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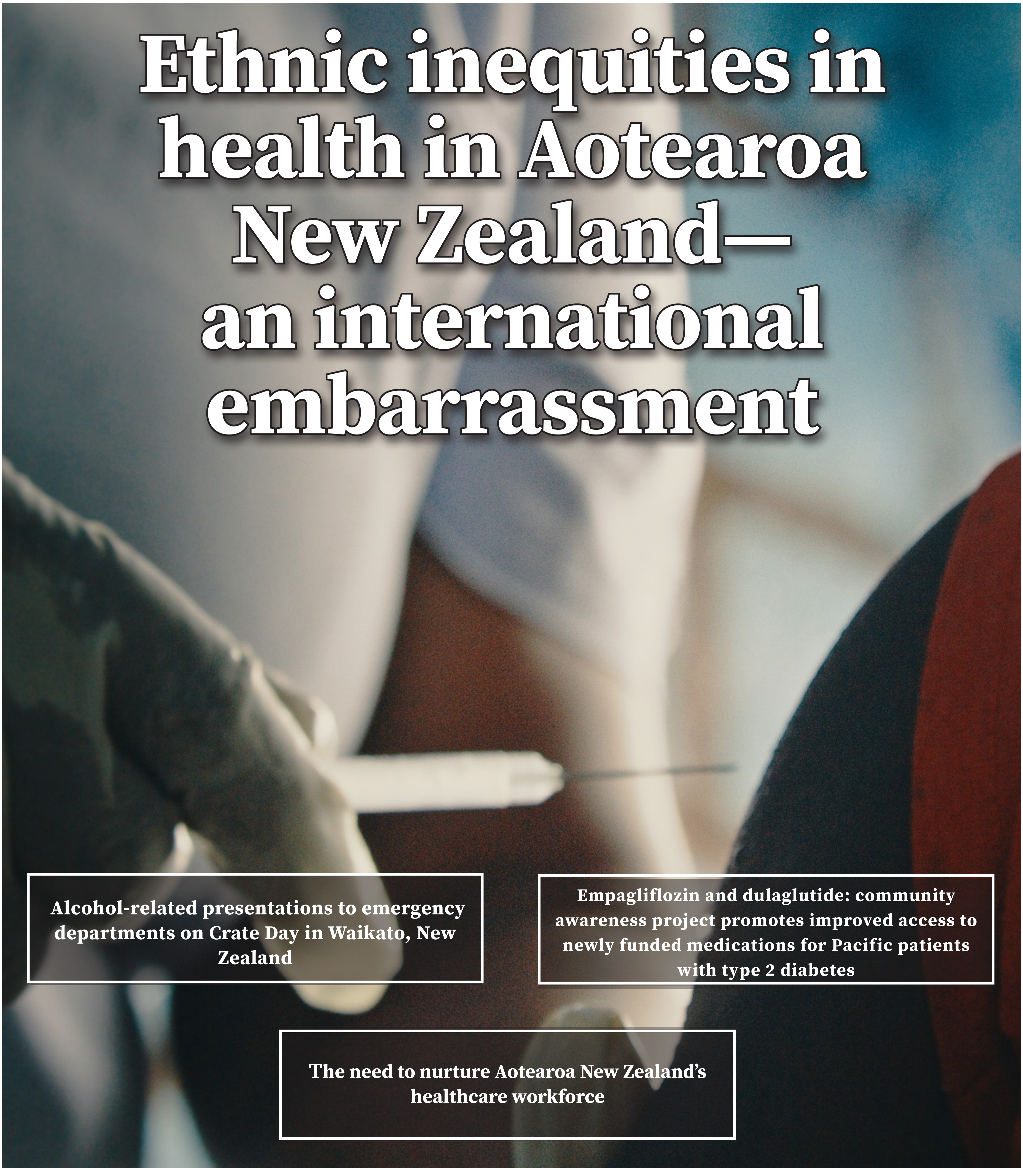

Ethnic inequities in health in Aotearoa New Zealand—an international embarrassment

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Treatment outcomes of adult acute lymphoblastic leukaemia in Auckland, New Zealand

Stephen Hong Chun Wong, Maryanne Offner, Rong Hu, Claire Hemmaway

This paper looks at the treatment outcomes of acute lymphoblastic leukaemia in Auckland City Hospital, which treats patients from most of the North Island. The survival outcomes of young adults are comparable to international standards (more than 80% of those treated will survive up to 3 years). However, adults and Māori and Pacific Islanders may have poorer survival compared to other countries. Increasing availability of newer drugs will improve outcomes.

