%	830	16.3%	
NZ Māori	1,099	13.2%	679	13.3%	
Pacific peoples	778	9.3%	569	11.1%	
NZ European	4,335	52.0%	2,643	51.8%	
Asian	644	7.7%	386	7.6%	
Specialty grouped					<0.01
General medicine	2,273	27.2%	1,700	33.3%	
Subspecialty medicine	429	5.1%	330	6.5%	
Haematology/Oncology	669	8.0%	471	9.2%	
Intensive care	181	2.2%	191	3.7%	
General surgery	2,591	31.1%	1,270	24.9%	
Subspecialty surgery	891	10.7%	596	11.7%	
Older persons' health	70	0.8%	42	0.8%	
Women's health	1,023	12.3%	383	7.5%	
Emergency department[a]	202	2.4%	119	2.3%	

Table 1 (continued): Characteristics and outcomes of the cephalosporin cohort pre- and post-change in antimicrobial guidelines.

Other	13	0.2%	4	0.1%	
Hospitalised in the last 365 days	4,139	49.6%	2,588	50.7%	0.21
CDI in prior 365 days	39	0.5%	43	0.8%	<0.01
Cefuroxime/ceftriaxone DOT within 30 days, mean, standard deviation	4.1	2.9	4.0	2.7	0.01
Incident CDI within 30 days	54	0.6%	52	1.0%	0.02
ESBL/3GCR-E culture within 30 days	289	3.5%	159	3.1%	0.31

Inter quartile range = IQR; *Clostridioides difficile* infection = CDI; days of therapy = DOT; extended-spectrum beta-lactamase or third generation cephalosporin-resistant Enterobacterales = ESBL/3GCRE-E.
[a]Although emergency department Pyxis data were unavailable, some patients were still coded as being under emergency once they had been admitted to a ward and received their first antibiotic dose.

Table 2: Characteristics and outcomes of the comparator cohort pre- and post-change in antimicrobial guidelines.

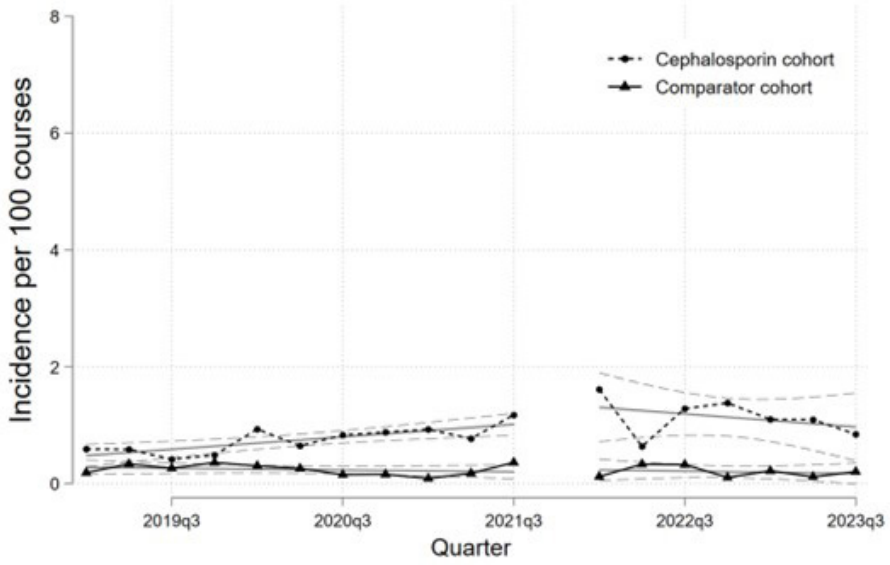
	Pre-change		**Post-change**		**p-value**
	N	**%**	**N**	**%**	
Total patients	16,547		7,237		
Age (years), median, IQR	62.2	(39.7, 76.2)	65.2	(47.2, 77.8)	<0.01
Female	9,232	55.8%	3,847	53.2%	<0.01
Ethnicity					<0.01
Other or unknown	2,566	15.5%	1,005	13.9%	
NZ Māori	2,349	14.2%	1,052	14.5%	
Pacific peoples	1,466	8.9%	682	9.4%	
NZ European	9,197	55.6%	4,110	56.8%	
Asian	969	5.9%	388	5.4%	
Specialty grouped					<0.01
General medicine	3,391	20.5%	1,551	21.4%	
Subspecialty medicine	1,974	11.9%	749	10.3%	
Haematology/Oncology	625	3.8%	267	3.7%	
Intensive care	141	0.9%	85	1.2%	
General surgery	1,086	6.6%	369	5.1%	
Subspecialty surgery	6,583	39.8%	3,368	46.5%	
Older persons' health	399	2.4%	191	2.6%	

Table 2 (continued): Characteristics and outcomes of the comparator cohort pre- and post-change in antimicrobial guidelines.

Women's health	1,942	11.7%	483	6.7%	
Emergency department	340	2.1%	141	1.9%	
Other	66	0.4%	30	0.4%	
Hospitalised in the last 365 days	7,647	46.2%	3,377	46.7%	0.53
CDI in prior 365 days	80	0.5%	49	0.7%	0.06
Total antibiotic LOT within 30 days, mean, standard deviation	3.4	3.4	4.1	3.5	<0.01
Incident CDI within 30 days	34	0.2%	13	0.2%	0.68
ESBL/3GCR-E positive culture within 30 days	234	1.4%	121	1.7%	0.13

Inter quartile range = IQR; *Clostridioides difficile* infection = CDI; length of therapy = LOT; extended-spectrum beta-lactamase or third generation cephalosporin-resistant Enterobacterales = ESBL/3GCRE-E.

Figure 1: 30-day incidence of *Clostridioides difficile* infection by quarter in the cephalosporin and comparator cohorts.



general surgical patients (6.6% and 5.1% of the cohort pre- and post-change) and more subspecialty surgical patients (39.8% and 46.5%). The incidence of CDI was lower than the cephalosporin cohort and did not change between time periods (0.2% and 0.2%, p=0.68) and incidence of ESBL/3GCR-E was not significantly different between periods (1.4% versus 1.7%, p=0.13). Figure 1 shows CDI incidence over time in the two cohorts.

The incidence increased prior to the AG change in the cephalosporin cohort, appeared to peak shortly after the change and decreased after this, whereas the incidence appeared stable across both time periods in the comparator group.

Table 3 shows the multivariate analysis results for CDI.

Table 3: Multiple logistic regression model for odds of incident CDI in the cephalosporin cohort, by different patient characteristics.

	aOR	95% CI	p-value
Age	1.02[a]	(1.00, 1.03)	0.01
Female	1.68	(1.12, 2.50)	0.01
Ethnicity			
Other or unknown	1.00		
NZ Māori	1.40	(0.71, 2.76)	0.34
Pacific peoples	0.32	(0.09, 1.09)	0.07
NZ European	1.04	(0.61, 1.77)	0.89
Asian	0.64	(0.21, 1.90)	0.42
Specialty grouped			
General medicine	1.00		
Subspecialty medicine	1.74	(0.76, 3.96)	0.19
Haematology/Oncology	2.19	(1.15, 4.16)	0.02
Intensive care	2.52	(0.94, 6.77)	0.07
General surgery	1.12	(0.62, 2.01)	0.72
Subspecialty surgery	2.40	(1.32, 4.37)	<0.01
Older persons' health	2.68	(0.77, 9.25)	0.12
Women's health	0.41	(0.09, 1.90)	0.26
Emergency department	–[b]		
Other	–[b]		
Hospitalised in the last 365 days	1.41	(0.92, 2.15)	0.12
CDI in prior 365 days	11.30	(5.25, 24.33)	<0.01
Cefuroxime/ceftriaxone DOT within 30 days	1.07[a]	(1.02, 1.13)	0.01
Post-change period patient	1.44	(0.97, 2.12)	0.07

Adjusted odds ratio = aOR; *Clostridioides difficile* infection = CDI; days of therapy = DOT.
[a]Odds ratio here represents increased odds per unit increase in the variable.
[b]Insufficient outcomes in these groups to generate an odds ratio.

Several covariates were associated with increased odds of CDI in the cephalosporin cohort, with the strongest being a prior diagnosis of CDI within the last year (aOR 11.3, 95%–CI 5.25–24.33, p<0.01), and cefuroxime/ceftriaxone DOT within 30 days of index dose (aOR 1.07 for each additional DOT, 95%–CI 1.02–1.13, p=0.01). The odds of CDI in the post-change period were no longer statistically significantly higher than the pre-change period (aOR 1.44, 95%–CI 0.97–2.12, p=0.07). The results of the multivariate analysis for ESBL/3GCR-E showed an aOR of 0.91 (95%–CI 0.74–1.11, p=0.34) for incident ESBL/3GCR-E in the post-change period (Appendix).

Table 4: Mean usage and resource consumption for cefuroxime and ceftriaxone per quarter pre- and post-change in guidelines.

	Mean per quarter		
	Pre	**Post**	**Difference**
Occupied bed days	36,535	39,022	2,487
Days of therapy			
Cefuroxime	2,067	105	-1,962
Ceftriaxone	528	2,494	1,966
Total	2,595	2,599	4
Dosing events and estimated resource usage			
Cefuroxime dosing events	4,958	237	-4,721
Nursing hours consumption[a]	1,818	87	-1,731
Waste generated[b] (kg)	970	46	-923
Overnight doses[c]	1,691	82	-1,609
Ceftriaxone dosing events	675	2,935	2,260
Nursing hours consumption[a]	248	1,076	828
Waste generated[b] (kg)	161	701	540
Overnight doses[c]	86	507	421
Total dosing events	5,633	3,172	-2,461
Nursing hours consumption[a]	2,065	1,163	-902
Waste generated[b] (kg)	1,131	748	-383
Overnight doses[c]	1,777	588	-1,189

[a]Based on an assumed 22-minute delivery time.
[b]Based on assumed infusion delivery.
[c]Overnight dose defined as between 10 pm and 6 am.

Table 4 shows the hospital-wide effects of the change in cephalosporin AGs between time periods.

The hospital was busier in the post-change period (additional 2,487 occupied bed days per quarter), but despite this, total cefuroxime/ceftriaxone DOT was very similar (2,595 DOT versus 2,599 DOT per quarter). As expected, there was a marked decrease in mean cefuroxime DOT per quarter (2,067 versus 105) and increase for ceftriaxone (528 versus 2,494). There was a large decrease in mean combined cefuroxime/ceftriaxone dosing events per quarter (5,633 to 3,172, decrease of 2,461), which translated to large reductions in estimated nursing time consumption (2,065 hours per quarter versus 1,163, reduction of 902) and estimated waste generated for infusion delivery (1,131kg to 748kg, reduction of 383kg). The mean number of overnight dosing events also decreased substantially (1,777 versus 588, decrease of 1,189 per quarter).

Discussion

This study demonstrates widespread hospital acceptance of pragmatic guidelines that take into consideration nursing workloads and patient convenience, with no statistically significant increase in CDI or resistant organisms. We argue that these principles should be significant considerations for the development of AGs, and that AMS should consider this "triple bottom line" framework, rather than focussing solely on the implications of antibiotic spectrum. Our programme emphasises the importance of ongoing monitoring of resistant organisms and CDI to ensure that we do not cause harm to the wider patient group in the name of nursing and individual patient convenience.

Nurses are in short supply globally, and it is especially important that nursing time is used optimally, with improvements in workflow implemented where possible.[5] A major benefit with the guideline change was the reduction in nursing time spent preparing and delivering IV antibiotics, primarily due to recommending a once-daily antibiotic. A mean estimated reduction of 902 nursing hours per quarter was realised, which equates to almost 10 hours per day, or roughly 1.7 full-time equivalent. In a period when there is a shortage of nurses, the ability to reallocate scarce nursing resources to other care priorities is a considerable advantage. Furthermore, overstretched nurses are known to be less compliant with hand hygiene and other infection control principles, so a reduction in workload may be beneficial in this regard, which is in line with the goals of AMS.[6]

Both ceftriaxone 2g and cefuroxime 1.5g can be administered as either a push (3–5 minutes for cefuroxime, 4–8 minutes for ceftriaxone) or via a 30-minute infusion.[7] While push administration is associated with less waste and overall time of delivery, observation during this study showed that infusion remains standard practice in our hospital. In several studies, an IV push antibiotic was associated with reduced time spent delivering doses compared to infusions, faster time to first dose and reduced consumables and costs per dose event.[8–10] Antibiotic infusion may also result in wastage of up to 24% of the dose if the residual volume is not flushed, an issue not present for bolus dosing.[10] A programme to encourage IV push of appropriate antibiotics may be a useful next step at our institution, although the convenience of being able to perform other tasks once an infusion has been hung is a common advantage cited by our nurses. The reported time savings of push administration may be less relevant, although it would still result in savings in waste.

Our findings suggest that a significant reduction in waste can be achieved with once-daily antibiotics such as ceftriaxone. We estimated that up to 383kg per quarter of consumable waste, or over a tonne of waste per year, was saved by the guideline changes (assuming infusion delivery; the quarterly estimate would be 297kg if all delivery was via push). Hospital waste contributes almost 5% of global greenhouse gas emissions and uses substantial plastic consumables.[11,12] In our country, most of the consumables are imported, adding to the emission footprint. Minimising single-use consumables (IV tubing, syringes, flush vials, plastic fluid bags) should be a priority for hospitals given the threats to human health from environmental contamination and climate change.[11,12] It should be noted that the time savings and waste generated are based on per-dose estimates and the final numbers should not be considered exact; however, they are likely to be a good indication of the magnitude of potential savings. Ceftriaxone is also sometimes dosed twice daily, for example in central nervous system infection, which would negate some of the benefits sited above. However, our data include all dosing events over the study time period, so this has been accounted for.

Use of a once-a-day antibiotic improves patient comfort and convenience, and should eliminate the need to give overnight doses, other than the first dose in patients presenting overnight. There was a reduction of 1,189 doses given overnight compared to the pre-change period. However, 22.6% of doses were still given in the overnight period. This suggests a failure to chart antimicrobials at more nurse- and patient-friendly times by doctors, who may not think of the negative impact on patient sleep and workload for nurses overnight—a time where staffing levels are lower. Interventions aimed at changing workflows, including time of medication administration, have been shown to be successful at improving sleep disruption for patients.[13,14] This is an area to target for prescriber education in our institution. A further advantage of once daily dosing is that it frees up patient time for other important aspects of their care, such as allied health, radiology or other therapies.

Critics of our approach may emphasise the potential harms of ceftriaxone when compared to cefuroxime due to its broader spectrum. Although

there are theoretical concerns regarding the emergence of antimicrobial resistance and CDI with use of broad-spectrum antibiotics, studies are heterogenous and do not provide simple answers. Antibiotics clearly have a profound effect on the microbiome, and this can be persistent, but the effect is complex.[15] Cephalosporins are associated with increased carriage of AmpC and ESBL-producing organisms.[16] Ceftriaxone and cefuroxime both promote increases in $bla_{CTX\text{-}M}$ abundance, with one study demonstrating a 22% per day increase in CTX-M genes in patients exposed to cefuroxime and 10% increase for patients on ceftriaxone.[17] Short-course antibiotics impact less on AMR genes in gut microbiome, and some studies have shown that the spectrum of antibiotics has less impact than duration of exposure; thus, the impact on the microbiome depends on a range of factors including duration and route of administration, as well as antibiotic spectrum.[15,18,19] Our data to date did not show an increase in ESBL-producing organisms relating to the change in cephalosporin AGs.

Data on antibiotic-specific risk for CDI is also challenging due to heterogenous methods and study design. Miller recently showed that cefuroxime has a similar odds ratio for CDI to third generation cephalosporins; however, their study used cefpodoxime rather than ceftriaxone.[20] The EUCLID study showed CDI risk was based on complex factors, not just antibiotic selection, and were unable to show a clear association with overall cephalosporin prescribing.[21] An older systematic review and meta-analysis showed an OR of 3.2 for ceftriaxone compared to 2.23 for cefuroxime for CDI.[22] There are some theoretical concerns relating to higher biliary excretion of ceftriaxone compared to other cephalosporins, which could exert more of an effect on intestinal microbiota and increase the risk of CDI and AMR; however, these concerns have not been substantiated by clinical data.[23,24] Our data showed a non-statistically significant increase in 30-day CDI incidence in the post-change period. However, the incidence appeared to have been gradually increasing over time prior to the change, with a peak shortly after the change, and subsequent return towards baseline levels. Ongoing surveillance will provide more robust data regarding the effects of guideline changes, but so far there are no convincing clinical data that establish ceftriaxone to be a higher risk antibiotic than cefuroxime for the risk of CDI or antimicrobial resistance.

The overall impact of initial empirical antimicrobials used in a hospital setting on the development of resistant gram negatives and CDI is likely to be less significant than the ongoing antimicrobial use in terms of spectrum and duration, and that of community prescribing, which in New Zealand accounts for around 95% of human antibiotic consumption.[25] In an AMS programme that prioritises early review, IV to oral switch and short courses, we have shown that taking a pragmatic initial approach helps our nursing colleagues, patients and the environment. While it is clear that antibiotics are a precious and limited resource, we believe it is important to consider the other resources that antibiotic administration requires. Analysis of antibiotic use should be broadened to include a "triple bottom line" approach, considering impact on nursing workload, patient comfort and environmental impact. We believe that these are important considerations for institutional guidelines and should form part of any contemporary AMS strategy. Integral to these concepts is actively monitoring the positive and negative impact of changes and responding to the findings objectively.

COMPETING INTERESTS
The authors have no conflicts of interest to declare. This work was supported by internal departmental funds.

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Appendix

Appendix Table 1: Multiple logistic regression model for odds of ESBL/3GCR-E in the cephalosporin cohort, by different patient characteristics.

	aOR	95% CI	p-value
Age	1.02[a]	(1.01, 1.02)	0.00
Female	1.24	(1.02, 1.50)	0.03
Ethnicity			
Other or unknown	1.00		
NZ Māori	1.00	(0.69, 1.44)	0.98
Pacific peoples	0.86	(0.57, 1.30)	0.47
NZ European	0.99	(0.76, 1.29)	0.92
Asian	1.64	(1.11, 2.41)	0.01
Specialty grouped			
General medicine	1.00		
Subspecialty medicine	1.00	(0.62, 1.61)	1.00
Haematology/Oncology	1.46	(1.03, 2.08)	0.04
Intensive care	2.22	(1.36, 3.62)	0.00
General surgery	1.41	(1.09, 1.83)	0.01
Subspecialty surgery	1.42	(1.03, 1.97)	0.03
Older persons' health	0.96	(0.37, 2.48)	0.93
Women's health	0.64	(0.35, 1.15)	0.14
Emergency department[b]	0.69	(0.30, 1.61)	0.39
Other	1.00[b]		
Hospitalised in the last 365 days	1.04	(1.01, 1.08)	0.02
Cefuroxime/ceftriaxone DOT within 30 days	1.14[a]	(1.12, 1.16)	0.00
Post-change period patient	0.91	(0.74, 1.11)	0.34

Extended-spectrum beta-lactamase-producing or third generation cephalosporin-resistant Enterobacterales = ESBL/3GCR-E; adjusted odds ratio = aOR; days of therapy = DOT.
[a]Odds ratio here represents increased odds per unit increase in the variable.
[b]Insufficient outcomes in these groups to generate an odds ratio.