Colonic Investigation following acute diverticulitis in Northland, New Zealand

Josh Tiro, Olivia Lengyel, Matthew James McGuinness, Christopher Harmston

Previous studies have suggested that up to 10% of patients with acute diverticulitis may have an underlying bowel cancer. Our study shows that patients who were admitted with acute diverticulitis in Northland had a low rate of bowel cancer found on investigation in the 2 years following their admission. However, we found a low rate of investigations of patients in Northland compared to previous studies. Larger studies may be needed to help guide how we investigate this group of patients in the future.

Alcohol-related presentations to emergency departments on Crate Day in Waikato, New Zealand

Ishani B Soysa, Alexander C Brebner, Dyfed Thomas, Elizabeth Becker

Crate Day is of public health concern because of the potential alcohol-related harm due to an increase in alcohol consumption in a high-risk way and which is likely to be distributed unevenly across society. It also could cause indirect harm through consumption of scarce healthcare resource and the associated cost of delaying other patients' care. This study aims to describe the pattern of emergency department (ED) alcohol-related presentations (ARPs) on Crate Day in the Waikato and the findings suggest such relationship between Crate Day and ARPs, which varies between different population groups.

Is success written in the stars? The effect of zodiac sign on the outcome of total knee arthroplasty

Christian JH Peacock, Irrum Afzal, Vipin Asopa, Nick D Clement, David H Sochart

There are 12 signs of the zodiac, each attributed with its own specific personality traits, desires and attitudes. The aim of the study was to evaluate the effect of zodiac sign on patient-reported outcome measures following total knee replacement. We identified 509 patients undergoing total knee replacement during a 2-year period, and collected data including patient demographics, patient-reported outcome measures and patient satisfaction scores. Each patient's zodiac sign was assigned from their date of birth. Our study found that zodiac sign was associated with outcome following TKA and shows that an individual's zodiac sign may serve as a useful predictive factor for functional outcomes and satisfaction following knee replacement.

Impacts of the COVID-19 lockdown on self-reported mood and self-rated health of community-dwelling adults with chronic illness

Gary Cheung, Claudia Rivera-Rodriguez, Brigid Ryan, Adrian Martinez Ruiz, Etuini Ma'u, Ange Bissielo, Brigette Meehan, Vanessa Burholt

The aim of this work was to determine whether the 2020 COVID-19 lockdown affected the self-reported mood or self-rated health of people with chronic illness in Aotearoa. We analysed data that is routinely collected from all New Zealanders who live at home and have medical and support needs. Unexpectedly, we found that in some demographic groups, self-reported mood and self-rated health increased following the 2020 COVID-19 lockdown.

The need to nurture Aotearoa New Zealand's healthcare workforce

Elizabeth Fenton, Cervantée E K Wild, José G B Derraik, Cameron Grant, Yvonne Anderson

Healthcare workers experienced significant stress and increased challenges in the workplace as a result of inadequate access to personal protective equipment (PPE) during the first COVID-19 surge in Aotearoa New Zealand. The inadequate state of New Zealand's PPE stockpile and distribution system at the beginning of the pandemic was a critical signal, a "canary in the coalmine," of broader challenges facing the New Zealand healthcare system, particularly for healthcare worker safety and wellbeing. As New Zealand reforms its health system with the aim of improving access to and equity of care, an opportunity exists to apply critical lessons learn from the COVID-19 pandemic about the need to prioritise the wellbeing of the healthcare workers we are dependent upon to deliver that care. Failure to apply this new knowledge will see the system similarly unprepared for future next public health emergencies, and potentially with healthcare workers less willing to accept the burdens placed on them.

Empagliflozin and dulaglutide: community awareness project promotes improved access to newly funded medications for Pacific patients with type 2 diabetes

Gerhard Sundborn, Fale Lesa, Graham King, Kate Vennell, Henry Kozak, Karen Pickering, John Baker

In 2021, Pharmac funded two new drugs for the treatment of type 2 diabetes (Jardiance & Trulicity) that offer significant advantages over current medications. The Diabetes Foundation Aotearoa conducted a "grass roots" community awareness campaign tailored primarily to the Pasifika community. This direct-to-consumer marketing approach was effective in increasing community health awareness and uptake of the new medicines.

Ethnic inequities in health in Aotearoa New Zealand—an international embarrassment

Collin Tukuitonga

Aotearoa New Zealand is a wealthy nation by global standards, but that wealth is unevenly distributed. It appears that the wealth gap is widening. Pasifika and Indigenous Māori people are among the most socio-economically disadvantaged. Socio-economic disadvantage is responsible for much of the ethnic inequities in health seen in Aotearoa New Zealand.

Combined with poor access to healthcare, sub-standard quality of care provided, racism and systemic bias, these factors result in chronic inequities and poor health outcomes for Pasifika and Māori people. Ethnic inequities in health are unjust, unfair and patently avoidable.

Bula Sautu – A window on quality 2021: Pacific health in the year of COVID-19 from the Health Quality and Safety Commission New Zealand[1] is the latest and most comprehensive description of the health status of Pasifika people. *Bula Sautu* shows us some of the worst inequities in our healthcare system but also profiles providers, communities and individuals responding well to the health challenges they face. For example, Pasifika people live 6 years fewer than non-Māori, non-Pasifika people. The gap in life expectancy appears to be widening, seen over the past 2 decades. The prevalence of diabetes in Pasifika people aged 25–44 years was 6.4% compared with 3.6% among Māori and 1.4% among non-Māori, non-Pasifika.

The 2023 Statistics New Zealand report *Pacific housing: People, place, and wellbeing in Aotearoa* outlines a grim picture of Pasifika housing.[2] Damp, cold and overcrowded housing is responsible for poor health in Pasifika children and their families. Over half of Pasifika peoples lived in homes with at least one housing problem, compared with 32% of the total population.

Around half of Pasifika peoples lived in an owner-occupied dwelling in 1986, but by 2018 this had fallen to just over one third. Quality housing is essential for better health, and despite investment in the housing stock in Aotearoa New Zealand, Pasifika people continue to struggle to secure access to a fundamental human right.

It is embarrassing situation for Aotearoa New Zealand given its reputation for fairness in global policy terms. There is a moral imperative to act decisively to eliminate ethnic inequities in health in Aotearoa New Zealand.

Despite multiple plans and strategies to improve Pasifika health over the past two decades, it appears that the health status of Pasifika people has deteriorated. Deterioration in health indicators reflects the deterioration in socio-economic circumstances and rising costs of living.

Ethnic inequities incur significant costs to the health system and society more broadly. It is time to make courageous decisions and take decisive actions to eliminate ethnic inequities in Aotearoa New Zealand.

The Pae Ora legislation is an excellent framework enabling actions to eliminate inequities, but it is important accountabilities are clear and those in leadership roles are held responsible for results. Consideration should be given to meaningful accountability measures for those involved. Public reporting of results should be implemented. Pasifika strategies should be fully costed, and priorities made clear to the health sector.

Pasifika leaders and communities should also be engaged with and supported to contribute to improvements in the wider determinants of health. Priorities for action include improvements in housing and income distribution.

Investment in primary healthcare is urgently needed, including doubling the capacity of Pasifika providers, including "free" access to GP and nursing services. Improvements in access to and quality of primary care should ease pressure on emergency departments and hospital services.

Further investment in the training of more Pasifika healthcare workers is an additional priority.

COMPETING INTERESTS

Nil.

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2. Statistics New Zealand [Internet]. Pacific housing: People, place, and wellbeing in Aotearoa New Zealand. 2023. Available from: https://www.stats.govt.nz/infographics/pacific-housing/.

Treatment outcomes of adult acute lymphoblastic leukaemia in Auckland, New Zealand

Stephen Hong Chun Wong, Maryanne Offner, Rong Hu, Claire Hemmaway

ABSTRACT

AIM: Acute lymphoblastic leukaemia/lymphoma (ALL) is a rare disease that requires an intensive chemotherapy regimen for successful treatment. This is a single-centre retrospective audit to assess the treatment outcomes in the largest ALL centre in New Zealand.

METHOD: Data such as survival and adverse events of patients with *de novo* ALL referred to Auckland City Hospital for treatment were included in this audit. Sub-group analyses were also performed.

RESULTS: Sixty-five patients aged from 18 upwards with ALL were included in this audit. The median survival of all patients was 37.6 months. Adolescent and young adults (AYA) treated on the COG (paediatric) protocols had a mean survival of 48.3 months (median not reached), while adults treated with the UKALL14 protocol had a median survival of 37.6 months. In the UKALL14 sub-group, Māori/Pacific Islanders had an inferior EFS that was statistically significant.

CONCLUSION: Overall AYA outcomes are comparable to international standards. Our adult outcomes may be poorer than the original UKALL14 trial, with Māori/Pacific Island patients having shorter survival.

Introduction

Acute lymphoblastic leukaemia (ALL) is a neoplasm of immature lymphoid cells. The estimated incidence world-wide in 2017 was 0.85 per 100,000.[1] It is classically divided into T- and B-cell lineages. Presenting features include cytopenias, lymphadenopathy and organ infiltration.