Medication use before and after bariatric surgery: 5-year results from a randomised controlled trial of banded Roux-en-Y gastric bypass versus sleeve gastrectomy in patients with obesity and type 2 diabetes

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ABSTRACT

AIM: Bariatric surgery is an effective tool for weight loss and for improving weight related co-morbidities. Changes in medication usage after a silastic ring laparoscopic Roux-en-Y gastric bypass (SR-LRYGB) compared with laparoscopic sleeve gastrectomy (LSG) are unknown.

METHODS: This was a single-centre, double-blind, randomised controlled trial. Patients were randomised to either SR-LRYGB or LSG. A medication history was obtained at regular follow-up intervals, and mean numbers of prescribed medications were analysed over 5 years. Poisson regression and generalised estimating equations were used to test for statistically significant changes in usage.

RESULTS: After eight patients were lost to follow-up, data from 52 patients in each group were available for analysis. There was no difference between the SR-LRYGB or LSG groups in the number of medications prescribed, with the exception of oral glucose-lowering medications, where there was a greater decrease after SR-LRYGB compared to LSG (79% vs 55% respectively) from baseline to 5 years. At 5 years, total medication prescribed was down 10% from pre-operative levels. Prescribed insulin decreased by 72%, and cardiovascular medication decreased by 56% compared to baseline. Prescriptions for analgesia increased by 50%, psychiatric medications by 133% and proton-pump inhibitors by 81%.

CONCLUSION: Both SR-LRYGB and LSG reduced requirement for diabetic and cardiovascular medications, but increased requirement for nutritional supplementation, analgesia and psychiatric medications. There was a greater reduction in oral anti-diabetic medication prescriptions following SR-LRYGB compared to LSG, but no other difference in medication usage between surgical groups was found.

It is well established that bariatric surgery is a successful tool for weight loss, and results in improvements in weight-related comorbidities. The Roux-en-Y gastric bypass has been performed for over 50 years with good long-term results; however, the sleeve gastrectomy is now the most commonly performed bariatric operation in New Zealand,[1] partly due to good long-term results achieved following surgery but with relative simplicity of the operation compared to the gastric bypass, and partly due to a different side effect profile.

It has been shown that bariatric surgery results in significant changes in medication usage for some obesity-related comorbidities,[2–4] but these studies have been limited by their lack of blinding. It is also not known what effect different bariatric operations have on medication usage.

In addition to side effects, the cost of medications places a significant financial burden on healthcare systems, and thus any reduction in medication requirements is likely to be beneficial for both patients and healthcare systems.

The aim of the present study was to identify if patients with type 2 diabetes and obesity who underwent bariatric surgery had a reduction in medication usage following surgery, and if so, if there was a difference between those who underwent a silastic ring laparoscopic Roux-en-Y gastric bypass (SR-LRYGB) versus laparoscopic sleeve gastrectomy (LSG).

Methods

A prospective, double-blind, randomised controlled trial was undertaken at our institution between 2011 and 2015. The protocol[5] and results

of the primary outcome of this trial[6] have been published.

Participants were eligible for inclusion if they were aged between 20–55 years, had type 2 diabetes for at least 6 months' duration, a BMI of 35–65kg/m^2 for at least 5 years, were suitable for either of the two surgical procedures, able to provide written informed consent and committed to follow-up. Exclusion criteria included C-peptide <350pmol/L, type 1 diabetes or secondary diabetes, chronic pancreatitis, oral steroid therapy, current smokers and those not suitable for general anaesthesia.

After induction of anaesthesia, patients were randomised 1:1 to either SR-LRYGB or LSG using computer generated codes, with stratification according to age category (20–29, 30–39, 40–55), BMI category (35–44.9, 45–54.9, 55–65), ethnicity (Māori, Pacific peoples, NZ European/other), duration of diabetes diagnosis (<5, 5–10 and >10 years) and the presence of insulin therapy.

Both operations were performed using identical incisions with a four-port laparoscopic technique. For LSG, a sleeve was fashioned starting 2cm proximal to the pylorus using serial applications of an Echelon Flex 45 stapler (Ethicon) over a 36 Fr oro-gastric bougie. For SR-LRYGB, a lesser curve-based gastric pouch was fashioned over a 32 Fr oro-gastric tube, with a 50cm biliopancreatic limb, 100cm antecolic Roux limb with a hand-sewn single layer gastrojejunostomy over a 32 Fr oro-gastric tube. A 6.5cm silastic ring was then secured around the gastric pouch 2–3cm above the gastrojejunostomy anastomosis. Mesenteric defects were closed.

Immediately following surgery, all medications for diabetes, hypertension, lipid-lowering therapies and aspirin were ceased, except in those patients for whom aspirin or lipid-lowering agents were used for secondary prevention, and for patients with microalbuminuria, angiotensin converting enzyme-inhibitor/angiotensin receptor blockers were not stopped. All patients were commenced on a multivitamin (Centrum Plus, Pfizer New Zealand) twice daily, containing 200mg elemental calcium and 600IU vitamin D3, and proton-pump inhibitor (PPI) (pantoprazole, 20mg once daily).

Prior to discharge, patients were reviewed by an endocrinologist who was blinded to the surgical procedure. Anti-hypertensive treatment was restarted if the mean post-operative blood pressure was greater than 150/90mmHg. Anti-diabetic treatment was restarted if the mean post-operative capillary glucose was greater than 12mmol/L.

Patients were followed up at 3, 6, 9, 12, 18, 24, 36, 48 and 60 months post-operatively. During follow-up, patients were reviewed by an endocrinologist and were actively considered for adjustment (cessation, dose adjustment or initiation) of anti-diabetics, anti-hypertensive and other cardio-protective medications (statins and aspirin/anti-platelets) on the basis of clinical profile, including blood pressure measurements, HbA1c level, urinary microalbumin level and cardiovascular risk, as per a pre-defined protocol.[5]

A medication history was obtained at each follow-up appointment. In the event of a patient missing a follow-up appointment, electronic dispensing records were accessed where available to obtain the medication history for that time point. If data from more than two time points was unavailable, that patient was considered lost to follow-up and excluded from the study. Medications that were only taken on an as-required basis were excluded, as were short course prescriptions (e.g., antibiotics). Topical treatments such as ointments and eyedrops were excluded.

Statistical methods

Medication usage was analysed as the average number of medications prescribed per class, not dosage. For analysis, medication classes were grouped into categories. Categories are described in Appendix 1. For each medication class or category, analysis was performed using Poisson regression and generalised estimating equations. If there was no statistical difference between the time profiles for the two groups, the overall time effect was reported and changes in usage were provided for the pooled groups. Two-sided p values <0.05 were considered to indicate statistical significance. Analysis was performed using SAS software, version 9.4 (SAS Institute, Cary, NC).

Results

After excluding patients not meeting inclusion criteria (n=90) and those who refused to participate (n=17), there were 114 patients who were randomised to either LSG (n=58) or SR-LRYGB (n=56). At 5 years, one patient had died in each group, and after the removal of those who were lost to follow-up (LSG: n=5; SR-LRYGB: n=3) there were 52 participants in each group. Baseline characteristics for the two groups were similar (Table 1), as was prevalence of baseline medication usage by indication (Table 2).

For all classes and categories of medications,

there was no difference found in medication prescribed over time between the SR-LRYGB and LSG groups (p >0.05), with the exception of the oral anti-diabetic medication group, where there was a significant surgery group/time interaction (p=0.036).

A statistically significant reduction (38%) in total medication prescribed was seen over the first 3 post-operative months (mean number of regular medications per patient = 5.0 pre-operatively, versus 3.1 at 3 months), but by 5 years this increased to approach baseline levels (10% reduction, mean number of medications = 4.5) (Figure 1). There was no difference between the two surgical groups (p=0.66).

Prescriptions for oral anti-diabetic medications reduced by 93% on average at 3 months after surgery (mean number per patient = 1.2 pre-operatively, versus 0.1 at 3 months), and increased slowly thereafter over the 5-year follow-up period to reach a mean of 0.5 for the LSG group and 0.3 for the SR-LRYGB group (Figure 2).

There was an 84% reduction in insulin prescribed at 3 months post-operatively (mean number of insulin types per patient = 0.31 pre-operatively, versus 0.05 at 3 months), with rates rising slightly over the 5-year follow-up period to reach a 72% reduction at 5 years (Figure 3). Of the 25 patients on insulin pre-operatively, only five remained on

Table 1: Baseline characteristics of patients.

Characteristic	Laparoscopic silastic ring Roux-en-Y gastric bypass (n=52)	Laparoscopic sleeve gastrectomy (n=52)
Age—year	47.9±5.8	46.5±6.4
Female sex—no. (%)	31 (60)	25 (48)
Ethnicity—no. (%)		
NZ European	31 (60)	37 (71)
Māori	10 (19)	8 (15)
Pacific peoples	6 (12)	1 (2)
Other	5 (10)	6 (12)
Duration of diabetes—no. (%)		
<5 years	24 (46)	23 (44)
5–10 years	11 (21)	15 (29)
>10 years	17 (33)	14 (27)
Insulin usage—no. (%)	15 (29)	10 (19)
HbA1c—mmol/mol	63.8±18.3	60.7±11.4
Body weight—kg	123.2±21.9	125.4±24.4
BMI (kg/m^2) —no. (%)		
35–44.9	41 (79)	37 (71)
45–54.9	7 (13)	13 (25)
55–65	4 (8)	2 (4)

Plus-minus values are means ± SD.

Table 2: Proportion of patients on medication at baseline.

Medication class	Laparoscopic silastic ring Roux-en-Y gastric bypass (n=52) no. (%)	Laparoscopic sleeve gastrectomy (n=52) no. (%)
Oral anti-diabetic	47 (90)	43 (83)
Insulin	15 (29)	10 (19)
All cardiovascular	46 (88)	46 (88)
Anti-hypertensive	39 (75)	36 (69)
Anti-platelet	19 (37)	19 (37)
Lipid-lowering	37 (71)	31 (60)
All psychiatric	10 (19)	8 (15)
Anti-depressant	10 (19)	8 (15)
Proton-pump inhibitors	10 (19)	12 (23)
Analgesics	5 (10)	3 (6)
Gout	6 (12)	5 (10)
Nutritional supplementation	13 (25)	16 (21)

insulin after 3 months, increasing to eight patients at 5 years.

Cardiovascular medication prescriptions, including anti-hypertensives (Figure 4), anti-platelets (Figure 5) and lipid-lowering agents (Figure 6), decreased by 72% after 3 months (mean number of cardiovascular medications per patient = 2.2 pre-operatively, versus 0.6 at 3 months). Over the 5-year follow-up period, there was a gradual increase in cardiovascular medication prescriptions (mean number per patient = 1.0 at 5 years), but this was still a 56% reduction compared to baseline (Figure 7).

PPI prescriptions more than doubled post-operatively (mean number of PPIs per patient = 0.21 pre-operatively, versus 0.50 at 3 months), with rates dropping back to baseline levels by 6 months (mean number = 0.21 at 6 months), then rising gradually to reach an 81% increase from baseline at 5 years (mean number = 0.39 at 5 years). PPI prescriptions at 5 years were slightly higher in the sleeve group, but this was not statistically significant (Figure 8).

From 1-year post-operative, there was a trend for increased psychiatric medication prescriptions continuing until 5 years after surgery, at which time there was a 133% increase in the prescription of psychiatric medications (including anti-depressants [Figure 9], anti-psychotics, hypnotics and sedatives) compared to pre-operative levels (mean number per patient = 0.23 pre-operatively versus 0.54 at 5 years) (Figure 10).

Prescriptions for analgesics trended upwards from 3 years post-operatively, increasing by 50% compared to pre-operatively after 5 years (mean number per patient = 0.10 pre-operatively and 0.15 at 5 years) (Figure 11).

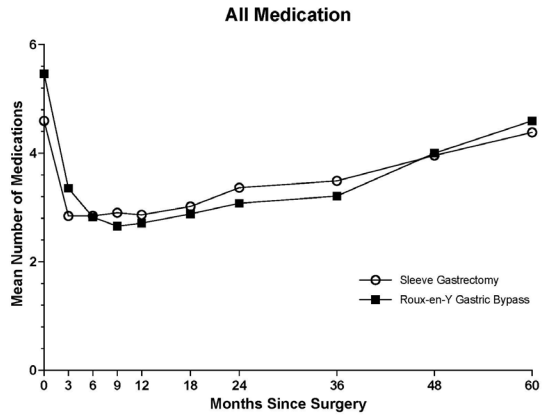
Nutritional supplementation prescriptions increased post-operatively (mean number of nutritional supplements per patient = 0.36 pre-operatively versus 1.24 at 3 months) but stabilised out to 5 years (mean number = 1.33 at 5 years), an increase of 273% on pre-operative levels (Figure 12).

There was no change in gout (Figure 13) or respiratory medication (Figure 14) prescriptions before and after surgery.

Discussion

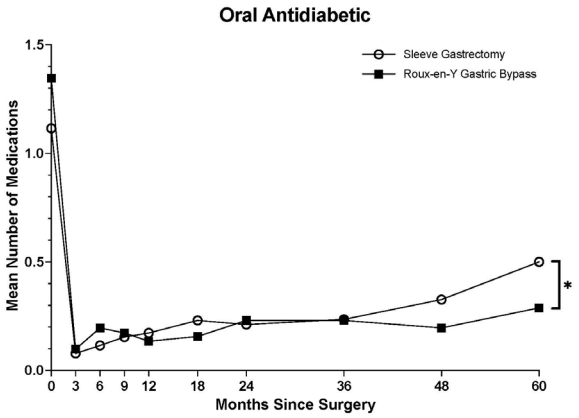
Medication usage among people with obesity

Figure 1: All medication prescriptions following surgery.



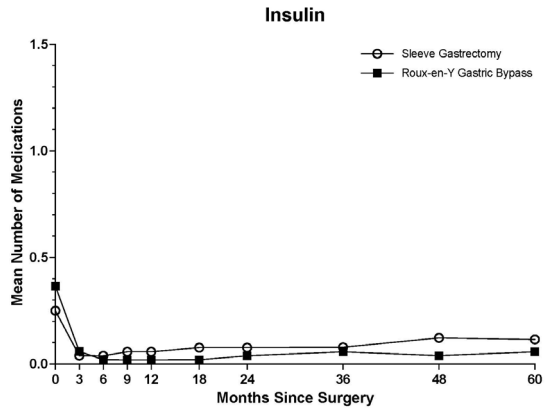
Overall time effect p <0.0001.

Figure 2: Oral anti-diabetic medication prescriptions following surgery.



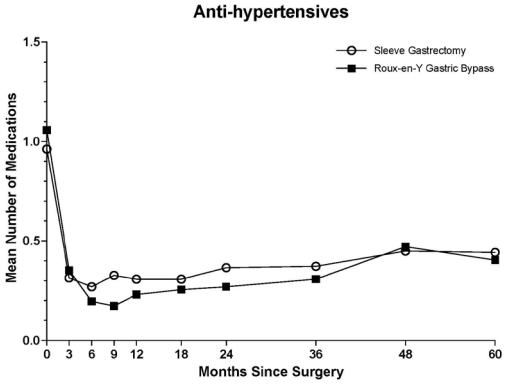
*Surgery group/time interaction p=0.036. Time effects: sleeve gastrectomy, p=0.008; gastric bypass, p=0.0002.

Figure 3: Insulin prescriptions following surgery.



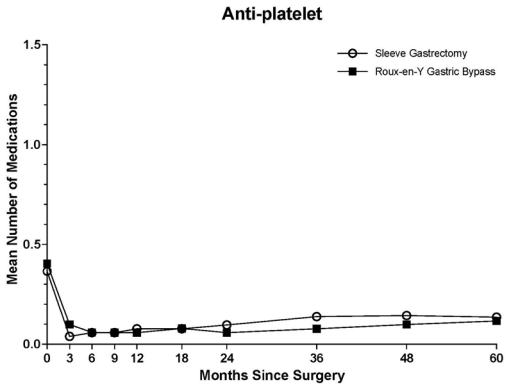
Overall time effect p=0.009.

Figure 4: Anti-hypertensive prescriptions following surgery.



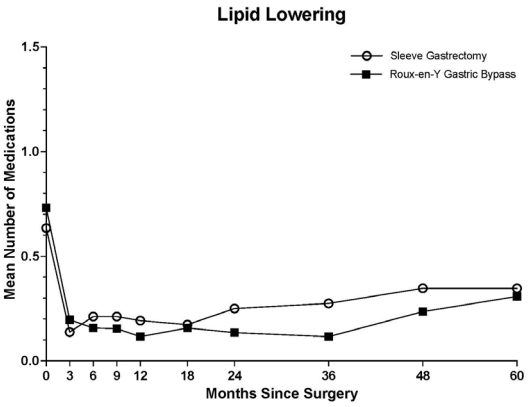
Overall time effect p <0.0001.

Figure 5: Anti-platelet prescriptions following surgery.



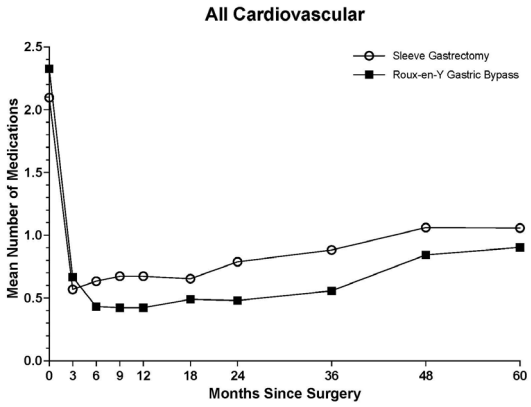
Overall time effect p=0.001.

Figure 6: Lipid-lowering prescriptions following surgery.



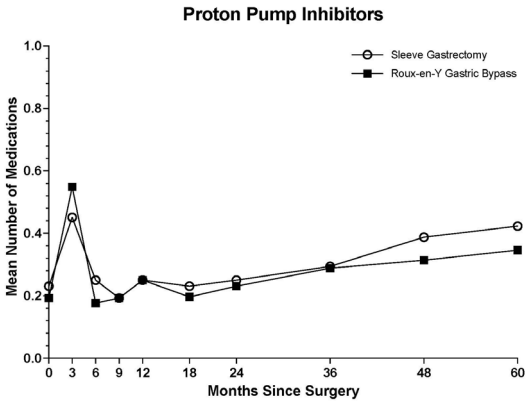
Overall time effect p <0.0001.

Figure 7: All cardiovascular medication prescriptions following surgery.



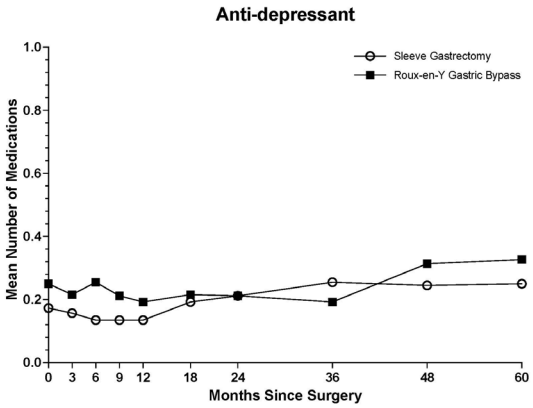
Overall time effect p <0.0001.

Figure 8: Proton-pump inhibitor prescriptions following surgery.



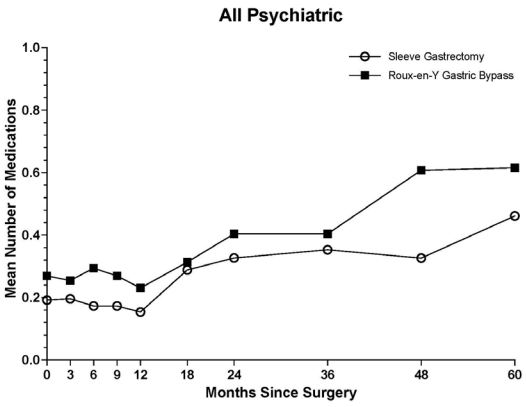
Overall time effect p <0.0001.

Figure 9: Anti-depressant prescriptions following surgery.



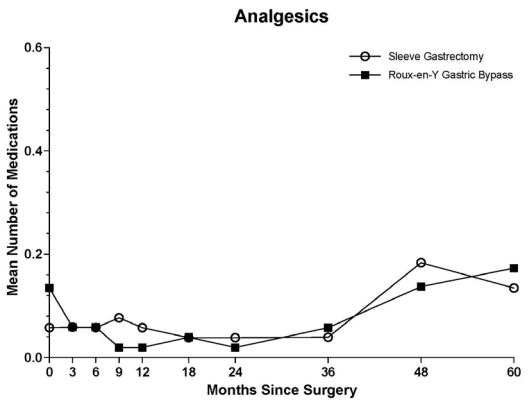
Overall time effect p=0.008.

Figure 10: All psychiatric medication prescriptions following surgery.



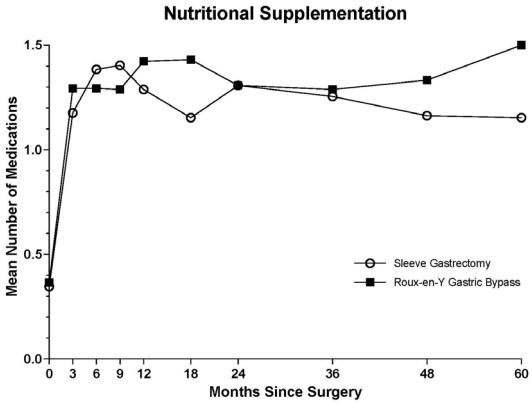
Overall time effect p <0.0001.

Figure 11: Analgesic medication prescriptions following surgery.



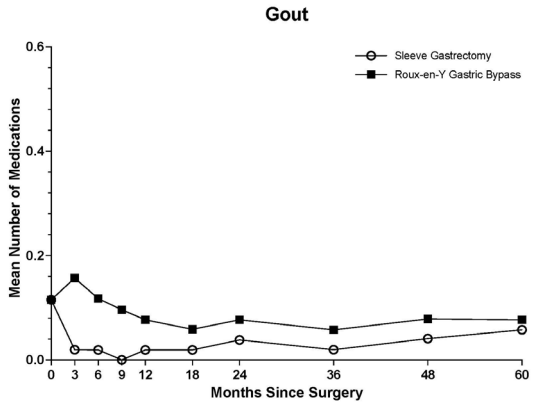
Overall time effect p=0.028.

Figure 12: Nutritional supplementation prescriptions following surgery.



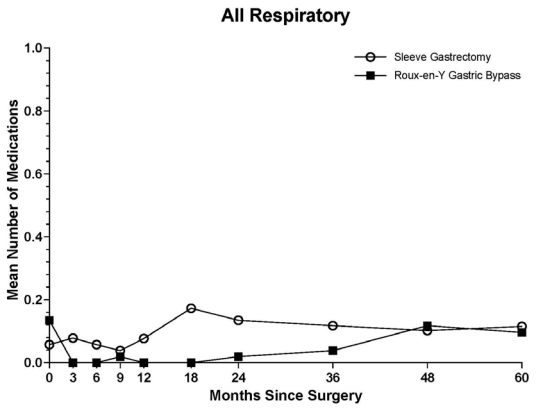
Overall time effect p <0.0001.

Figure 13: Gout medication prescriptions following surgery.



Overall time effect p=0.381.

Figure 14: All respiratory medication prescriptions following surgery.



Overall time effect p=0.081.

and type 2 diabetes changes significantly after both SR-LRYGB and LSG. Immediately post-operatively, total medication prescriptions decreased by 39%. This is largely due to a reduction in anti-diabetic medication (both oral and insulin) and cardiovascular risk-reducing medication (including anti-hypertensives, anti-platelets and lipid-lowering medication) requirements. The reduction in diabetic medication is not surprising given the improvements in glycaemic control that were seen at 1 year[7] and 5 years post-operatively among the same cohort of patients,[6] and the diabetes remission following bariatric surgery that has been shown in meta-analyses.[8] Oral anti-diabetic medication was the only class of medications for which there was a difference between the SR-LRYGB and LSG groups, where there was a higher requirement for oral anti-diabetic medication in those who had LSG compared to SR-LRYGB. However, the trial was powered to detect a difference in diabetes remission, not overall medication differences, and therefore the lack of statistical significance between the two trial groups with regards to medication usage could be related to being underpowered for this purpose.

The reduced requirement for oral anti-diabetic medication at 5 years in the SR-LRYGB compared to LSG suggests a benefit in the SR-LRYGB in terms of diabetic control in accordance with the results from the 5-year analysis of this cohort.[6] The mechanism of action of bariatric surgery on weight and diabetes is complex and multifactorial, and involves changes in gut hormones, bile acids and altered gut microbiota. These changes are possibly more beneficial following the SR-LRYGB compared to the LSG, which could account for the greater reduction in oral anti-diabetic medication usage in the SR-LRYGB group compared to the LSG group.[9] A recent systematic review and meta-analysis comparing LSG with laparoscopic Roux-en-Y gastric bypass revealed a paucity of data from randomised controlled trials to draw long term conclusions,[10] further highlighting the need for more studies in this area.

Cardiovascular medication prescriptions dropped significantly following bariatric surgery and, while rates slowly increased over time, usage rates were approximately half that of pre-operative levels. Overall, there are limited studies on cardiovascular events following bariatric surgery. However, a prospective, non-randomised controlled intervention trial comparing outcomes in obese type 2 diabetics who had bariatric surgery versus a control group who did not have surgery demonstrated a significant reduction in myocardial infarction incidence among the group who had bariatric surgery.[11] Cardiovascular risk after bariatric surgery is likely lower than pre-operatively, although validated risk prediction equations have not been developed for this population on which to base decisions on cardiovascular medication prescribing. It appears that cardiovascular medication usage is reduced on the basis of targeted risk factors (blood pressure, lipids, diabetes) improving.

The dramatic spike in PPI prescriptions immediately post-operatively is attributable to the fact that patients were discharged on a PPI after surgery for protection against ulceration. The reasons for the long-term trend towards increasing PPI prescriptions in both surgical groups are less clear.

Other studies have shown that gastro-oesophageal reflux disease symptoms can be worsened following a sleeve gastrectomy,[12] possibly due to anatomical changes which result in increased pressure within the sleeve. This could explain the increased requirement in the LSG group. For patients in the SR-LRYGB group, potential reasons for increasing PPI requirements include the development of anastomotic ulceration or reflux symptoms that may be attributable to the silastic ring.

Psychiatric medication prescriptions, including anti-depressants, anti-psychotics, sedatives and hypnotics, changed significantly throughout the 5-year follow-up period, with patients taking more than double the number of medications from these classes at 5 years. This was an unexpected finding, as bariatric surgery often results in an improvement in psychological health; a recent review of the long-term effects of bariatric surgery on depression and anxiety suggests that bariatric surgery is associated with long-term reductions in anxiety and depressive symptoms.[13] We would have therefore expected a reduction in the need for psychiatric medications. It is possible that patients may have improved psychiatric symptoms despite an increased requirement for medication, and further studies in this field are needed.

While the absolute number was small, there was an increase in analgesia prescriptions over the 5-year follow-up period following bariatric surgery. This is despite bariatric surgery and subsequent weight loss usually resulting in improvements in pain and physical functioning.[14] While our sample size precluded analysis of analgesic medication use by individual class, other studies have evaluated opioid use before and after bariatric surgery and have found opioid requirements increase after bariatric surgery.[15,16] The authors of those studies suggested that possible reasons for persistent opioid requirement despite weight loss included tolerance to opioids and more pain sensitivity in obese patients, which persists after bariatric surgery.[15]

The dramatic increase in nutritional supplementation after surgery was expected, as all patients were discharged on lifelong multivitamin supplementation to prevent nutritional deficiencies.

Overall, our study has provided an interesting insight into medication changes following SR-LRYGB and LSG, but we do appreciate there are some limitations. First, medication usage is only a surrogate marker for medical comorbidities, and further studies evaluating long-term outcomes following bariatric surgery, especially in the areas of cardiovascular events, psychiatric health and chronic pain would be useful. A further limitation is that of medication compliance, although this issue is not unique to our study. Our analysis was based on prescribed medication, but it is known that patient adherence with prescribed medication is often poor. A large review of medication compliance for the treatment of diabetes, hypertension and dyslipidaemia revealed that only 63% of patients continue with medication beyond 1 year, and patients only take their medication 72% of the time.[17] Finally, our study is further limited by the lack of non-operated controls. Future research would benefit from including such a group for drawing comparisons.

In summary, bariatric surgery is an effective tool for reducing the requirements for diabetic and cardiovascular medication in type 2 diabetic patients with obesity, but results in increased requirements for nutritional supplementation, PPIs, analgesia and psychiatric medication. Respiratory and gout medication usage is unchanged following surgery. The type of operation performed did not affect medication usage except for oral anti-diabetic medication, which had a greater reduction following SR-LRYGB compared to LSG.

COMPETING INTERESTS
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Appendix

Appendix 1: Medication categories.

Category	Examples
Oral anti-diabetic	Alpha-glucosidase inhibitors Biguanide Dipeptidyl peptidase-4 (DPP-4) inhibitors Glucagon-like peptide-1 (GLP-1) receptor agonists Sodium-glucose co-transporter 2 (SGLT-2) inhibitors Sulfonylurea Thiazolidinediones
Psychiatric	Anti-depressants Anti-psychotics Hypnotics Sedatives Stimulants
Analgesics	Anti-convulsant (e.g., gabapentin) Anti-migraine Non-steroidal anti-inflammatory drugs Opiates Paracetamol
Cardiovascular	Anti-anginal Anti-arrhythmic Anti-coagulation Anti-hypertensives Anti-platelets Diuretics Lipid-lowering
Nutritional supplementation	Iron supplementation Multivitamins Vitamin B12 Vitamin D
Gout	Allopurinol Colchicine
Respiratory	Inhalers

Health impacts of war: case studies of New Zealand veterans of the First World War

Nick Wilson, Jennifer A Summers, Christine Clement, George Thomson

ABSTRACT

AIM: Armed conflict remains a tragic feature of the modern world and so it is necessary to continue to study its health impacts. Even the study of historical conflicts is relevant given that certain health impacts are common to most wars e.g., post-traumatic stress disorder (PTSD).

METHODS: This study built on a previous quantitative analysis of a randomly selected group of 200 New Zealand veterans from the First World War (WWI). From this sample we selected 10 cases that illustrated particular themes around morbidity impacts.

RESULTS: The theme of severity of impacts was illustrated with a case who was severely wounded and died from suicide when back in New Zealand, and another case with severe PTSD. The theme of the high frequency of non-fatal conditions was revealed with cases illustrating new diagnoses (a case with n=8 diagnoses), hospitalisations for new conditions (n=6), non-fatal injury events (n=3) and for sexually transmitted infections (n=3). The theme of chronic debility as a consequence of various conditions was illustrated with cases who had suffered from being gassed or having gastroenteritis, malaria or pandemic influenza.

CONCLUSION: These 10 selected cases reiterate how severe and extensive the morbidity burden for military personnel in WWI could be. Also illustrated is how the morbidity could contribute to adverse impacts on some of their lives after returning to New Zealand.

The study of the impacts of war remains a relevant topic given how warfare remains a tragic part of the modern world. As of early 2024, there were major conflicts relating to the Russian invasion of Ukraine, and also one involving Israel in Gaza. One monitoring agency has detailed over 110 armed conflicts around the world: throughout the Middle East and North Africa (over 45), the rest of Africa (over 35), in Asia (21), Europe (7) and Latin America (6).[1]

Different settings and weapons used in various armed conflicts will produce a variety of patterns of harm to the health of the military personnel involved. But some of the health impacts from wars spanning the last 150 years have similarities—including such conditions as post-traumatic stress disorder (PTSD), albeit with variant manifestations.[2,3,4] The conflict in Ukraine even involves trench warfare,[5] which has similarities to the situation in the First World War (WWI).

Recent work has studied the morbidity impacts of WWI on New Zealand veterans.[6] This involved examining the archival military files of a random sample of 200 personnel drawn from all participating personnel. The results showed that these veterans experienced a very high morbidity burden, e.g., 94% had at least one new condition diagnosed during their military service. Furthermore, the relative severity of these conditions was reflected by the high level of hospitalisation (89% at least once, with a mean of 1.8 hospitalisations for new conditions per individual). Indeed, over half of all these personnel (59%) were at some stage deemed no longer fit for military service. The study concluded that "*the overall morbidity burden of this military force in WWI was very high, and much higher than the previous official estimates*". This high burden of morbidity was also compatible with an earlier study of New Zealand soldiers from Central Otago,[7] the burden of influenza in the New Zealand military in 1918,[8] and as described in other work.[9] Nevertheless, this previous study focussed on quantitative analyses and did not illustrate a range of qualitative issues. Therefore, in this current study, a more qualitative approach was taken with the consideration of 10 illustrative cases.

Further key background to New Zealand and WWI includes the estimate of 98,950 military personnel serving overseas and 7,036 serving on home territory in the New Zealand Expeditionary Force (NZEF).[10] An estimated 18.2% of these personnel died during the war and up to the end of 1923.

The official number of personnel wounded or suffering illness was 41,317 (equivalent to 39.0% of all NZEF personnel). As of 31 March 1921, a total of 40,227 veterans had lodged claims for war pensions for war-related disability and 17,612 dependents had also lodged war pension claims (for the period September 1915 to 1921).[11] Of all these claimants, 89% were granted war pensions.

Methods

Cases for this qualitative study were all drawn from previous work involving archival military files on 200 military personnel in the New Zealand military who were involved in WWI.[6] These personnel were a random sample of all participating personnel (albeit with some exemptions[6]). We chose to select illustrative cases along the lines of the following three themes:

- Severity of health outcomes (i.e., overall outcome and for PTSD);
- High frequency of conditions (i.e., new diagnoses; hospitalisations for new conditions; non-fatal injury events; sexually transmitted infections [STIs]);
- Debility as a consequence of various conditions (i.e., after being gassed, having gastroenteritis, malaria or pandemic influenza).

Data collection

The individual-level data primarily came from a publicly available online archive of military files.[12] Key information had been abstracted by the authors for the previous study,[6] but the files on the selected 10 cases were all re-examined for this study (all by at least the first author). Lifespan data were collected via additional genealogical research as previously detailed.[6] War pension data were collected by examining the "War Pension Card Index" (code=6825) held by Archives New Zealand. Additional data that could potentially inform long-term outcomes were searched for using the names of the individuals, e.g., in online legal documents[12] and in online New Zealand electoral rolls.

Ethics statement

Ethical approval for this study was provided through the University of Otago Human Ethics Committee process (Category B Approval, D22/030).

Results

The 10 cases covering the three themes are detailed in the table below. The theme of severity of impacts was illustrated with two cases. One died from suicide after their return to New Zealand with a serious head wound (Case A). The second was a severe case of "shell shock"/PTSD (Case B). The theme of high frequency of conditions was illustrated with a case with multiple new diagnoses (n=8 new diagnoses; Case C), a case of repeated hospitalisations for new conditions (n=6; Case D), a case of repeated non-fatal injury events (n=3; Case E) and one with multiple sexually transmitted infections (n=3; Case F). The theme of chronic debility as a consequence of various conditions was illustrated with cases who had suffered from being gassed (Case G) and having gastroenteritis (Case H), malaria (Case I) and pandemic influenza (Case J).

Discussion

This qualitative study of 10 cases has further illustrated how severe the morbidity burden for military personnel in WWI could be. At the extreme end of the spectrum was premature death from suicide in 1919 (Case A). The cause of this man suffering depression is not precisely known, but it could reflect the collective impact of: i) his permanent facial injuries (with this reason in the official record), ii) having been "left weak and depressed" from pandemic influenza (with these issues mentioned by the Coroner), iii) the deaths of his brothers in 1916 (killed in action) and in 1918 (pandemic influenza), and iv) other possible wider societal factors that were common at the time, e.g., difficulty for veterans obtaining work in the post-war period.

These cases also illustrate the potentially long-term nature of some of the impacts, e.g., from PTSD (Case B) and debility from poisonous gas, gastroenteritis, malaria and pandemic influenza (Cases G to J). Unfortunately, there was limited long-term outcome information on these individuals from the sources we examined, other than occupational/address data from archival sources and lifespan. To better understand these outcomes would probably require very in-depth genealogical research and might not even be feasible in some cases. Even so, we know from other information that some injuries and illnesses among veterans had impacts for many years (see this review[13]), and there is a pattern of

Table 1: Ten cases illustrating aspects of the morbidity experience among New Zealand military veterans of WWI.