The treatment of ALL involves multi-agent chemotherapy. An initial intensive phase lasts 6 to 9 months, with a subsequent maintenance phase lasting for up to 2 years. The goal is to achieve a measurable residual disease (MRD) negative status, where leukaemic cells are unable to be detected using current techniques; this is associated with superior outcomes.[2,3] Allogeneic stem cell transplantation (allo-SCT) is recommended in those who do not attain an MRD-negative state or who have high-risk genetics.[4]

Outcomes in children are excellent, with a 5-year overall survival (OS) exceeding 90%.[5] However, the OS in adults historically ranges from 5 to 55%.[2,6,7] This may be due to a) treatment with less intensive regimens due to risk of adverse events, b) comorbidities, c) higher incidence of high-risk genetics, d) treatment delays due to toxicity, and e) comparative lack of ancillary services and support in older patients. Adolescents and young adults (AYA), which is defined as age from 10 up to 39, is a unique sub-group. These patients (and potentially patients up to 45 years old) when treated with paediatric protocols do better compared with adult protocols, with one review finding a relative risk of 0.55 for all-cause mortality at 3 years favouring paediatric regimens.[8] In the very high-risk category of patients (which includes all patients aged between 13 and 30) treated on the COG1131 trial, the 4-year disease-free survival was 76%.[9] New Zealand data from between 2008 and 2017 found that the 5-year survival in the 15–24-year-old cohort improved from 68% to 79% overall. However, survival in Māori/Pacific Islanders remain lower than non-Māori/Pacific Islanders, with the 5-year survival being 75%, 73% and 82% respectively.[10]

In the Northern region all patients aged 16 and over who are candidates for curative therapy are referred to the adult haematology department at Auckland City Hospital (ACH). From 2018, all AYA ALL patients in the former Waikato District Health Board (DHB) were referred, and from early 2019 all AYA patients in MidCentral DHB were also referred in to ACH. AYA patients aged between 16 and 30 are treated using Children's Oncology Group (COG) protocols within a trial or on the control arm of the most recent trial.

Adults aged from 31 up to 60 are treated using the control arm of the UKALL14 protocol; the UKALL14 is the latest adult ALL trial from the UK.[11] Adults aged above 60 are treated using CALGB8811 (called CALGB60+) or UKALL60+ protocols based on fitness; these regimens are less intensive compared to the UKALL14.[12,13] The CALGB60+ is of an intermediate intensity between the UKALL protocols, while the UKALL60+ is of lower intensity and does not contain asparaginase. The protocols are adapted based on funded drugs. Allo-SCTs were carried out according to protocols if a donor could be identified.

The aim of this audit was therefore to review the characteristics and outcomes of ALL patients treated by the adult haematology service at ACH between 2016 and 2021.

Methods

Study design and data sources

This was an audit conducted by the adult haematology department at ACH. Data including patient details and selected clinical outcomes was collected prospectively for all *de novo* patients referred to ACH with confirmed ALL, biphenotypic acute leukaemia that included a lymphoid lineage, or CML in lymphoid blast crisis from June 2016. If the diagnostic bone marrow biopsy found <25% morphologic blasts, this was considered a B- or T-lymphoblastic lymphoma (LLy). We then retrospectively collected additional data from electronic hospital records, including demographics and other specific outcomes such as adverse events and treatment delay, into the database. This was anonymised, password protected and then analysed. Community records were not accessed as essentially all relevant care was conducted by the department. Institutional and ethical approval was sought from the Auckland City Hospital Research Office but was deemed to be not required.

Inclusion criteria

Patients in the database from 1 June 2016 to 1 November 2021 were included in this analysis. Patients who commenced therapy overseas but were transferred to ACH after induction were also included.

Exclusion criteria

Patients who were referred to ACH purely for allo-SCT and those predominantly treated overseas were excluded.

Definitions

The diagnosis of ALL was based on the consensus opinion of the Auckland acute leukaemia multi-disciplinary meeting. The date of diagnosis was based on the date of the first bone marrow biopsy.

Event-free survival (EFS) was defined as the time from diagnosis until a relapse or primary refractory state was diagnosed on a bone marrow or peripheral blood specimen, or death.

Complete remission was defined as <5% leukaemic blasts on a bone marrow biopsy. MRD was determined by flow cytometry (for B-ALL, COG standard (3 tube, 6 colour panel) and leukaemia-specific phenotype for T-ALL) for the purposes of this audit; a negative state was defined as <0.01%.

If a patient died after a diagnosis of relapsed or refractory disease, then this was considered the cause of death. Otherwise, deaths were defined as treatment related—for example, sepsis or liver failure. If the patient died of an unrelated cause, this was considered treatment unrelated.

The COG category included all patients treated with on a COG protocol, 1131 and 1732 for B-ALL and 1231 for T-ALL. The 60+ category included those treated with CALGB60+ and UKALL60+. The UKALL14 category is standalone. A few patients were treated with other protocols, and were included in the survival analysis but not displayed on selected KM curves due to the small numbers.

For the analysis of treatment delays, the minimum days in each phase of treatment was subtracted from the actual days.