Feature/ characteristic	Details
Severity of outcome/condition	
Worst outcome: head wound and then committed suicide when back in New Zealand (Case A)	Case A appeared to have the worst war-related outcome of the sample of 200 personnel. He died from suicide in 1919, with this being officially attributable to his war service given his injuries sustained during the war. In the Battle of the Somme in September 1916 he had suffered shrapnel injuries to the head. As a result of this he developed a permanent one-sided facial paralysis. His treatment involved 3.5 months in three facilities (two hospitals and a convalescent facility). He was discharged as no longer physically fit for war service and arrived back in New Zealand in June 1917. A medical board recommended he get a war pension with an assessment that his "*capacity for earning a full livelihood in the general labour market is lessened by* … ½". Archival data (pension card collection) confirm that he was given a war pension. He died at age 31 years from a self-inflicted gunshot in mid-1919, which was 2 years and 8 months after his injury on the Somme, and 4 years and 5 months after enlistment. The Coroner reported that his suicide was while he was mentally depressed, and that he had suffered from influenza during the epidemic from which he had been left weak and depressed. There were no data identified on his post-war occupational status (his name was not listed in the 1919 Electoral Roll). He was one of three brothers who enlisted for WWI. One was killed in action in 1916 (2 weeks before Case A's own injuries), and the other brother died in the 1918 influenza pandemic.
PTSD example: "shell shock" that was "severe" (Case B)	Of the personnel in the sample who were described as having "shell shock", we identified the case where this was described as "severe", Case B. He was first described as having "shell shock" in July 1916 and was managed by a field ambulance and then a casualty clearing station in France. Following this, he was transferred to a depot at Étaples (a major site for quartering Commonwealth troops and with many hospitals), although it was not clear what he did at the depot (possibly on light duties). But in November 1916 he was admitted to a hospital in France with "old shell shock" and then transferred to a hospital in the United Kingdom (UK). In January 1917 he was transferred to a convalescent facility and classified as "unfit". He was then "invalided" back to New Zealand in a hospital ship, arriving in March 1917. Archival data (pension card collection) indicated he was given a war pension. Electoral roll data indicate he worked as a freezing worker and labourer and had four different residential addresses between 1919 and 1931 with his wife (including in two different regions). After 1931 his residential address was more stable (only two moves). He died at age 84 years in the early 1970s.
High frequency of conditions/hospitalisations	
Highest number of new diagnoses: eight (Case C)	Case C had a total of eight new diagnoses during his more than 4 years of military service (of which he spent 3 years and approximately 5 months overseas). This was the highest number of new diagnoses for any individual in the sample of 200 personnel. He had poor dentition (needing dental attention); had two separate injuries (both gunshot wounds); myalgia (November 1916); influenza (January 1917); pneumonia (December 1917); an STI; and was put on sick leave for a non-specified reason (December 1918). Of these conditions, he was hospitalised for four of them: both the gunshot injuries, the myalgia and the STI. He was "dangerously ill" with pneumonia during one injury-related hospitalisation and was invalided back to New Zealand twice (once after an injury at Gallipoli, Turkey; and then, after returning to service in France, he was declared unfit for military service due to chronic pulmonary disease). Unlike most of the other cases detailed in this table, he did not have a pension card indicating a war pension (based on a search of archival data). Archival data (Police Gazettes) indicate he was involved in two separate criminal offenses during the 1920s, when he was identified as a labourer. He died at age 58 years in the early 1940s.

Table 1 (continued): Ten cases illustrating aspects of the morbidity experience among New Zealand military veterans of WWI.

Feature/ characteristic	Details
Highest number of hospitalisations for new conditions: six (Case D)	Case D had the highest number of hospitalisations for new conditions (six) in the sample of 200 personnel. His first hospitalisation was in "Salonika" (the modern-day city of Thessaloniki, Greece) in February 1916. This was for post-inoculation fever and while the name of the vaccine was not stated, it was probably typhoid vaccine. After recovery he was next "admitted" to a hospital in Moascar (a military camp near Ismailia in Egypt) in April 1916. He was subsequently "discharged" after an unknown period with no stated diagnosis. His third hospitalisation was in September 1916 at a hospital in Amiens (France) for around 2 weeks and with no diagnosis stated. He was discharged but then re-admitted 2 weeks later with pyrexia of unknown origin (PUO), (so we classified these two sequential hospitalisations as probably related to the same diagnosis). His fourth hospitalisation was in January 1917, again to a hospital in Amiens. This was for a sprained ankle and he was discharged after several days. His fifth hospitalisation was to a hospital in Wisques (France) with PUO in November 1918. His sixth hospitalisation was to a ship's hospital in May 1919. This was for several days but with no diagnosis given. Of note was that this individual was in the medical corps, but it was clearly stated that he was "admitted" and then "discharged", as opposed to being placed in a hospital for work purposes. Archival data (pension card collection) indicated he was given a war pension. In post-war legal documents and media reports he was described as a farmer who was involved in a local rifle club and Home Guard. He was married and only had three different residential addresses in the post-war period (electoral roll data). He died at age 79 years in the early 1970s.
Most non-fatal war injury events: three (Case E)	Several cases in the sample had three non-fatal injury events, but only for Case E were these all from gunshot or artillery shells (i.e., the others also involved accidents or being gassed). The first of these was a "GSW head" (a gunshot wound to the head), in August 1915 at Gallipoli, Turkey. He was treated on a hospital ship and then spent nearly 5 weeks at a hospital in Malta. The second injury involved being "sick & blown up by shell" in September 1916. For this he was hospitalised in France for a week. At this time, he was also reported as having a "urethral stricture" that may or may not have been related to this injury event. The third injury event involved gunshot wounds to his left arm and right thigh at Passchendaele (Belgium) in October 1917. These wounds were treated in the field (dressing station/field ambulance) and he returned to duty after a little over 2 weeks. Another health problem during his service was bronchitis, with this involving 3 weeks in a UK hospital (December 1917). It was for this condition that he was discharged from the military as no longer fit and was recommended for a war pension by a medical board. Archival data (pension card collection) confirmed that he was given a war pension. He was listed in electoral rolls as a shepherd and appears to have never been married. He died at age 70 years in a residential facility for war veterans in the mid-1950s.
Highest number of different STI diagnoses: three (Case F)	Case F had three different STI diagnoses, the highest number in the sample of 200 personnel. The first of these was the diagnosis of "gonn", presumably gonorrhoea, in January 1919, with this managed at a casualty clearing station. But several days later he was hospitalised in Étaples, France with "V.D.S.C.", an abbreviation used for the STI of "venereal disease soft chancre". Then, in March 1919, he was admitted to hospital with "V.D.S.", the abbreviation used for syphilis. Other diagnoses that this man had during his military service were trench mouth, scabies (twice) and being hospitalised on the ship voyage back to New Zealand (no diagnosis given). Archival data (pension card collection) indicated his war pension was "declined", without any specific details for this identified. In post-war legal documents he was described as a carpenter and having had a divorce in the 1930s. Electoral roll data indicate three other occupational descriptions (cabinetmaker, labourer and handyman) and six different post-war residential addresses. He spent 1 month in jail in the early 1930s. He died at age 58 years in the mid-1950s.

Table 1 (continued): Ten cases illustrating aspects of the morbidity experience among New Zealand military veterans of WWI.

Feature/ characteristic	Details
Debility associated with various conditions	
Debility as a result of being gassed (Case G)	Of the personnel in the sample who were gassed, the link with subsequent debility was most unambiguous in Case G. He was injured by phosgene gas in Flanders (Belgium) in November 1917, and was managed in a field ambulance and casualty clearing station. But he had a persisting cough and shortness of breath and when hospitalised in March 1918 he was reported as having "severe" debility. A medical board assessment in September 1918 declared that he had breathlessness and permanent debility as a result of the gas poisoning. In May 1918 he left on a ship back to New Zealand and was discharged from the military in September 1918. He was recommended for a war pension with an assessment stating he had a permanent disability and that his "*capacity for earning a full livelihood in the general labour market is lessened by* … ½". Other archival data confirm he was given a war pension (pension card collection). In the post-war period he worked as a farmer and as a grocer, and had three changes of residential address shown in the electoral rolls (along with his wife). He died at age 81 years in the late 1960s.
Debility following gastroenteritis in the Gallipoli Theatre (Case H)	The most unambiguous case of debility following gastroenteritis at Gallipoli (Turkey) was Case H. He was first admitted to a hospital ship at ANZAC Cove (Gallipoli) with tonsillitis in August 1915. But 3 days later, he was also given the diagnosis of gastroenteritis. He was treated in hospital in Cairo (Egypt). Subsequently, he was invalided back to New Zealand on a ship in September 1915. The final medical board assessment in his records in April 1916 noted gastroenteritis with consequent debility with only "slight" progress in recovery. He was recommended for a war pension with an assessment that his "*capacity for earning a full livelihood in the general labour market is lessened by* … ¼". Archival data confirm that he was given a war pension (pension card collection). In post-war documents he was described as a retired butcher, was a Justice of the Peace and stood for the office of mayor. Electoral roll data indicate he also worked as a fruiterer, had a wife, and lived nearly all his post-war life in just one town. He died at age 73 years in the late 1960s.
Debility from malaria (Case I)	Although a number of personnel experienced malaria-related debility, this was most unambiguous for Case I (i.e., he had no other reported conditions that could have contributed to debility). He was diagnosed with "severe" malaria in October 1918 when in the vicinity of Gaza, Palestine. This resulted in him being hospitalised in Heliopolis (Egypt) for 2 weeks, and then he had 2 weeks in a convalescent facility. He was discharged from the military as no longer being fit due to "malarial debility" in March 1919. In total, he had spent only 1 year and 2 months outside of New Zealand. Archival data indicated he was given a war pension (pension card collection). Post-war documentation and electoral roll data suggest he worked as a coal miner, farmer and labourer, and was married. He appears to have had only two different residential addresses after WWI. He died at age 58 years in the mid-1950s.
Debility following likely pandemic influenza (Case J)	Several of the military personnel in the sample had a diagnosis of "debility" following influenza infection—but only Case J had this at a time that would fit with pandemic influenza in late 1918. That is, in mid-December 1918 he was diagnosed with "influenza" and hospitalised at Outreau (France). In mid-January 1919 he was transferred to a hospital in the UK for a week and then to a convalescent facility. A medical board assessment in late January described him as having "debility following influenza" with a minimum recovery time of 3 months. He left by ship to New Zealand in March 1919 and he had a normal discharge from the military in May 1919 (i.e., with no further mention of his health status). A search of archival data (pension card collection) found no pension card, suggestive that he was not given a war pension. In post-war archival documents and electoral rolls, his occupation was "salesman". He had three different post-war addresses and appeared to have never married. He died at age 70 years in the early 1950s.

premature death among these New Zealand veterans of WWI.[14,15] Similarly, an Australian study found higher mortality after 1921 for particular WWI veterans (e.g., those who were discharged as medically unfit),[16] and research has also shown that exposure to mustard gas in WWI was associated with increased risk of lung cancer death.[17]

Case C had a total of eight new diagnoses, with these spanning injuries (two separate occasions of gunshot wounds), three different infections, poor dental health and two poorly defined conditions. This high tally reflects typical exposure to hazards on the battlefield and to unsanitary and crowded living conditions for many WWI personnel. Many of these health problems could have been prevented with knowledge available at the time and better planning and resourcing, e.g., in terms of injury prevention,[18] food quality[19] and preventing diseases associated with crowding.[20,21] The approach to preventing STIs by military authorities was also initially problematic, but it did improve over the course of the war.[22,23]

This study drew its 10 cases from a relatively small (n=200) random sample out of the total of 105,986[10] New Zealand military personnel serving in WWI. As such, it is likely that some cases in the total military force would have suffered even more severe morbidity or even more extensive multi-morbidity than the cases considered here.

The limitations of the data used in this type of study have been discussed elsewhere, along with an inter-observer reliability assessment of data from these military files.[6] But these 10 cases also directly illustrate some of the limitations. For example, there were sometimes vague and unclear diagnoses (e.g., "myalgia" experienced by Case C or the lack of a diagnosis for two of the hospitalisations for Case D). Also, it is possible that with the different STI diagnoses for Case F, there could have been an incorrect provisional diagnosis that was not subsequently changed in the records before another diagnosis was obtained shortly afterwards. Furthermore, the "PUO" experienced by Case D in November 1918 and the "sick leave" experienced by Case C in December 1918 could well have been from pandemic influenza.

Conclusions

These 10 selected cases reiterate how severe and extensive the morbidity burden for military personnel in WWI could be. Also illustrated is how the morbidity could contribute to adverse impacts on some of their lives after returning to New Zealand.

COMPETING INTERESTS
Nil.

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Management of chronic kidney disease for Māori in Aotearoa New Zealand: a summary of clinical practice guidelines

Curtis Walker, Susan Reid, Carla White, Merryn Jones, Lee-ora Lusis, Rachael C Walker, John Collins, Helen Rodenburg, David Tunnicliffe, Suetonia C Green

ABSTRACT

AIMS: The kaupapa of the Caring for Australians and New Zealanders with Kidney Impairment (CARI) *Clinical practice guidelines for management of chronic kidney disease for Māori in Aotearoa New Zealand* is to provide whānau-centred and evidence-based recommendations to healthcare systems, healthcare providers and healthcare workers. The guidelines include screening, identification, management and system-level responses to chronic kidney disease (CKD) to deliver best practice care to Māori affected by CKD across community, primary and secondary services.

METHODS: The guidelines are funded by the Ministry of Health – Manatū Hauora and are written by a panel of Māori and non-Māori clinicians and literacy experts across Aotearoa New Zealand from Kaupapa Māori organisations, general practice and nephrology units using standardised methods. The guidelines' methodology included consultation with whānau Māori with lived experience of CKD and primary and secondary care practitioners. Additional guideline development would be required to inform management of CKD for non-Māori in Aotearoa New Zealand.

RESULTS: The guidelines provide recommendations about equity, governance and accountability, cultural safety, case management, information systems, social determinants of equity and wellbeing and screening.

CONCLUSIONS: Recommendations to health services for Māori with CKD are based on giving effect to Te Tiriti o Waitangi and best practice care to prevent CKD, delaying its progression, treating kidney failure through timely transplantation, delivering in community and providing high-quality symptom management.

Guidelines

Honoa te pito ora ki te pito mate

Recommendations for health systems and health services

Equity

We recommend that health systems and providers prioritise actions to achieve equitable outcomes in kidney health for whānau Māori.

Strong recommendation. Evidence: pai (good).

We recommend that health systems and providers advance equity in kidney health through the collection, reporting, monitoring and use of high-quality, Māori-centred data over time to inform quality improvement.

Strong recommendation. Evidence: āhua pai (moderate).

Governance and accountability

We recommend that health systems and providers include Māori leadership and governance and hold providers accountable for healthcare quality.

Strong recommendation. Evidence: pai (good).

Cultural safety

We recommend that health systems and providers ensure that cultural safety is a key aspect of workforce training and professional development to ensure that culturally safe care is delivered to whānau Māori.

Strong recommendation. Evidence: pai (good).

Case management

We recommend that health systems and providers of services for Māori with or at risk of chronic kidney disease (CKD) are led in primary care or Kaupapa Māori services providing case management and support throughout the patient journey.

Strong recommendation. Evidence: pai (good).

Information systems

We suggest that health systems and providers of care for Māori with or at risk of CKD are supported by a unified, integrated information and referral system.

Strong recommendation. Evidence: āhua pai (moderate).

Social determinants of equity and wellbeing

We recommend that health systems and services for Māori with or at risk of CKD partner with organisations to address social determinants of risk factors for kidney health, such as justice, housing, education and poverty.

Strong recommendation. Evidence: āhua pai (moderate).

Screening

We recommend that health systems and providers calculate 5-year cardiovascular disease risk using the New Zealand Primary Prevention Equation, including urine albumin to creatinine ratio and estimated glomerular filtration rate for all tāne Māori (men) aged 30 years or older, wāhine Māori (women) aged 40 years or older and all Māori with diabetes from diagnosis.

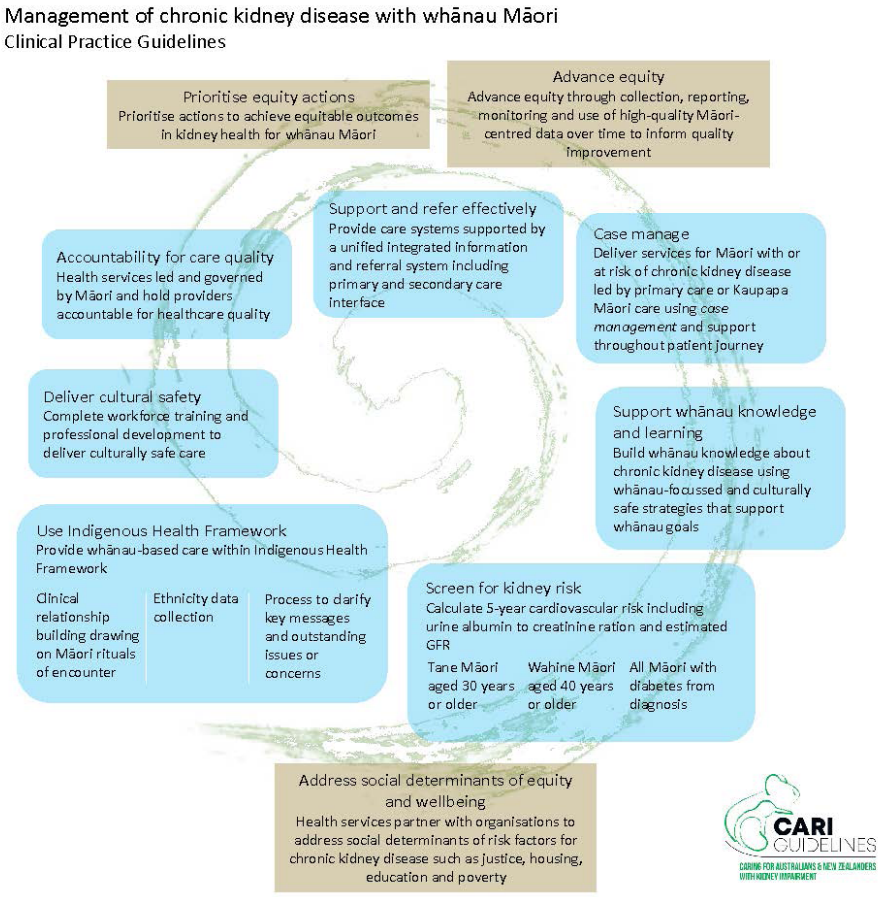
Strong recommendation. Evidence: āhua pai (moderate).

Recommendations for clinicians and health service providers

Clinical assessment framework

We recommend that individual providers of care to Māori with or at risk of CKD provide whānau-based care within an Indigenous Health Framework. This includes the importance of respect and reciprocation within the clinical relationship-building process that draws on Māori rituals of encounter, the importance of ethnicity data collection and a process to clarify key messages

Figure 1: Summary of *Clinical practice guidelines for management of chronic kidney disease for Māori in Aotearoa New Zealand.*



and identify outstanding issues or concerns.

Strong recommendation. Evidence: pai (good).

Whānau knowledge and learning

We recommend that individual providers of care to Māori with or at risk for CKD build whānau knowledge about CKD and health issues that contribute to using learning strategies that are whānau-focussed and culturally safe to support whānau goals.

Strong recommendation. Evidence: pai (good).

Context

CKD affects one in nine adults, and costs 1% of the annual health budget in Aotearoa New Zealand.[1,2] There is substantial inequity in delivery of health services and outcomes for CKD that has been documented over decades.[3] NZ European patients are three times less likely to commence dialysis for advanced CKD and have one-third of the risk of requiring dialysis care due to diabetes than Māori.[4] In addition, NZ European patients are four times more likely than Māori to receive a kidney transplant and more likely to have a transplant as their first treatment for advanced CKD.[5]

The purpose of these clinical practice guidelines is to assist health providers in making decisions about the management of CKD affecting Māori.[6] This guideline is intended to inform policy, service development and design and treatment protocols, specifically to improve healthcare delivery for CKD for Māori. The guideline has a focus on the earlier stages of CKD. These guidelines use a strengths-based approach and focus on interventions at a health services and health provider level.

Guidelines review

There has been no previous clinical practice guideline for CKD management for Māori. The guidelines were identified as a priority topic by the CARI Guidelines Steering Committee in consultation with clinicians in Aotearoa New Zealand. A guideline working group was then formed.