Statistical analysis

A statistician (RH) was employed to perform statistical analysis using the SAS 9.4 programme. The Log-Rank test was used to determine statistical significance via Kaplan–Meier (KM) curves for differences in outcome. Other analytical methods are presented with the relevant results below. All confidence intervals (CI) displayed are of 95% percentile.

Results

A total of 65 patients were included in this audit. There were 52 B-ALL and 13 T-ALL patients. Table 1 summarises the demographic data.

Overall, 27 patients (41%) died during the study period. Of these, five (19%) were due to primary refractory disease, 14 (52%) were due to relapse, and seven (26%) due to treatment related mortality. One patient relapsed but died of a treatment

Table 1: Patient demographics.

	T-ALL/LLy	**B-ALL**
Total number	13	52
Female	6	21
Age (median)	18–70 (33)	18–70 (44)
Follow-up range in months (median)	3 to 59 (20.6)	42 days to 64 months (18.4)
DHB		
Auckland region	13	43
Other	0	9
Ethnicity		
NZ European	4	22 (42%)
Māori	0	11 (21%)
Pacific Islander	4	7 (13%)
Other	5	12
AYA patients	**7**	**16**
AYA Māori and Pacific Islander	3	8
AYA non-Māori and non-Pacific Islander	4	8
Treatment protocol		
COG	6	16
UKALL14	5	22
CALGB60+	0	6
UKALL60+	1	6
Other	1	2
Enrolled on trial	1	4
Allogeneic transplant	5	14
Relapse post-CR/refractory		
COG	1/1	1/0
UKALL14	0	13/2
60+	1/0	4/0
Other	0/1	1/0
Total	4 (31%)	21 (40%)

Table 2: OS and EFS of B-ALL divided by protocol.

	60+	COG	UKALL14
3-year OS	21.1% (SE 0.17)	83.3% (SE 0.11)	41.5% (SE 0.12)
3-year EFS	21.1% (SE 0.17)	83.9% (SE 0.10)	39.7% (SE 0.12)
Median OS (months, CI)	27.5 (8.8–42.0)	NR	22.2 (10.8–37.6)
Median EFS (months, CI)	21.2 (8.0–42.0)	NR	11.3 (6.2–39.3)

Table 3: OS and EFS divided by ethnicity.

	Māori and Pacific Islanders	Non-Māori and Pacific Islanders	Hazard ratio Log-Rank (CI)
3-year OS	36.3% (SE 0.13)	57.1% (SE 0.09)	NA
3-year EFS	21.1% (SE 0.17)	53.9% (SE 0.10)	NA
Median OS (months)	27.5	42	0.73 (0.3–1.7)
Median EFS (months)	27.5	32.9	0.8 (0.4–1.7)

Table 4: Demographic differences between ethnicities for B-ALL treated with UKALL14.

	Māori/Pacific Islander	Non-Māori/Pacific Islander
Total	8	14
Age	44 (34.6–53.1)	47.2 (33.7–57.7)
Female	5	6
Existing comorbidity altering induction chemotherapy[a]	3 (37.5%)	2 (14%)
High risk[b]	8	14
MRD-negative by induction phase 2	3 (38%)	9 (64%)
Stem cell transplant	1 (13%)	7 (50%)
Median survival (months)	11.7	37.6
Relapse/refractory	6	8
Death	5	6
Relapse	5	4
TRM	0	1
Refractory	0	1
Treatment delays in days (range)	46.5 (12–129)	35 (21–78)
Recieved salvage chemotherapy on relapse	3	7

[a] Any comorbidity or organ dysfunction leading to dose alteration during induction chemotherapy.
[b] High risk as per UKALL14: age >40, unfavourable genetics, MRD-positive at end of induction phase 2.

Figure 1: OS and EFS by diagnosis.

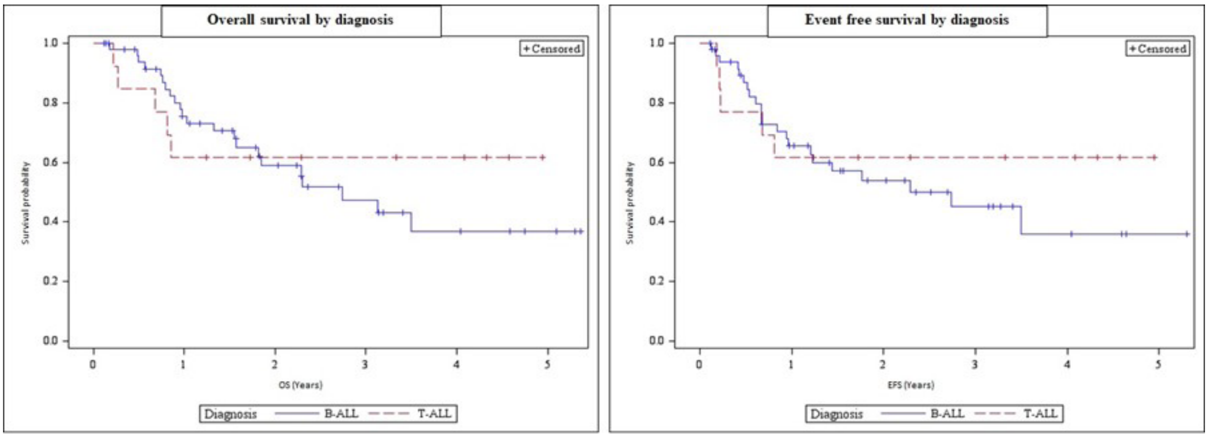


Figure 2: OS and EFS by treatment protocol.

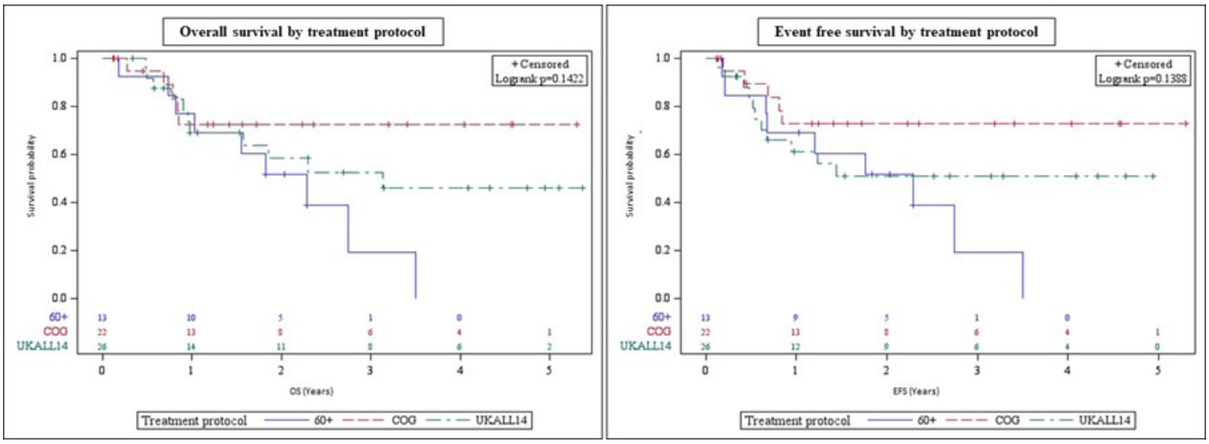


Figure 3: OS and EFS for B-ALL by protocol.

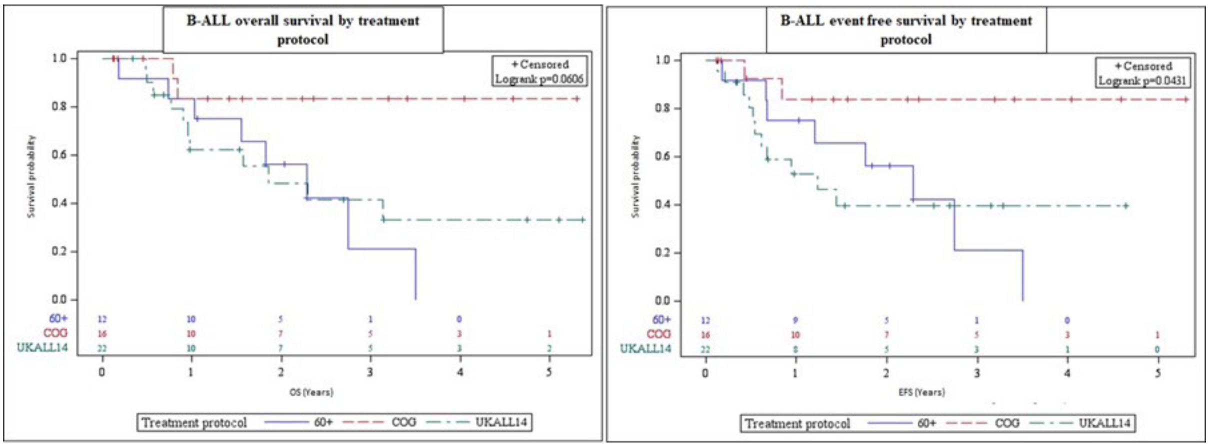
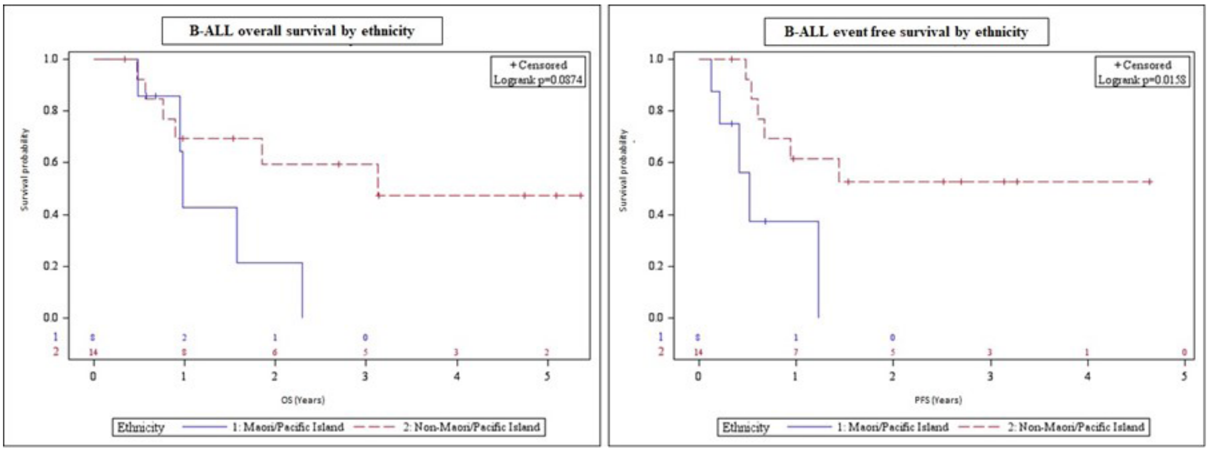