Consultation

The topics in these guidelines were identified as important by Māori patients and whānau who attended one of four hui facilitated by SR and CW in Hawke's Bay, South Auckland and Kerikeri. Both are experienced focus group facilitators with extensive knowledge of Te Ao Māori. The transcripts were analysed inductively into major topics related to clinical care. Nephrologists and nephrologists in training and primary care clinicians met separately at two meetings with members of the guideline working group (SG and Carmel Gregan-Ford) to determine provider-led expectations for the scope of the guidelines.

Consultation with whānau Māori with lived experience of CKD provided a clear mandate to generate the guidelines to inform delivery of best practice care. Whānau described not being told how they developed kidney disease or that blood pressure and diabetes were risk factors for kidney disease. They described missed opportunities when seeking healthcare to build their knowledge about CKD and ways to prevent or delay its progression. Whānau described care as lacking continuity and untimely. They experienced a lack of relationship building with clinicians and uncertainty about where to access trustworthy information. Whānau described being blamed for having their condition and wanted to experience shared decision-making within a trusted therapeutic relationship. Most whānau did not recall discussions about kidney transplantation until after commencing dialysis. Whānau described many examples where a reasonable standard of care was not provided due to poor delivery of primary care, poorly coordinated care services and insufficient time to have face-to-face discussions with health workers.

Primary and secondary healthcare clinicians indicated that the guidelines should be focussed on primary care, to enable care that supports equitable outcomes, and to address issues of relevance to policy and practice change.

Guideline development group

The guideline development group includes Māori and non-Māori health literacy experts and practicing clinicians from Kaupapa Māori, primary and secondary healthcare organisations, including the authors of this paper (CW, SR, CW, MJ, LL, RW, JC, HR, DT, SG). The guideline development was discussed with the Ministry of Health – Manatū Hauora, which provided funding to support consultation with whānau to conceptualise the core topics of the practice guidelines.

Methodology

Principles

The two key principles on which healthcare services for Māori with CKD are based on were:

- Giving effect to Te Tiriti o Waitangi guarantee of tino rangatiratanga—autonomy, self-determination, sovereignty, self-government—to enact the principle of partnership, the principle of active protection, the principle of equity and the principle of options.
- Best practice care that prevents CKD, prevents or delays progression of CKD, cures or treats kidney failure through timely transplantation, is delivered in the community and provides high-quality symptom-based care.

Pou

The guidelines are grounded by four pou (pillars), as considered collectively by the guideline writing panel (Figure 2). These pou are drawn from mātauranga shared by whānau Māori during guideline development and form the underlying aspirations of safe and effective healthcare expressed within the guideline recommendations.

Development of guidelines

A key aspect of these guidelines was to ensure Māori community engagement over whānau Māori experiences of CKD and the health system's response. This was undertaken in accordance with partnership, participation and to inform options.

This guideline was developed using the CARI guidelines development manual.[7]

The CARI guidelines development includes:

- Defining scope and priority topics
- Retrieving evidence
- Assessment of evidence with synthesis
- Formulating recommendations
- Planning implementation of the guidelines

Evidence review

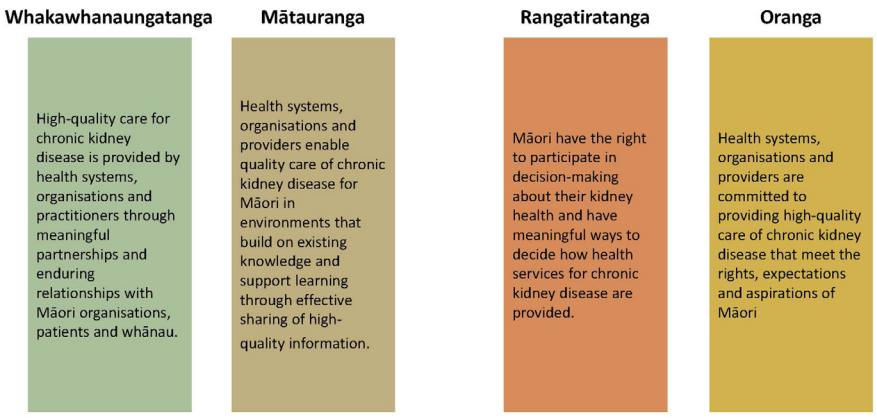
Evidence reviews were carried out following community consultation hui to address:

- Equity
- Governance and accountability
- Cultural safety
- Case management
- Information systems
- Social determinants of health and equity
- Screening and awareness of CKD
- Models of care
- Knowledge and learning

Identification and retrieval of evidence

We first conducted an electronic literature search in MEDLINE, nzresearch.org and Google Scholar without a language or date restriction. We used keyword search terms, including "Māori", "Indigenous", "First Nations", "Aboriginal and Torres Strait Islander", "Native" and "Oceanian". We combined these terms with keyword search terms related to health and knowledge, including "mātauranga", "ōranga", "health outcomes", "equity" and "critical". We did not use search terms for a particular study design or publication type. We searched the reference lists of retrieved publications to identify additional eligible studies. We reviewed the retrieved citations by title and abstract to identify potentially eligible data. The full text of potentially included studies was then examined to adjudicate study eligibility. The flow of information during the literature search is

Figure 2: Guideline pou underpinning the development of the clinical practice guidelines drawn from mātauranga shared by whānau Māori during the guideline process.



shown in the online guideline publication.[6]

We included reports, articles and publications that were peer-reviewed and reported data for the management of CKD and risk factors for CKD, including cardiovascular risk factors, smoking, physical movement, nutrition, lipid abnormalities, cardiovascular disease and diabetes and pre-diabetes (any type). We included systematic reviews, scoping reviews, narrative reviews based on empirical evidence, government and non-governmental reports and policies, randomised controlled trials, cohort and cross-sectional studies, and qualitative and survey data.

We considered studies to be eligible if they reported data for the management of long-term conditions, including CKD, diabetes, hypertension, cardiovascular disease and risk factors for CKD. We included studies involving Indigenous peoples in any region or location. We considered any health-related role as eligible, including health systems, health providers, health services, health professionals, clinicians, patients and whānau. We also considered non-health settings, including education and justice. Studies proved eligible if they reported models of care or health services improvement or reform, equity approaches, or care quality and determinants of inequity, including racism, marginalisation and colonisation.

Evidence synthesis

Information in the available eligible studies was extracted line-by-line and grouped according to the evidence review topics. Data were tabulated and reviewed by the guidelines group to identify core concepts and evidence related to clinical outcomes and clinical practice management. The concepts and related evidence were triangulated among the guidelines group during several online video hui and two kanohi-ki-te-kanohi hui in Auckland and Wellington conducted with the guidelines expert team from the CARI office.

Evidence grading

Each guideline recommendation includes the strength of the recommendation and the certainty of the evidence on which the recommendation is made.[8] Evaluation of the evidence certainty underpinning these guideline recommendations is based on an appraisal of the quality of the underlying research, using an Indigenous Quality Appraisal Tool, combined with whether contributing studies were consistent in their findings, and provided evidence directly relevant to clinical management for Māori patients and whānau.[9]

The evidence certainty was adjudicated as:

- **Pai (good)** when the underlying research was conducted aligning to best practices when involving Māori, was consistent across studies and involved evidence from research conducted with Māori.
- **Āhua pai (moderate)** when the research was less well aligned to best practices when involving Māori, or findings were not consistent, or studies were not conducted involving Māori.
- **Whekowheko (poor/weak)** when the research was less well aligned to best practices when involving Māori, *and* findings were not consistent *and* studies were not conducted involving Māori.

The strength of the recommendation (strong or conditional) considered the balance between benefits and harms, evidence certainty and applicability to Māori health and wellbeing. A strong recommendation is based on the quality of the evidence, a lack of evidence of important harms and a judgement about whether translation of the evidence into practice will improve Māori health and wellbeing. A strong recommendation indicates that most stakeholders would make the same choice as the suggested guideline action. A conditional recommendation indicates that most stakeholders would make the same choice as the guideline action, but a substantial minority would not.

Peer review

The draft guidelines were extensively peer reviewed by a Māori Public Health physician and a nephrology Nurse Specialist.

Presentation

The guidelines are presented categorised into the core topics identified during the consultation process and based on analysis of a systematic review of the electronic literature. The CARI guidelines encourage the inclusion of the findings into clinical pathways, health policies and health system design and development.

Dissemination plan

The guidelines are publicly available on the CARI website and are available for inclusion in Health Pathways.[6] The guidelines will be

published in the *New Zealand Medical Journal* and presented to the New Zealand Nephrology Group of the Australian and New Zealand Society of Nephrology and the Renal Society of Australasia. The guidelines will be disseminated via the Kidney Health New Zealand website and to primary care via other communication channels. The guidelines will be available to whānau Māori through local renal units and patient newsletters through an animated video of the results.

Implementation

Guideline implementation will be monitored through CKD outcomes as measured in the clinical quality registry for treated advanced CKD in Aotearoa New Zealand.[3]

Definition

CKD is defined as a structural abnormality or evidence of an estimated glomerular filtration rate below 60mL/min per 1.73m^2 of body surface area and/or abnormal urinary sediment, including red cells, white cells, or albuminuria or proteinuria occurring on at least two occasions in the previous 3 months.[10] Advanced CKD is an estimated glomerular filtration rate of 15mL/min per 1.73m^2 or treatment with kidney transplantation or dialysis.

COMPETING INTERESTS
Nil. Funding from Manatū Hauora Ministry of Health.

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Navigating challenges: insights into chronic kidney disease care in South Auckland

Kalpa Jayanatha, Viliami Tutone, David Voss, Jamie Kendrick-Jones, Fakaola Otuafi, Fortune Ngwenya, Nogi Eiao, Rachel Spence, Andrew Hill

ABSTRACT

The burden of chronic kidney disease is increasing throughout New Zealand, resulting in growing strain on patients, families and the healthcare system. The population of South Auckland is the most diverse in New Zealand and it is particularly vulnerable to the effects of chronic kidney disease due to its demography and its many communities that endure significant hardships. This article explores the prevailing challenges identified by renal physicians and nurse specialists over 35 years of caring for patients with chronic kidney disease in South Auckland.

The resident population of South Auckland was estimated to be 567,000 in 2018, representing 11% of New Zealand's population.[1] South Auckland is ethnically diverse, with 16% of the population identifying as Māori, 22% as Pacific, 28% as Asian and 34% as New Zealand European or Other.[1] The Pacific and Māori populations residing in South Auckland are the largest and the second largest respectively in New Zealand.[1] The population of South Auckland is also young, with 66% of peoples aged between 15 and 64 years and 23% of peoples aged 14 years or younger, compared to 65.1% and 15.1% respectively for the total New Zealand population.[1]

The epidemiology of end-stage kidney disease (ESKD) requiring renal replacement therapy (RRT) is well understood in New Zealand as a result of robust registry data; however, less is known about the regional variation in chronic kidney disease (CKD). The prevalence of CKD in Samoan peoples living in Auckland is estimated between 15.9% to 33.4%; however, data regarding the wider population of South Auckland are less robust.[2] The peoples of South Auckland also face a number of challenges in receiving care for CKD in both primary and secondary care. The purpose of this article is to outline common challenges identified by renal physicians and nurse specialists over 35 years of caring for patients with CKD in South Auckland.

Low socio-economic status has been associated with more rapid progression of CKD, unplanned RRT commencement, lower probability of pre-emptive renal transplantation and increased mortality.[3,4] The peoples of South Auckland endure significant socio-economic hardships, with 37% of its population residing in the most deprived New Zealand Index of Deprivation 2018 [NZDep2018] quintile and 49% of people aged 15 years or older have an annual income of NZ$30,000 or less, compared to the national average of NZ$105,000.[1] Residence within the most deprived NZDep2018 quintile of South Auckland disproportionately affects Pacific peoples (78%) and Māori (58%).[1]

South Auckland faces significant challenges related to housing. Compared to the national average, it has twice the prevalence of multifamily households—approximately 14% of households accommodate two families, while 2% house three or more families.[1] Additionally, an estimated 22% of residents in South Auckland live in crowded or severely crowded households.[1] These housing conditions may exacerbate income and food insecurity. Food insecurity is further perpetuated by the fact that the most socially deprived areas in South Auckland are essentially food deserts.[5–7] These areas lack access to nutritious, affordable food options and instead offer calorie-dense, low-nutrient and expensive foods, which have been linked to the progression of traditional risk factors for CKD progression, including obesity, diabetes mellitus and hypertension.[5–7]

Patients with CKD in South Auckland often highlight lack of transport as a significant barrier to accessing both primary and secondary care, which may adversely impact patient engagement

and contribute to suboptimal outcomes.[8] Notably, the most economically active family members often serve as the primary transportation providers for both younger and older family members in South Auckland. Furthermore, public transport coverage in the most socially deprived wards of South Auckland exhibits suboptimal frequency, high costs and uneven geographical distribution, disproportionately impacting Māori and Pacific communities.[8] Functional decline often occurs in advanced CKD and this, coupled with visual impairment from diabetic or hypertensive retinopathy, complicates the safe transfer in and out of either private or public transport. CKD thus has a bidirectional effect on both income security and transportation, leading to secondary consequences for the broader family.[4,8]

Patients with CKD in South Auckland are also more likely to reside in temporary or transitional housing, which are associated with suboptimal living conditions, chronic illness and hospitalisation.[9] Some patients reside in garages or makeshift annexes; their housing situation remains largely unquantified. Furthermore, suboptimal housing is often an insurmountable obstacle to performing home-based RRT; the provision of which would otherwise confer better quality of life, maintenance of employment and higher probability of renal transplantation.[10] In the aftermath of the pandemic, income insecurity has significantly affected the capacity and outreach of numerous community organisations in South Auckland. As a consequence, services available to patients living with advanced CKD—such as home assistance, social support and access to food banks—are experiencing significant strain.

There are disparities in educational achievement in South Auckland with 21.3% of school leavers not attaining a qualification in 2022 compared with the national average of 13.0%, and only 23.9% achieving university entrance compared to 39% for New Zealand as a whole.[11] The relationship between level of education, self-management, CKD, multimorbidity and mortality is complex, particularly given the long lag time from development of risk factors to the occurrence of ill health.[12,13] Based on clinical experience in South Auckland, low health literacy is a central feature of suboptimal management of metabolic comorbidities, limited engagement with primary or secondary care and non-concordance with medications.

Low health literacy contributes to both delayed diagnosis of CKD and its progression.[12] Low health literacy in advanced CKD is associated with an increased risk of complications, including renal anaemia, volume overload, acid-base disturbances, electrolyte abnormalities, CKD mineral and bone disorder, infection and hospitalisation. Nevertheless, robust evidence indicates that health literacy can be enhanced through targeted educational programmes. Additionally, self-management interventions have the potential to improve knowledge, self-efficacy, quality of life and even mortality rates.[12] Based on local experience, community-based pre-dialysis education sessions have led to decreased complications in advanced CKD and increased planned initiation of RRT. Furthermore, these sessions have encouraged family members to attend primary care for metabolic screening.

Patient experience evaluations suggest that these group education sessions are both appropriate to, and well received by, pre-dialysis patients in South Auckland. Pre-dialysis patients, however, account for a relatively small proportion of all patients with CKD in South Auckland; addressing the larger need requires engagement and resourcing of the education, public health and primary care systems. While there is some debate about the optimal form of CKD education, given the detrimental impact of metabolic risk factors on CKD and the long lag time to ill health, a multifaceted strategy is necessary.[12] This strategy should include school-based education, community group initiatives and self-management strategies within primary care to address a broad range of topics, including CKD awareness, metabolic syndrome, diet and exercise.

Patients who are non-English speakers, or for whom English is a second language, encounter substantial challenges when navigating the health pathways between primary and secondary care. This issue seems to disproportionately impact Pacific patients.[13–15] Although access to interpretation services in secondary care is improving, there remain significant staffing constraints that result in some Pacific, Middle Eastern and Asian communities having access to a limited pool of clinical interpreters. Some patients have raised concerns about perceived risks to confidentiality, particularly if they hold prominent positions within their community, while others have reported selectively withholding sensitive information.

Interpreting via family members is an alternative that is avoided where practicable

due to issues including untrained medical language skills, lack of neutrality, emotional bias and difficulty sharing bad news.[15] Regardless of language proficiency, involvement of family is often essential for Māori, Pacific and Asian patients with CKD to understand, engage in and manage their condition.[16] Based on clinical experience, it is considered best practice to proactively involve the patient's family, facilitated by the designated family spokesperson(s), when navigating complex decisions for patients with CKD.[13,16] These decisions may include selecting the most suitable RRT modality, opting for best supportive care or contemplating treatment withdrawal.[17]

Another frequently encountered cultural issue in the management of CKD in South Auckland is whakamā (a noun referring to shame or embarrassment, or verb referring to being ashamed, bashful or embarrassed).[18] While whakamā is predominantly described by Māori and Pacific individuals, patients of Asian heritage have also reported experiencing something similar. In clinical practice, whakamā may manifest as subtle psychological changes or confounding behaviours, including self-stigmatisation, fear of judgment, social isolation and avoidance.[18] It may be a confounding cause for variable patient engagement. The detection of whakamā necessitates that clinicians practise and maintain a high standard of cultural awareness, competency, sensitivity and humility in the face of clinical inertia and health system pressures.[18,19] Moreover, fostering a long-term patient–clinician relationship may alleviate the distress associated with whakamā.[18]

Both the demand for CKD care and the case complexity of CKD have increased significantly in South Auckland over the past three decades. This trend coincides with substantial population growth, the pervasive obesity–diabetes epidemic and an ageing population.[1,2,20] Patients with CKD in South Auckland frequently describe difficulty in accessing primary care appointments, which is due to a long-standing shortage of general practitioners and, latterly, increased demand following the pandemic period.[21,22] While existing health pathways offer guidance for managing patients with CKD in primary care, the practical adoption and implementation of this guidance remain uncertain.[20,23–25] Factors such as rising case complexity, clinical inertia, varying patient engagement and challenges in maintaining longitudinal follow-up within the primary care context may contribute to this uncertainty.[1,20,23–27]

There has been a parallel growth of wait lists for secondary renal care, which has been exacerbated by increasing demand following the pandemic period.[27] The prioritisation of first specialist assessment appointments, a key performance indicator (KPI), typically takes precedence over follow-up appointments, which may contribute to more fragmented longitudinal management of patients with advanced or complicated CKD.[27] This is further compounded by the increased time and resources required to troubleshoot interacting multimorbidity, which now burdens the majority of patients with advanced CKD in South Auckland.[24] Accordingly, the issues of access may not only mitigate the clinical synergies of longitudinal management in, but may also precipitate variable engagement with, secondary care.