Figure 4: OS and EFS of B-ALL divided by ethnicity.



unrelated ruptured aortic aneurysm.

The median OS was 37.6 months, 37 months, and not reached (NR) for all patients, B-ALL and T-ALL respectively. The median PFS was 30.2 months for B-ALL, and NR for T-ALL. The 3-year OS and EFS was 51% (standard error [SE)] 0.07) and 50% (SE 0.07) for all comers, 47% (SE 0.09) and 45% (SE 0.09) for B-ALL, and 62% (SE 0.13) and 62% (SE 0.13) for T-ALL respectively. Figure 1 displays the KM curves for OS and EFS.

When classified by protocol, the median OS and 3-year OS was 27.5 months (confidence interval [CI] 9.8–42.0) and 19% (SE 0.16) for 60+; 37.6 months (CI 11.7–37.6) and 53% (SE 0.11) for UKALL14. The median OS was not reached for COG, but the 3-year OS was 72% (SE 0.11). Figure 2 displays the KM curve.

Figure 3 displays the outcomes for B-ALL only, and demonstrates the effect of age and treatment protocol on outcomes. Table 2 shows the 3-year survival outcomes. Despite the small numbers, patients treated with COG have a statistically superior EFS with a HR of 6.5 (CI 2.4–17.3) compared with 60+ protocols, and 8.0 (CI 3.1–19.4) with UKALL14. OS was also superior, with a HR of 5.5 (CI 1.8–16.6) with 60+ and 4.7 (CI 1.8–12.6).

The data for T-ALL were also analysed, but not displayed due to small numbers. The median survival when divided by protocol was 9.73 months (CI 2.2–9.7) for COG and not reached for UKALL14.

We then looked at the effect of ethnicity on treatment outcomes. Table 3 summarises the survival outcomes. There was no statistical difference in the OS and EFS with a p-value of 0.42 and 0.55.

Sub-analysis was performed for B-ALL. T-ALL was not analysed due to small numbers. For AYA patients treated on the COG protocol, Māori/Pacific Islanders had a 3-year OS and EFS of 71.4% (SE 0.17) and 72.9% (SE 0.17) respectively, while non-Māori/Pacific Islanders had a 100% OS and EFS. However, this was not statistically significant with a p-value of 0.21 and 0.23 for OS and EFS using the Log-Rank test.

Table 4 details the demographic differences for patients on the UKALL14 protocol, and Figure 4 presents the KM curves for illustrative purposes. There was a statistically significant difference in EFS.

The percentage of patients achieving an MRD-negative remission after induction was 44% for UKALL14, 52% for COG and 31% for 60+ protocols. There was no statistical difference when comparing Māori/Pacific Islanders and non-Māori/Pacific Islanders based on a two-tailed p-value of 1.0 using Fisher's exact test.

In terms of selected adverse events, seven patients developed asparaginase-associated thrombosis, and three patients developed asparaginase-associated liver failure. Of the patients who had treatment-related mortality, one died from a secondary malignancy, one on the CALGB60+ died from asparaginase-associated liver failure, one on the COG protocol died from methotrexate toxicity and three died from sepsis.

A total of 19/65 (29%) patients received an allo-SCT. Patients who did not have a transplant had a median overall survival of 22 months and a 3-year OS of 36%. Those who received a transplant did not reach median survival but had a 3-year OS of 80%. The Log-Rank test revealed a p-value of 0.0013.