The lack of clinical, administrative and information technology integration between primary care, secondary care, community pharmacies and social services exacerbates the challenges faced by patients with CKD in South Auckland.[25,28] The timely communication of treatment plans, referrals and medication changes is essential for the management of CKD; however, the experience of patients in South Auckland is often more fragmented, which leads to medication complexity, suboptimal engagement and missed opportunities for holistic care.[29]

Patients with CKD also face the burden of multiple primary care, secondary care and allied health appointments for interrelated conditions. There is also the potential for duplication of work and blurring of the lines of care coordination between primary and secondary care.[29] It is also not currently possible to address clinically significant KPIs in real time. These issues result in suboptimal outcomes, such as fewer than two thirds of patients with diabetes in the Auckland Metro area meeting guideline targets for HbA_{1c} (61%), systolic blood pressure (59%) and primary prevention of cardiovascular disease (54%).[20]

In summary, the peoples of South Auckland encounter multiple challenges—both within and outside the health system—when seeking care for CKD. There are several possible adjustments within the health system that may enhance both patient experience and outcomes. First, provision of out-of-hours renal clinics may help address issues of engagement relating to either employment or transport. Second, multidisciplinary renal clinics, where patients receive sequential reviews from a nephrologist, a nurse specialist, a dietitian and possibly a psychologist, have the

potential to streamline care and improve engagement for those with advanced CKD.

Third, localities-based integration of the secondary renal service into primary care may result in synergies, including early detection and management of CKD, fostering of collaborative care and potentially reducing referrals to secondary care. Community pharmacies are uniquely placed to provide medication education and guidance, which are often reinforced by their long-term relationships with patients and families. Thus, fourth, fostering collaboration between primary care, secondary care and community pharmacies—with a particular emphasis on monitoring medication dispensation frequency—could be used to facilitate hypertension and diabetes management and promote patient engagement.

Fifth, there is a clear need for enhanced health promotion and prevention relating to obesity, diabetes and hypertension in South Auckland. Considering the significant impact of CKD, it may be prudent to integrate health promotion and prevention initiatives into the education system. Furthermore, these efforts should also be delegated to community groups, including churches and maraes, which are important in the day-to-day lives of most families in South Auckland. There is also a role for self-management interventions in primary and secondary care, which have been shown to increase self-efficacy and quality of life.[12]

Sixth, addressing the long-standing systemic issue of the primary care workforce in South Auckland will not only enhance outcomes for patients with CKD, but may also yield cost efficiencies by preventing morbidity and optimising the utilisation of secondary care services. There are additional opportunities for improvement beyond the health system that would benefit the people of South Auckland living with CKD. Expansion of the public transport system will likely address some aspects of access and patient engagement. This includes expanding the availability and frequency of health shuttle services in Māngere, Manurewa and Ōtara.

In addition, there is a pressing need to expand the availability of affordable housing in South Auckland. This expansion will help alleviate the social and health challenges linked to temporary housing, transitional housing and homelessness. This is supported by evidence that stable housing may improve healthcare engagement, reduce hospitalisations and improve survival.[30] Regulatory initiatives are required to encourage supermarkets to establish a presence, expand and actively compete in low socio-economic communities like Māngere, Manurewa and Ōtara. This approach is essential for addressing health challenges related to food deserts and may play an important role in safeguarding future generations of children from the impact of metabolic syndrome.

In summary, the need and case complexity of patients with CKD in South Auckland has increased significantly over the past 35 years. These have been perpetuated by factors including changes in demographics (increasing population, obesity–diabetes epidemic and ageing), socio-economic instability (income inequality, housing, transportation and nutrition) and healthcare provision (resourcing, staffing and service integration). Despite these challenges, there is scope to improve the quality of care for patients with CKD in South Auckland. Adequate resourcing and adjustment of standard care are required to improve access to, and flexibility of, primary and secondary care in the near term. Long-term structural changes are required within and outside of the health system to both address the increasing demand for CKD care in South Auckland and safeguard future generations from developing CKD.

COMPETING INTERESTS
Nil.

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Chronic traumatic encephalopathy—the first neuropathological report in New Zealand

Fen-Lan Cherry Chang, Richard LM Faull, Maurice A Curtis, Andrew M Chancellor, Michael E Buckland, Clinton P Turner

Chronic traumatic encephalopathy (CTE) is a neurodegenerative condition characterised by the abnormal accumulation of hyperphosphorylated tau protein within the cerebral cortex. We describe the first neuropathological report of CTE from New Zealand.

Case report

The decedent, a New Zealand European male, died in 2021 aged 79 years. He played rugby from 9 years of age and participated in high school boxing and rugby league. He represented New Zealand in rugby league during the 1960s and early 1970s before retiring in his late 30s. He sustained multiple "minor" head knocks (one resulting in hospitalisation). At age 64 he was diagnosed with Parkinson's disease by a neurologist based on motor features, and was prescribed L-dopa. At age 70 neuropsychiatric aspects including cognitive difficulties, apathy and low mood had emerged. Dementia developed over the latter part of his life, requiring hospital-level care. His brain was donated to the Neurological Foundation Human Brain Bank.

At neuropathological examination, the formalin-fixed brain weighed 1,142g. There was widespread cortical atrophy, most noticeable frontally, and a pale substantia nigra. Histological examination confirmed brainstem, limbic and neocortical/diffuse Lewy body disease[1] consistent with Parkinson's disease (Figure 1). There was cortical and sub-cortical beta-amyloid deposition (Thal phase 3)[1] with type 2 cerebral amyloid angiopathy (CAA).[2] Additional neuropathologic findings included: hippocampal sclerosis with hippocampal TDP-43-positive inclusions; medial temporal lobe tau-positive neurofibrillary tangles (NFTs) and neuropil threads (Braak stage II)[1] (Figure 1); and patchy changes of age-related tau astrogliopathy (ARTAG)[3] (Figure 2).

In addition, perivascular tau-positive NFTs were visible in the depths of several sulci in the occipital cortex and inferior parietal lobule consistent with the lesion of CTE (red arrow, Figure 2). NFTs were visible in the bank and crest of adjacent gyri and superficial cortical laminae. NFTs were also present within the hippocampus (CA1 and CA4), amygdala, thalamus and dentate nucleus, consistent with high-stage CTE.[4,5]

Final neuropathologic diagnoses of neocortical Lewy body disease, high-stage CTE, low-level Alzheimer-disease neuropathologic change (NIA-AA score A2 B1 C1), stage 2 limbic age-related TDP-43 encephalopathy (LATE-NC),[6] ARTAG and type 2 CAA were rendered.

Discussion

CTE is defined pathologically by perivascular neuronal hyperphosphorylated tau aggregates, with or without astrocytes, in the depths of cortical sulci in the cerebral cortex.[4] The only recognised cause of CTE is prior exposure to repetitive head impacts (RHI) such as that due to participation in contact sports or military service.[4] Determining the prevalence of CTE is difficult. CTE rates of 9–31.8% in contact sport participants have been reported in brain bank cohorts.[7,8] Extended exposure to RHI increases the risk of CTE.[9]

"Traumatic encephalopathy syndrome" has been applied when CTE is suspected during life based on relevant history and a non-specific neuropsychiatric syndrome of irritability, impulsivity, depression and memory decline.[4] With advancing disease, gait and speech abnormalities, parkinsonism and frank dementia typically emerge. In our patient, the parkinsonism, with early cognitive and neuropsychiatric manifestations, was most likely due to a combination of the Lewy body disease and CTE.

The older an individual with dementia, the less likely a single pathology is responsible. As in this case, comorbid neuropathologic processes

Figure 1: Summary of neuropathological changes in the brain: a) Lewy body in a pigmented neuron of locus coeruleus (blue arrow; haematoxylin and eosin stain, scale bar=50µm); b) alpha-synuclein immunohistochemistry showing cortical Lewy bodies in the middle frontal gyrus (scale bar=100µm); c) beta-amyloid immunohistochemistry showing amyloid plaques in the middle temporal gyrus with overlying amyloid angiopathy (blue arrow; scale bar=500µm); d) tau (AT8) immunohistochemistry showing a high density of neuropil threads and neurofibrillary tangles in the transentorhinal cortex (scale bar=50µm); e) marked neuronal loss and gliosis within CA1 of the hippocampus consistent with hippocampal sclerosis (blue arrow; scale bar=200µm); and f) phosphorylated TDP-43 immunohistochemistry showing neuronal cytoplasmic inclusions within the dentate gyrus of the hippocampus (scale bar=50µm).

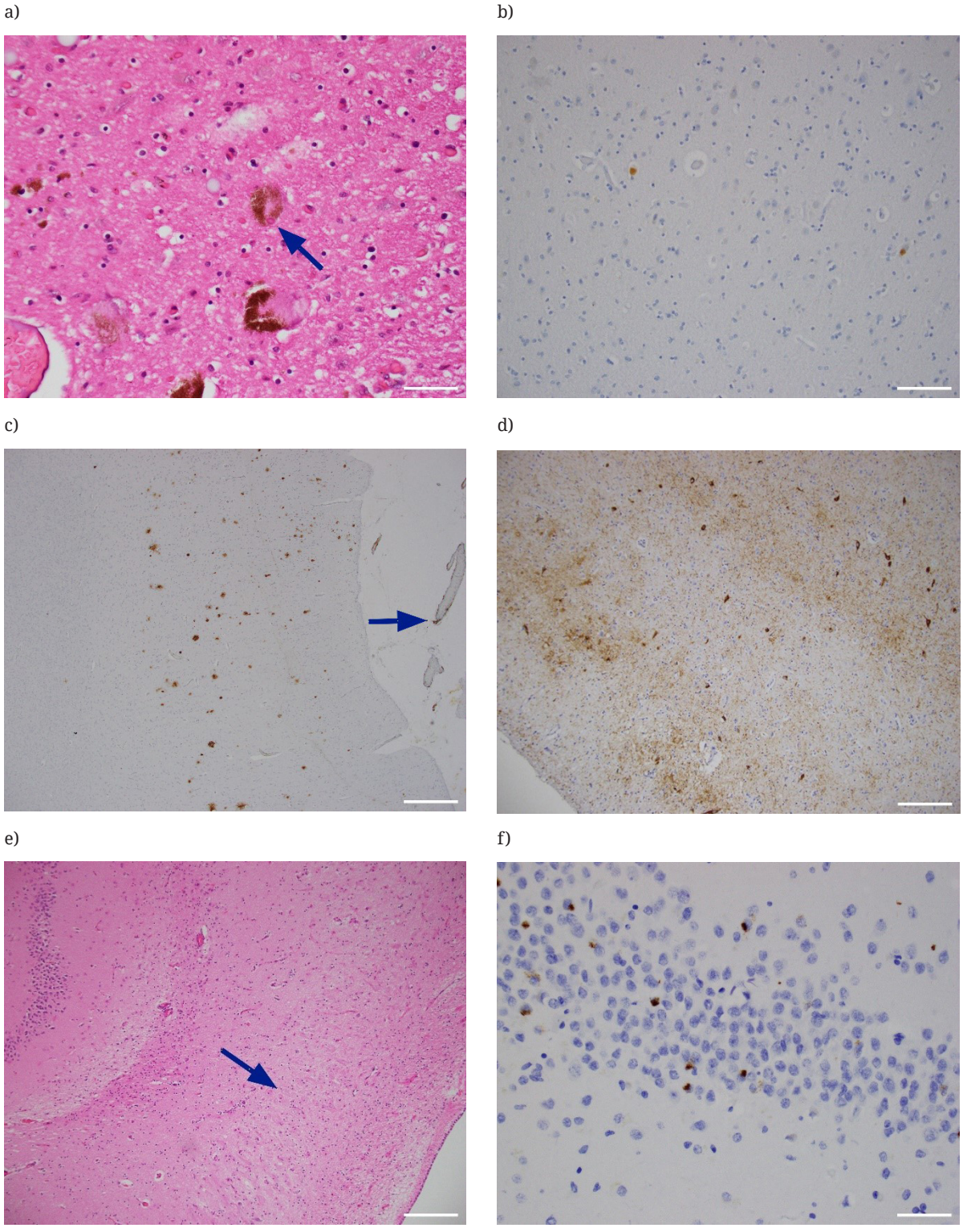
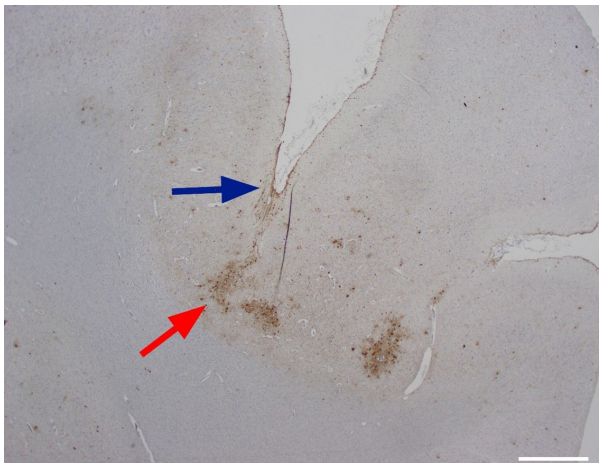
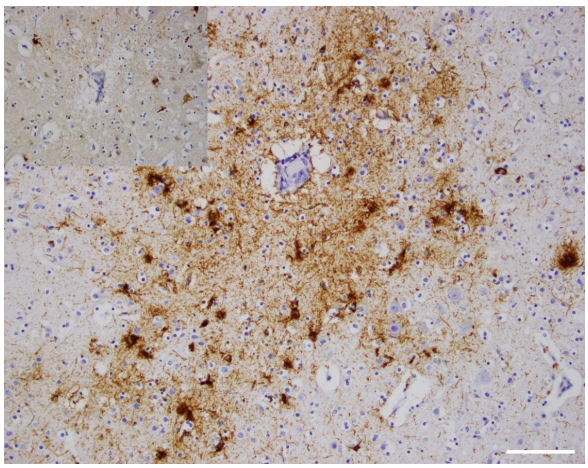


Figure 2: a) Tau (AT8) immunohistochemistry showing deep sulcal perivascular tau consistent with CTE (red arrow) in the inferior parietal lobule. Subpial astrocytic tau pathology consistent with ARTAG (blue arrow) is also present (scale bar=1mm); b) higher power view of the neuronal and glial tau pathology around a deep sulcal vessel in the inferior parietal lobule (scale bar=50µm). Inset 3R tau immunohistochemistry highlights the perivascular tau neurofibrillary tangles; c) tau (AT8) immunohistochemistry showing dendritic neuronal swellings in CA4 of the hippocampus (scale bar=50µm).

a)



b)



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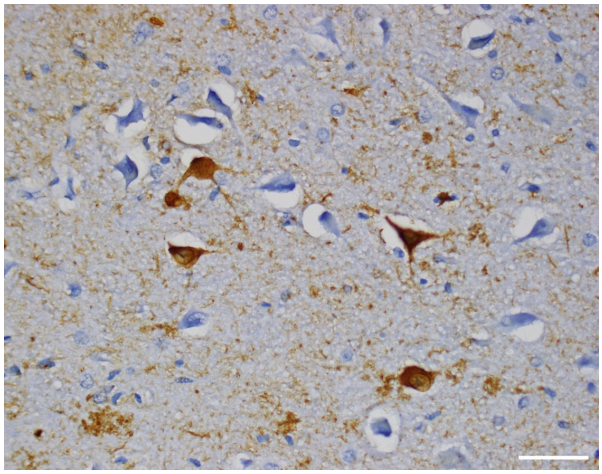

(e.g., Alzheimer's disease and Lewy body pathology) are described in conjunction with CTE.[10] The relative contribution of the multiple neurodegenerative pathologies to the clinical picture in our case cannot be stated with confidence and no pathological criteria exist to make this distinction. CTE may develop in early adult life, when such confounding variables are less likely.[9]

CTE should be considered in any individual at risk of RHI and may be seen in conjunction with other neuropathologic processes. Postmortem examination is the only way to definitively diagnose CTE—and should be considered in any individual with neuropsychiatric features and a history of RHI.

COMPETING INTERESTS
Nil.

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Preimplantation diagnosis and embryo selection in a patient with severe hereditary coproporphyria

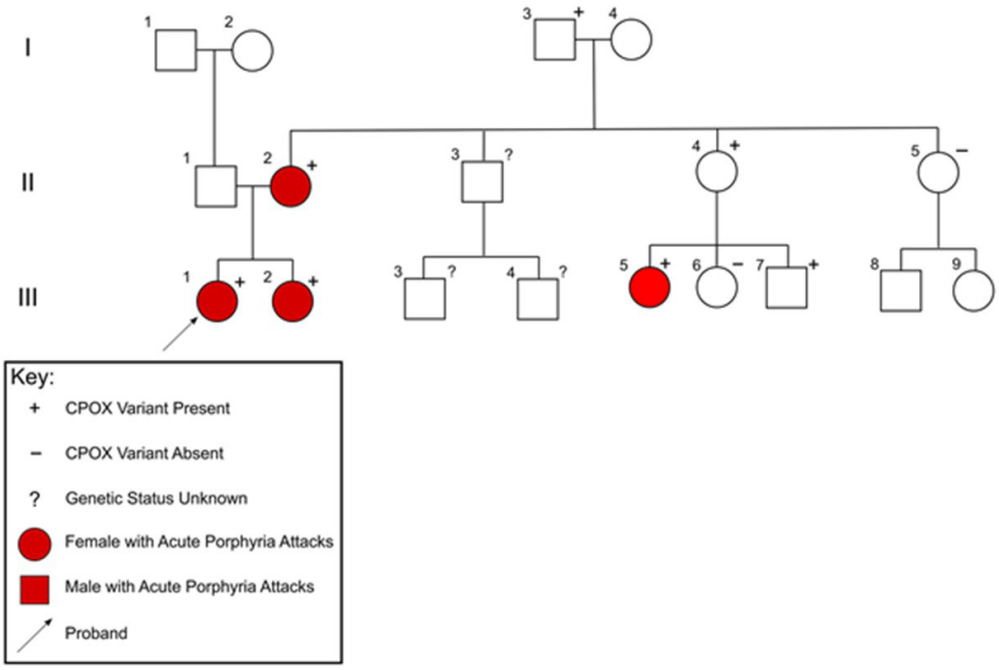
Gisela A Kristono, Leigh Searle, Cindy Towns

Hereditary coproporphyria (HCP) is the rarest of the three autosomal dominant, acute porphyrias.[1] These metabolic disorders of haem synthesis typically have low penetrance and, even when penetrant, a limited impact on patients' health and quality of life.[1–3] Given the low impact of the condition, pre-implantation genetic testing for monogenetic disorder (PGT-M), a process that enables embryo selection to avoid passing on significantly debilitating genes,[4] is not common practice in this condition. However, we have identified a family with HCP with high penetrance, recurrent attacks and significant complications (Figure 1).[5] We present the first member of this family to undergo PGT-M to avoid passing the gene variant to subsequent generations.

Case report

A 27-year-old female first presented in 2012 with abdominal pain of unclear cause. In 2017, following the identification of HCP in her maternal cousin,[6] she underwent genetic testing and was also revealed to carry the novel missense variant in the coproporphyrinogen oxidase (CPOX) gene, c.863T>G(p.Leu288Trp).[5] She has had a total of 31 hospital presentations with abdominal symptoms that have since been attributed to HCP. Presentations with positive urinary porphobilinogen (PBG) tests were treated with intravenous haem arginate via central or peripherally inserted central catheter (PICC) lines. Other presentations with pain flares and negative PBG tests were treated with supportive care.

Figure 1: Pedigree with coproporphyrinogen oxidase (CPOX) variant c.863T>G(p.Leu288Trp).



The pedigree for this patient's family, adapted from Towns et al. (2022).[5] The patient discussed in this case is III 5.

She has had a number of hospital-associated complications including three episodes of venous thromboembolism (VTE)—which occurred despite the haem arginate being administrated via a central or PICC line—and a PICC-associated *Staphylococcus aureus* bacteraemia. She also developed opioid dependence secondary to pain from her HCP flares and underwent an opioid-weaning regime with buprenorphine/naloxone and input from pain specialists.[7] Her long-term pain, recurrent hospitalisations and complications have had significant impacts on her mental health and ability to engage in education and regular employment.

She started having discussions regarding family planning with her health professionals in 2021. She wanted a child but did not want to pass on her CPOX mutation. She had a previous unplanned pregnancy (during which she had no HCP-related symptoms) that resulted in an elective termination. For this planned pregnancy, she was referred for pre-conception counselling regarding management of porphyria in pregnancy with an obstetrician and fertility specialist. She also had input from a porphyria specialist, genetic counsellor and haematologist. Collectively, the patient and her specialists agreed to *in vitro* fertilisation (IVF) with PGT-M.

In terms of specific treatment, this patient underwent a standard antagonist protocol using folitropin alpha for ovarian stimulation. She recieved luteal phase oestrogen pre-treatment with oestradiol valerate 2mg twice daily beginning in the mid-luteal phase. This was prior to the onset of menses when ovarian stimulation was commenced. A gondatrophin-releasing hormone antagonist was started on day 5 of ovarian stimulation and ovulation was triggered with human chorionic gonadotrophin. Blastocysts were biopsied on day 5 and 6 post-fertilisation. She then underwent a thawed embryo transfer of an unaffected embryo using oestradiol valerate 2mg three times daily for 17 days, then following a scan to check endometrial development micronised progesterone pessaries were commenced 200mg three times daily. Both of these medications were continued until 10 weeks gestation. As this patient had a history of VTE in the past, prophylactic enoxaparin 40mg daily was given during oestrogen treatment and throughout pregnancy.

The patient completed her pregnancy without any HCP-related flares and successfully delivered her baby vaginally. The only complication she had during labour was a postpartum haemorrhage of 3 litres due to uterine atony from retained placental fragments. This was managed with removal of the retained remnants, Bakri balloon and four units of transfused red blood cells. Her trough haemoglobin level was 80g/L and the level increased to 97g/L on discharge from hospital (3 days post-delivery). Urine PBG (analysed via a rapid qualitative screen) was negative on days 2 and 3 following delivery. The patient was discharged with a 6-week course of enoxaparin for VTE prophylaxis. The patient has remained well and has the ongoing support of primary care and psychology as needed, as well as a porphyria specialist.

Discussion

This is the first case report to document the use of PGT-M in acute porphyria. We believe this reflects genuine low use of assisted reproductive technology in this genetic disorder. There are a number of reasons for this related to both the condition and the procedure. First, with regard to the condition itself, the three acute porphyrias are characterised by low penetrance. Estimates predict that fewer than 10% of those carrying the mutation will present with symptoms, while increasingly complex whole exome sequencing suggests this could be as low as 1%.[2,8] Second, when acute attacks occur they seldom become recurrent or severe.[8] Third, acute attacks often have triggers—e.g., alcohol, caloric deprivation, smoking and hormonal fluctuations—that can be avoided or managed.[1] Hence, although porphyria is a genetic condition amenable to PGT-M, it would be inappropriate to consider PGT-M as clinically indicated for routine practice, especially when considering the risk and cost of PGT-M.

Although PGT-M is a relatively safe process, it is not without risks. There is an estimated <1% risk of misdiagnosis and selecting an embryo that actually carries the gene mutation.[4] Most reports have not found increased risk of blastocyst degeneration after biopsy; however, there is a small chance of unsuccessful thawing of vitrified blastocysts of <5%.[9] Similar to other assisted reproductive technology, there is a 1.5% chance of monozygotic twins being formed, and an increased risk of perinatal mortality if multiple embryos are transferred.[4] IVF is also thought to be porphyrinogenic and may trigger a porphyria flare.[10] However, a case series by Vassiliou et al. reported no porphyria flares in nine diagnosed women who received IVF treatment, although only one out of the nine cases

Table 1: Hospitalisation costs for porphyria-related admissions in New Zealand.

Case*	Total number of porphyria-related hospitalisations	Total cost (NZD)
III 5	31	$209,754
III 2	59	$766,545
III 1	10	$69,351

The total cost in New Zealand dollars (NZD) for three patients' hospitalisations associated with porphyria flares or related complications (in written correspondence from M Purves, January and June 2023).
*Case III 5 is the patient discussed in this case report, and Cases III 1 and III 2 are cousins of Case III 5, who have previously been discussed in another publication.[5]

were reported to have severe porphyria attacks.[10]

In New Zealand, there are strict criteria for receiving PGT-M. For familial single-gene disorders, PGT-M can only be applied if there is evidence that a family member has the disorder, that there is at least a 25% chance of the disorder being passed onto the child, and that this disorder is likely to significantly affect the child's future quality of life.[11] The cost of PGT-M in New Zealand (including feasibility testing, IVF, genetic testing for HCP and embryo transfer) is estimated at around NZ$20,000 per cycle.[12]

Given the usual clinical course of acute porphyria and the risks and costs of PGT-M, the question is whether PGT-M can be clinically and ethically justified in this patient. We believe the history of this patient, alongside the experiences of the other family members with the condition, provide clear justification.[5] Despite the involvement of a porphyria specialist and long-term attempts to avoid triggers, this patient has had numerous hospital admissions with severe pain and both medical and psychosocial complications subsequent to that. Her experience is also not isolated among her family members. Women from families with inherited mutations associated with acute porphyrias have previously been shown to have a much higher penetrance than the estimated penetrance in the general population (up to 50% compared with 1%, respectively).[13,14] This particular family has a variant with an estimated penetrance of 71% and significant resulting morbidity.[5] The only known curative treatment for acute hepatic porphyria, currently, is liver transplantation.[1] Although the small interfering ribonucleic acid (siRNA) molecule, Givosiran, has shown promising biochemical and clinical response,[15,16] it does not represent a cure and may well be prohibitively expensive, particularly with the limited budget for purchasing publicly funded medications that is given to New Zealand's Pharmaceutical Management Agency.[17]

From an ethical perspective, avoiding the possibility of similar clinical experiences in subsequent generations would align with the principles of beneficence and non-maleficence.[18] However, demand frequently outstrips supply, particularly in a public health system. With the cost of the reproductive technology being used, consideration should be given to the just or reasonable allocation of resources. The costs of not only the hospitalisation of this patient, but also the costs attributable to the admissions of other family members, are summarised in Table 1. The patient's (Case III 5 below) hospitalisation costs over the past 11 years have been estimated at 10-fold the cost for PGT-M, at NZ$209,754 (in an email from M Purves [Mike.Purves@ccdhb.org.nz] January and June 2023).

Financially, these figures demonstrate a significant burden to New Zealand's healthcare system to date. The cost of admission to an intensive care unit (a disproportionate amount for Case III 1)[5] may be avoided in the future due to disease knowledge and early recognition of acute attacks. There is also some uncertainty regarding penetrance or severity of future carriers. However, the experience of this family is that acute attacks and hospitalisation cannot be avoided even with education and knowledge. The cost–benefit analysis, even from a solely financial perspective, provides justification for decreasing the frequency of this mutation in subsequent generations.

In conclusion, although we do not consider routine use of PGT-M in the acute porphyrias to be indicated, the procedure should be considered in cohorts with high penetrance, recurrent attacks and/or complications. In this patient, PGT-M is clinically and ethically justified and may also reduce the overall downstream costs to the health system.

COMPETING INTERESTS
Dr CT is a member of the Medical Advisory Board of the Australia Porphyria Association. Dr LS is a shareholder of Fertility Associates New Zealand. Dr GK is an Advisory Board Member of the *New Zealand Medical Student Journal*, which is independent from the *New Zealand Medical Journal*. The authors have no other conflict of interest to declare. No specific funding from public, commercial or not-for-profit sectors was obtained in regard to this manuscript. Written informed consent was obtained from the patient prior to publication of this case report.

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Spiritual Healing.

NZMJ, 1924.

Some aspects of healing in relation to the Christian religion, with especial references to the new psychology and what has become known as spiritual healing, were traversed by Canon Percival James, in a sermon in St. Mary's Cathedral, Auckland. The service had been specially arranged in connection with the Medical Conference, the President, Mr. Carrick Robertson, and many delegates attending. There was a very large congregation.

It was an historical fact, said Canon James, that the force which had most powerfully developed and guided the movement of medical and surgical science had been the Christian religion. Christianity had given to the doctor's calling its dignity and sacredness, and had been the motive of that unselfish service which was the noble tradition of the profession. Christianity built the hospitals. And the nursing profession—perhaps the noblest that women could enter—had its origin in the self-dedication of holy women to the service of the Lord Christ.

The fulfilment of God's promise of "gifts of healing in one Spirit" was to be found to-day in the patient labour and the beneficent skill of those who brought the resources of science to the relief of human suffering. The triumph of Christianity over disease began with the dawn of the age of science, when men gained a new conception of faith in God that He meant them to "work out their own salvation"; not to fall down in dread of advancing disease, beseeching God to have mercy, but to co-operate intelligently with God's ways of ordering the world.

A PERIOD OF SUPERSTITION.

"In the slow and painful advance of medical science toward freedom of inquiry and practice, the sternest struggle has ever been against superstition, which is equally the enemy of true religion," continued Canon James. "History shows that the periods of great wars have always been favourable to the growth of superstition. Beginning early in the war with the notorious fiction of the 'Angels of Mons,' there has been evident in the last decade a widespread and amazing credulity and appetite for superstition.

"This temper has tended to mar the usefulness of a really great movement within the Church—popularly known as 'spiritual healing.' Rash and irresponsible fanatics have tried to mix up the movement with magic; and this is the more deplorable since the movement itself is most salutary—recalling the attention of Christians to the value of religion as a healing power, and rescuing this function from the neglect of which the Church has been guilty."

LAMBETH COMMITTEE'S REPORT.

The Lambeth Committee of 1920 requested the Archbishop of Canterbury to appoint a committee to give guidance to the Church as to "spiritual means of healing," said the preacher, and a strong committee of clergymen, representative of all shades of opinion, and of leading English medical men, had been engaged in prolonged investigation and deliberation. It had recently issued a report, which would be welcomed by all thoughtful who had the interests of the Church at heart.

Not the least valuable was the negative side of the report:—"Our committee has so far found no evidence of any case of healing which cannot be paralleled by similar cures wrought by pyscho-therapy without religion, and by instances of spontaneous healing, which often occur even in the gravest cases in ordinary medical practice. No sick person must look to the clergyman to do what it is the physician's or the surgeon's duty to do." Such authoritative utterances ought to put an end to a language about "miracles of healing," which is in conflict alike with the truth of science and the interests of religion.

MENTAL HEALING.

Speaking of the remarkable discoveries of the new psychology, and their effect upon the healing art, the Canon declared that the doctor could now "minister to a mind diseased." Psycho-therapy, though in its practical application hardly out of the experimental stage, was quickly taking its place among the methods of healing employed by the trained physician.

In the future the physician would find a potent auxiliary ready to work in close and loyal co-operation—the minister of religion. It was largely the clergyman's work. There was no question of the clergy becoming "dabbling amateurs" in a most perilous enterprise, in which they would be

a terrible menace to their patients. The Church was alive to the need, and was determined to furnish skilled men, learned in such studies as the psychology of religion, and particularly in moral theology, and prepared by a thorough training, discipline, and apprenticeship to become competent "physicians of the soul."

The greatest medical psychologists recognised that the religious instinct was a fundamental characteristic of man, and acclaimed the immense health-giving and health-restoring power of religion. Men were moving slowly, but surely, toward a working agreement between the two great professions, which joined in their labour for the relief of human suffering.—*Auckland Herald.*

Proceedings of the Pain Society ASM 2024

"It doesn't define me": a reflexive thematic analysis of people living well with Complex regional pain syndrome

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INTRODUCTION

Complex regional pain syndrome (CRPS) is a rare but debilitating condition. CRPS symptoms can vary from highly distressing to mild, with individuals maintaining employment and leading meaningful lives. The perspectives of people with CRPS are rarely explored, with most attention paid to the difficulties and shortcomings of healthcare and society. To our knowledge, no study has attempted to understand how people learn to live well despite experiencing long-term CRPS.

AIMS

To understand how individuals with long-term CRPS live well despite their pain.

METHODS

Data from in-depth interviews were analysed using a reflexive thematic analysis. Participants were New Zealand-based, diagnosed with CRPS (type I or II) >12 months ago and self-identified as "living well" with CRPS.

RESULTS

Three overarching themes were identified from the thematic analysis: 1) making sense of an unknown threat, 2) addressing the threat, and 3) accommodating a new life. Experiencing CRPS disrupted participants' sense of self through physical limitations, loss of independence, alteration in self-image, and withdrawal from meaningful occupations. Participants engaged in a sensemaking process facilitated by a diagnosis and specialist care, allowing them to address the multifaceted threat posed by CRPS. Rebuilding a new life post-CRPS required adjustment and accommodation. Participants recognised they needed to let go of their pre-CRPS lives and recalibrate their foundational values.

CONCLUSIONS

"Living well with CRPS" was about understanding, adjusting and accommodating to maintain engagement in values-based actions.

A meta-epidemiological study on the reported treatment effect of pregabalin in neuropathic pain trials over time

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INTRODUCTION

Pregabalin is a drug used to treat neuropathic pain, and its use has increased substantially since 2007. Early trials found a strong treatment effect on pain for post-herpetic neuralgia and diabetic neuropathy. However, more recent studies have failed to replicate these results.

AIMS

This meta-epidemiological study aimed to assess change in the reported effectiveness of pregabalin in neuropathic pain trials over time, and if a change is present, determine any associated factors.

METHODS

We performed electronic searches for published trials in Medline, Embase and Cochrane Central Register of Controlled Trials databases, and unpublished trials on ClinicalTrials.gov, the EU Clinical Trials Register and the Australian New Zealand Clinical Trials Registry with no restrictions. Included randomised, placebo-controlled trials of pregabalin for treatment of neuropathic pain in adults. Two authors independently extracted study data: sample size and mean baseline, end-point and change in pain scores with measures of variance, trial end year, publication year, clinical indication, funding source, country of study, treatment duration, treatment dose, mean age and percentage male. We defined treatment effect as the mean difference in pain scores between pregabalin and placebo groups at trial end-point and assessed for change over time using a random-effects meta-regression, adjusted for sample size, indication, treatment duration (weeks) and treatment dose.

RESULTS

We included 38 randomised published trials (9,038 participants) and found between 2003 and 2020, the reported treatment effect of pregabalin decreased by 0.4 points (95% CI: 0.3 to 0.6; p<0.001)

on an 11-point pain scale per 5-year interval, from 1.3 points (95% CI: 1.0 to 1.5) in trials conducted in 2001–2005, to 0.3 (95% CI: -0.1 to 0.7) in trials conducted in 2016–2020. The reported treatment effect was lower than the minimal clinically important difference (MCID) of 1.7 points across all time periods, doses and most indications, and was not found to be associated with study characteristics.

CONCLUSIONS

The reported treatment effect or analgesic efficacy of pregabalin from clinical trials has diminished over time. Clinical recommendations may need to be re-evaluated to account for recent evidence and to consider whether pregabalin therapy is indicated.

Curiosity with patient: a hermeneutical analysis of pain, context and care

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INTRODUCTION

When engaging in acts of care with people living with pain, the range of issues clinicians and clients have to deal with are bewilderingly complex, constantly throwing up new questions and possibilities. A natural curiosity, then, is a necessary prerequisite for any skilled, mature clinician. Most theories of curiosity emphasise the acquisition of information, and chronic pain is commonly understood in biomedical terms, with contemporary pain self-management fostering a positivist approach, and, through the acquisition of skills and strategies, proposes recovery.[1]

AIMS

To demonstrate the interconnected nature of curiosity and how fostering a curiosity with context can reconcile the delivery of care.

METHODS

I present a hermeneutical analysis of pain self-management literature and argue the style of curiosity is currently constrained by normative (biomedical, behavioural and biomechanical) healthcare practices. This affects how care is delivered in pain management programmes.

RESULTS

In pain management, the dominant delivery of strategies adopts a positivist approach focussing on normative (biomedical, behavioural and biomechanical) practice. In essence, pain management practices are underpinned by an acquisition of knowledge, a curiosity that is constrained and instructed by predominant models of care. Through an analysis of historical and philosophical texts, it is proposed that curiosity is multiple beyond a singular drive to acquire knowledge.[2] Curiosity can be referred to as a relational practice to cultivate new ways of delivering pain care otherwise.

CONCLUSIONS

Curiosity is a necessary skill in pain self-management and complements acts of pain care more broadly, yet it can become constrained by predominant normative practices. This presentation proposes that curiosity is less of a skill and more of a relational process. It can cultivate new ways to deliver care that liberates the needs of individuals living with persistent pain.

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Helping medical students gain confidence and competence for chronic pain and other persistent somatic symptoms: research, training workshops and a basket of resources ("Te Kete")

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INTRODUCTION

Many patients present to primary care with persistent somatic symptoms (PSS) including chronic pain, functional neurological symptoms, irritable bowel syndrome, tension headaches, chronic fatigue and so on, many of which are associated with stigma and negative medical bias.

AIMS

Medical student knowledge acquisition and skills related to these conditions has not been explored in Aotearoa.

METHODS

Eleven focus groups were conducted with final year medical students at Otago Medical School (OMS), and 10 interviews were conducted with clinical or teaching staff. Data were analysed by thematic analysis. Preliminary results and emerging institutional outcomes will be presented.

RESULTS

At present, formal teaching about chronic pain

and other PSS for students is sparse, inconsistent and uncoordinated. Clinician interviews revealed a diverse range of attitudes, clinical skills and self-confidence in relation to these conditions. Students are disappointed and disconcerted by their observations of variable role modelling or negative bias and feel poorly equipped to work with such patients. In general, senior medical students currently know little about the neuroscience of sensation, are unable to make a positive diagnosis and do not know how to offer an explanation.

CONCLUSIONS

Recommendations to OMS include developing more coherent curricula for these conditions and incorporating contemporary neurosciences into the curriculum. Meanwhile, we have developed communication skills workshops and resources for local students to increase their knowledge, skills and explanations. Teaching and Te Kete are based largely on pain neuroscience education, somatisation models and clinical implications of the sympathetic nervous system. Copies of Te Kete will be available.

High intensity exercise may worsen temporal summation, but not conditioned pain modulation, in chronic neck pain: a randomised crossover trial

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INTRODUCTION

Physical exercise is the first treatment of choice for chronic neck pain (CNP), yet the mechanisms of effect of different exercise intensities are poorly understood. The presence of central sensitisation (CS) possibly mediates the effects of exercise on patient-reported outcomes.

AIMS

To investigate the effects of high- and low-intensity exercise on measures of CS in people with CNP.

METHODS

This was a randomised crossover trial (n=35 people with CNP, 63.2% female, age= 36.5±14.1 years). Participants performed a high-intensity (INV_{HIGH}) and a low-intensity (INV_{LOW}) aerobic exercise session in randomised order, 1 week apart. CS measures included conditioned pain modulation (CPM), a measure of descending pain inhibition and temporal summation (TS), a measure of facilitatory pathways. CPM was assessed in series, using a cold pressor test as conditioning stimulus and pressure pain threshold as test stimulus. TS was assessed using PinPrick over the cervical region.

RESULTS

After INV_{HIGH}, there was a significant increase in CS (mean difference=0.51±1.24, p=0.02). No differences were found after INV_{LOW} (mean difference=-0.06±1.37 p=0.80). No changes in CPM were found after INV_{LOW} and INV_{HIGH}.

CONCLUSIONS

High-intensity aerobic exercise had a detrimental effect on pain facilitatory pathways, whereas low-intensity exercise did not worsen outcomes. To avoid exacerbation of central sensitisation outcomes, these results suggests that low-intensity exercise might be a better option than high-intensity exercise. These findings may assist in the development of personalised approaches to exercise therapy.

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High-definition transcranial infraslow pink noise stimulation for chronic low back pain: a pilot, safety and feasibility randomised placebo-controlled trial

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INTRODUCTION

In people with chronic low back pain (CLBP), neuroimaging studies demonstrate altered electrical activities in cortical areas responsible for pain modulation, emotional, and sensory components of pain experience (i.e., pregenual and dorsal anterior cingulate cortex [pgACC, dACC], and somatosensory cortex [SSC] respectively).[1] Treatments targeting to change electrical activities of these key brain regions may produce clinical benefits.[2]

AIMS

To determine feasibility, safety and acceptability of a novel neuromodulation technique, high-definition transcranial infraslow pink noise stimulation (HD-tIPNS), in people with CLBP, and explore its effects on pain and disability.

METHODS

A pilot triple-blinded (participant, treating therapist and outcome assessor) randomised placebo-controlled trial. Participants with CLBP (n=40) received 20 sessions of either HD-tIPNS (targeting pgACC, dACC, SSC) or sham stimulation. Feasibility and safety measures were collected, and acceptability of intervention was assessed post-intervention. Brief pain inventory and Roland-Morris Disability Questionnaires were administered at baseline, immediately post-intervention and at 1-week, 1-month and 3-months post-intervention. Data were analysed descriptively.

RESULTS

Feasibility data includes recruitment rate (28%), randomisation (100%), dropouts (8%) and treatment adherence (91%). No serious adverse events were reported. Participants reported moderate to high levels of acceptability (Mean±SD:2.57.2±2.5) and treatment satisfaction (Mean±SD:6.3±2.5). A higher proportion of participants in HD-tIPNS group demonstrated a clinically meaningful reduction in pain severity (70%), interference (65%) and disability (65%), when compared to sham stimulation group at 3-months post-intervention.

CONCLUSION

HD-tIPNS is a safe and an acceptable approach for treating CLBP. A fully powered trial is feasible and warranted to test effectiveness of HD-tIPNS in people with CLBP.

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How people in Aotearoa New Zealand with endometriosis sustain employment, barriers and enablers: a qualitative interpretive description study

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INTRODUCTION

Endometriosis is a chronic and incurable condition impacting one in 10 women in Aotearoa New Zealand.[1] Endometriosis symptoms include painful periods, pelvic pain, fatigue, painful intercourse, bloating, urinary frequency and urgency, irritable bowel syndrome, fertility delay and infertility.

AIMS

The study was conducted to gain knowledge concerning the barriers and enablers that impact the ability of people with endometriosis to sustain employment.

METHODS

This is a qualitative study using Thorne's interpretive description. Purposive sampling was used to gain six participants with a confirmed diagnosis of endometriosis and in paid employment. Data were collected using semi-structured interviews and analysed using Braun & Clarke's thematic analysis.

RESULTS

Themes developed around the barriers and enablers to sustaining employment in Aotearoa New Zealand with endometriosis. This included 1) it's more than just a bad period, 2) choosing to tell others, and 3) finding a way through.

CONCLUSIONS

Delegates will be introduced to a range of perspectives on the experience of sustaining employment with a diagnosis of endometriosis and an opportunity to consider the role of occupational therapists in working with this population. Delegates will be introduced to opportunities for future research within this population.

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Improving outcomes from pain management programmes in Aotearoa New Zealand: hearing the voices of Māori

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INTRODUCTION

There are inequities for Māori in relation to chronic pain, including a disproportionate prevalence of chronic pain, a greater impact of pain and reduced benefit from chronic pain services in the long-term. Māori have a holistic orientation to health that incorporates spiritual, relational and environmental dimensions. This worldview shapes experiences of pain and pain management. However, these views may not be incorporated in current pain management programmes.

AIM

To determine the experience of Māori who had attended a 3-week pain management programme run in a bicultural urban centre in Aotearoa New Zealand.

METHOD

An interpretive descriptive methodology was used. Six participants were individually interviewed regarding their experiences of attending the programme. The interviews were recorded, transcribed, coded, and the data analysed using thematic analysis.

RESULTS

Four themes were developed. *The programme provides respectful care* described the caring, supportive nature of the programme, which contrasted with previous negative experiences with the healthcare system. *Education enables tino rangatiratanga (self-determination)* described how the provision of knowledge facilitated participants to make their own healthcare choices. *Whanaungataunga (relationship) is valued as much as pain-specific content* described the value of the social and relational aspects of the programme. *Where is the tikanga?* described the lack of traditional Māori protocols and health views, which meant the programme was experienced as medical and Western-oriented.

CONCLUSIONS

Recommendations for change were centred around providing options for patients to engage with traditional treatments, incorporation of tikanga and promoting ongoing social connections with both the clinic and the patient's local community.

Interdisciplinary pelvic pain self-management in a small group format: replication of pilot outcomes in clinical practice

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INTRODUCTION

Pelvic pain is a common, disabling and burdensome condition affecting many thousands of women in New Zealand. Current biomedical end-organ directed management approaches fail to bring relief for many with or without endometriosis. International literature, however, demonstrates that whole-person pain self-management approaches can improve pain and quality of life.

A pilot study of a 6-week small group interdisciplinary pain self-management intervention for women living with pelvic pain demonstrated clinically significant improvement for 88% of participants across a number of domains, with no clinically significant deterioration on any measure.

Following this successful pilot, the intervention was delivered as a treatment option for women with pelvic pain attending a private pelvic pain clinic. Outcome measures and free-text feedback were collected for ongoing quality improvement.

AIMS

To confirm the efficacy and acceptability of a group self-management programme for women with pelvic pain in real-world clinical practice.

METHODS

Using a within-subject pre-and-post design, the participants completed self-report measures prior to, immediately and at 6- and 12-months following participation.

RESULTS

Results demonstrate clinically significant gains immediately following and up to 12 months after participating in a group self-management programme for pelvic pain.

CONCLUSIONS

Consistent with the pilot, this small-group pain self-management programme demonstrates improvements in wellbeing and self-efficacy for women living with pelvic pain.

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miRNAs involved in neuropathic pain can be reliably measured in saliva

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BACKGROUND

miRNAs have been shown to be dysregulated in neuropathic pain conditions such as diabetic painful neuropathy. While invasive techniques such as blood samples are routinely used to collect and analyse miRNAs, the use of non-invasive techniques such as salivary samples for analysing miRNAs involved in neuropathic pain has been minimal.[1] Therefore, the objective of this study was to determine if miRNAs involved in neuropathic pain can be measured reliably in salivary samples comprising of healthy European and Pacific population.

METHODS

Participants were recruited via advertisements on notice boards, social media, word of mouth and pamphlets. Saliva samples were collected from healthy European and Pacific participants. Samples were stored in -80°C until analysis. Total RNA was extracted using miRNEasy kit (Qiagen) following manufacturer's protocol, and the concentration was measured using Nanodrop (Thermo Fisher). Twenty nanogram of total RNA was then reverse transcribed, followed by amplification using specific primers against miR-16, -124, 132 and -134. miR-24 was used as the internal control (all primers from Thermo Fisher).[2]

RESULTS

A total of 37 healthy participants (19 European and 18 Pacific; age range: 22–57 years) were included in the study. Results showed that four different miRNAs (miR-16, miR-124, miR-132 and miR-134) that have been demonstrated to be associated with neuropathic pain were expressed and reliably measured in all the salivary samples.

CONCLUSION

All the miRNAs identified in our study have been shown to be involved in neuropathic pain and inflammation. Hence, further research is required in this area to investigate the feasibility of extracting and analysing these miRNAs in people with neuropathic pain.

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The efficacy of interdisciplinary pain management for complex regional pain syndrome: an observational study

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BACKGROUND

Interdisciplinary pain management programmes (IPMPs) are gold standard care for chronic pain and are recommended for people with complex regional pain syndrome (CRPS). However, no controlled trials have assessed their efficacy for CRPS.

AIMS

To examine the efficacy of IPMPs for CRPS by comparing outcomes for people with CRPS with two groups for whom the efficacy of IPMPs is well established: those with chronic low back pain (LBP) and chronic widespread pain (CWP).

METHODS

Retrospective data from people with CRPS (*N*=66) who had completed a 3-week IPMP at The Auckland Regional Pain Service were compared with age- and sex-matched controls with LBP (*N*=66) and CWP (*N*=66) who had completed the same programme. Measures of pain intensity, pain-interference, pain catastrophising, pain self-efficacy, depression, anxiety and stress pre- and post-programme, and at 1, 6 and 12 months were extracted. Latent class analysis was used to identify recovery trajectories, and Chi-squared analyses were used to identify whether outcome differed according to diagnostic group.

RESULTS

Two recovery trajectories for pain interference and for pain intensity were identified. Following IPMPs, 58% of people were classified as belonging to a positive pain interference reduction trajectory, while 12% were shown to be on a positive pain intensity reduction trajectory. Recovery trajectories were equal across the three diagnostic groups

(CRPS, LBP, CWP) for both pain interference ($\chi 2=1.8$, $p=0.4$) and intensity ($\chi 2=0.2$, $p=0.9$).

CONCLUSION

IPMPs lead to significant improvements in pain intensity and pain interference, and are equally effective for people with CRPS, LBP and CWP. This supports current guidelines that people with CRPS should engage in IPMPs.

The lived experience of chronic pain for Māori: how can this inform service delivery and clinical practice? A systematic review and qualitative synthesis

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BACKGROUND

In Aotearoa New Zealand, Māori have a higher prevalence and report a greater impact of chronic pain than non-Māori. However, only a small body of research has investigated how Māori experience pain and whether services currently provide culturally responsive treatment. This research has not yet been synthesised.

AIMS

To synthesise the literature describing experiences of chronic pain and pain management for Māori, and to understand how this experience could inform service delivery and clinical practice.

METHODS

We systematically searched for qualitative research on Māori chronic pain experiences (Scopus, Medline, PsycINFO, NZ Research, Research Square). Data extracted were coded and synthesised using thematic analysis.

RESULTS

Seven studies were included. Three themes encapsulated the data: 1) a multidimensional view of pain and pain management: Māori expressed a holistic and integrated understanding of the multiple factors that influence pain and its management, 2) a responsibility: respectful tikanga-informed care: the experiences of Māori participants with healthcare highlight a need for anti-racist approaches, and a clinical responsibility to practise manaakitanga and tikanga, and 3) tino rangatiratanga: a desire for knowledge, choice and autonomy in pain management: Māori valued the empowering nature of knowledge about pain, and information and support to make decisions about treatment, including options for Western and traditional management.

CONCLUSION

Health services need to: understand and respect the multidimensional aspects of pain, minimise racism and discrimination, use whakawhanaungatanga and tikanga-informed practices and provide appropriate information to support tino rangatiratanga for pain management.

The role of micro-RNAs in neuropathic pain—a scoping review

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BACKGROUND

Neuropathic pain can be caused by a lesion or disease of the somatosensory system characterised by pathological neuro-immune alterations. At a molecular level, microRNAs (miRNAs) act as regulators of gene expression orchestrating both immune and neuronal processes. Thus, miRNAs may act as essential modulators of processes for the establishment and maintenance of neuropathic pain. The objective/aims of this scoping review was to explore and chart the literature to identify miRNAs that are dysregulated in neuropathic pain.

METHODS

The following databases were searched from inception to March 2023: PubMed, EBSCO, CINAHL, Cochrane Library and Scopus. Two independent reviewers screened, extracted data and independently assessed the risk of bias in included studies. The JBI critical appraisal checklist was used for critical appraisal. A narrative synthesis was used to summarise the evidence.

RESULTS

Seven studies (total of 384 participants) that met our eligibility criteria were included in this scoping review. Our review has identified different miRNAs that are commonly involved in the chronic neuropathic pain conditions including miR-132, miR-101 and miR-199a. Our review findings further suggest

that expression of miRNAs to be significantly associated with increased diabetic disease duration, HbA1C levels and fibrinogen levels.

CONCLUSIONS

Our review findings suggest that there is clear association between miRNA expression and chronic neuropathic pain conditions. Therefore, increasing the specificity by selecting a candidate miRNA and identifying its target mRNA is an area of future research.

A Phase III, international, multi-centre, double-blind, dose increment, parallel-arm, randomised controlled trial of duloxetine versus pregabalin over 14 days for opioid unresponsive neuropathic cancer pain

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INTRODUCTION

Management of neuropathic cancer pain (NCP) refractory to regular opioids remains an important challenge. Gabapentinoids and duloxetine offer the potential of analgesia in opioid refractory NCP, but there has been no head-to-head comparison.

AIMS

The aims of this study are to assess the analgesic efficacy of duloxetine compared with pregabalin in patients with opioid refractory NCP and to build the standard pharmacological treatment.

METHODS

An international, multicentre, double-blind RCT is planned. Patients' eligibility criteria include: adults with NCP refractory to opioids, BPI-item 3 ≥4 despite of an adequate trial of regular opioid medication. Participants will be randomised to duloxetine or pregabalin arm. Dose escalation is until day 14.[1] The primary endpoint is defined as the mean difference in BPI item 3 at day 14 between groups.[2]

RESULTS

A sample size of 160 patients will be enrolled, and at the time of abstract submission (30 November 2023), 99 cases have been enrolled, with case accumulation expected to be completed by the end of 2024. The dose schedule of each drug requires discussion. As the starting dose differs between Australia and Japan, it was necessary to determine a uniform dose for the international study. The dose titration schedule has been devised to maximise the likelihood of benefit while minimising the risk of adverse events. We have defined the initiation dose and maximum dose of duloxetine and pregabalin from the results of a recent systematic review and meta-analysis and the National Comprehensive Cancer Network guideline of adult cancer pain.

CONCLUSIONS

The planned double-blind multicentre RCT will be the first to evaluate the efficacy of pharmacological treatment on well-defined NCP, and the results of this study contribute to the establishment of the standard pharmacological treatment for opioid refractory NCP.

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What is the effectiveness of manual therapy in people with upper back pain? A scoping review

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INTRODUCTION

Upper back pain (UBP), often referred to as thoracic spine pain, is a prevalent musculoskeletal condition with significant implications for individuals' quality of life. Manual therapy (MT) techniques are commonly used by physiotherapists and osteopaths to manage upper back pain. However, the efficacy of such interventions in UBP is unclear and requires further investigation. Hence, the aim of this review

was to scope available evidence to understand the effectiveness of MT in the management of UBP.

METHODS

A systematic search was conducted across multiple electronic databases, including PubMed, OneSearch, EBSCOhost, CINAHL Ultimate, Medline and Google Scholar from 2000 to 2023. Two independent reviewers assessed the articles for inclusion and a third reviewer was utilised if required. A JBI critical appraisal tool was utilised to evaluate the risk of bias in included studies.

RESULTS

Six studies (295 participants) met inclusion criteria (four randomised control trials [RCT] and two case reports were included). The review evidenced that MT interventions may have some positive effects in terms of reduced pain, improved function and quality of life in the short-term (up to 4 weeks).

DISCUSSION

The findings suggest that MT may positively impact people with UBP. However, these findings are derived from a small number of studies. Hence, more research is required to clarify review findings, especially regarding potential long-term effectiveness of MT in this cohort.

Women with surgical mesh injury present with potentially modifiable risk factors for persistent post-surgical pain and would consider prehabilitation

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INTRODUCTION

Between 50–75% of those with a surgical mesh injury will undergo surgical removal of mesh. These patients commonly present with a number of modifiable risk factors for persistent post-surgical pain that could be targets for prehabilitation.

AIMS

To compare psychosocial risk factors in women with surgical mesh injury with other patients referred for specialist pain management.

To explore the attitude of women with surgical mesh injury towards a prehabilitation programme that would target these risk factors.

METHODS

An audit of intake psychometric measures completed by women with pain from surgical mesh injuries was compared to the profile of all adult women referred for specialist pain management in New Zealand. To explore attitudes of women with a surgical mesh injury towards prehabilitation, a patient survey was sent to a sample of 1 year of women presenting with mesh injury.

RESULTS

Comparison of psychosocial measures demonstrated equivalent average severity across a range of psychosocial measures. Ninety-one percent of those surveyed were planning or had already undergone mesh removal surgery. Of these, 89% were open to a prehabilitation programme.

CONCLUSIONS

Modifiable risk factors for poor post-surgical pain outcomes that are targeted by prehabilitation for those with persistent pain are found as frequently in those with pain resulting from mesh injury. Attitudes to prehabilitation by this group appear to be favourable and therefore this warrants further exploration.

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Prevalence and profile of New Zealand osteopaths treating people experiencing headaches and migraines

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BACKGROUND

Headache disorders are an important cause of pain and disability and substantially affect quality of life. Osteopaths are primary healthcare practitioners who primarily manage musculoskeletal conditions including headaches and migraines in their practice.

However, there is a lack of data concerning the profile of Aotearoa New Zealand osteopaths treating these conditions. Hence, the aim of the study was to describe the profile of New Zealand osteopaths treating people experiencing headaches and migraines.

METHODS

The Osteopathy Research Connect-NZ (ORC-NZ), a practice-based research network (PBRN) for the New Zealand osteopathy profession was established, and recruitment occurred between August to December 2018.

RESULTS

Two hundred and seventy-seven (277) respondents provided responses to the headache and migraine items on the ORC-NZ practice questionnaire. Of these respondents, 235 (84.8%) indicated treating headaches often, and 107 (38.6%) indicated treating migraines often. Osteopaths who reported "often" treating patients with migraines and headaches were more likely to report clinically supervising associates and to be co-located with a general practitioner. These osteopaths may use diagnostic imaging often as an assessment tool. In terms of management, they tend to use HVLA, are likely to treat TMJ in case of migraine and the thoracic spine for patients with headaches. Further, New Zealand osteopaths frequently refer patients with migraines and/or headaches to other practitioners and are aware of an inter-professional approach required for this patient population.

CONCLUSION

Aotearoa New Zealand osteopaths treat people with headaches and migraines frequently and demonstrate a good understanding of an inter-professional/multi-disciplinary approach required to manage these patients.