In terms of treatment delay, patients on the UKALL14 and COG protocol had a median delay of 27 days and 10 days respectively. When comparing the ethnicities for all comers, the mean delay was 29 days and 23 days for Māori/Pacific Islanders and non-Māori/Pacific Islanders respectively. The Wilcoxon two-sample test was not statistically significant with a two-sided p-value of 0.97. The most common cause of delays were cytopenias and neutropenic fever.

Discussion

This audit had a number of strengths and limitations. Although it is retrospective, it provides a real-world snapshot of the largest group of adults with ALL treated in New Zealand. However, the numbers remain small, which makes comparison with international groups difficult.

Our outcomes in AYA patients currently appear comparable to international standards. However, in patients who are aged 30 and above treated on the UKALL14 protocol, we may be below international standards. First analysis of the UKALL14 trial for B-ALL found a 3-year EFS of 44% for the control arm at a median follow-up of 50.5 months.[14,15] The UKALLXII trial, which recruited adults with T- and B-ALL between 1993 and 2006, had an OS of 38% at 5 years.[16] By comparison, our OS with the UKALL14 protocol for both T- and B-ALL at 3 years was 53%, and our EFS for B-ALL patients was 39.7%. There was a statistically significant difference in outcomes between ethnic groups.

We were not able to accurately assess the reasons for this due to the small sample. Despite the fact that most of the deaths were due to relapse, our MRD-negative rates were similar to the international trials.[9,15] With respect to the differences between Māori/Pacific Islanders and non-Māori/Pacific Islanders, more non-Māori/Pacific Islander patients were MRD-negative by induction and received an allo-SCT, while Māori and Pacific Islanders had more treatment delays and initial dose alterations due to various toxicities. However, there were no statistically significant differences in treatment delay and achievement of MRD negativity; statistical analysis was not performed for the other parameters. It is important to note that the ability to proceed to a stem cell transplant depends on performance score during chemotherapy and stem cell donor availability. Registry data from South Australia has shown a significant improvement in OS in ALL in the last two decades; this was attributed to the extension of intensive chemotherapy protocols to older patients, improvement in supportive care and possibly increasing numbers of allo-SCTs.[17]

Treatment delays during chemotherapy are thought to affect prognosis.[18,19] This audit shows that patients treated with the UKALL14 protocol have more delays; this is one aspect where we can potentially improve on.

The available chemotherapeutics are limited in New Zealand, unless trial enrolment is successful. The study drug in the UKALL14 trial, Rituximab, has only just been approved in 2021; we have now incorporated this into our protocol. The lack of ready access to newer novel therapies such as Blinatumomab, Inotuzumab, and CAR-T cells which have proven efficacy in the relapsed setting leading to improved OS remains an ongoing issue. However, Blinatumomab is now available via a Named Patient Pharmaceutical Assessment (NPPA) as a bridge to stem cell transplant for those with MRD levels of >0.1%.[20]

Alternative regimens exist. HyperCVAD is used in some New Zealand centres, which can include asparaginase. Outcomes vary internationally, with a 5-year OS between 39–60%.[21,22] Paediatric-inspired protocols have been used up to the age of 45; this may be another option to improve our adult outcomes if they can be administered safely.

In conclusion, while the Auckland outcomes of ALL treatment are comparable to international groups, there remains room for improvement, especially in the adult Māori and Pacific Island population. Further research in this area is required.

COMPETING INTERESTS

Nil.

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Colonic Investigation following acute diverticulitis in Northland, New Zealand

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ABSTRACT

AIM: Diverticulitis is common and increasing in incidence. The risk of malignancy in those with uncomplicated diverticulitis is estimated to be 0.7%, compared with 10% in complicated diverticulitis. Newer guidelines suggest colonic investigation in patients with complicated diverticulitis only. We aim to investigate which patients in Northland undergo colonic investigation following an episode of diverticulitis, define malignancy detection rate and aid in the formulation of local guidelines.

METHODS: A retrospective review of adults admitted to Whangārei Hospital with diverticulitis between 2015 and 2019. Patients were classified as complicated or uncomplicated based on the Hinchey classification radiologically or intra-operatively. Patients were followed up to a minimum of 24 months.

RESULTS: Three hundred and forty-nine patients were included. One hundred and eighty-two (48%) patients underwent colonic investigation following admission with diverticulitis; 50 with complicated and 132 with uncomplicated disease. The rate of colonic investigation between the groups was similar, at 53% and 47% respectively.

Two patients (1.1%) were found to have a colonic malignancy, both in the uncomplicated group. The performance of a colonic investigation was not associated with complicated disease, ethnicity, gender or age on univariate or multivariate analysis.

CONCLUSION: Colonic investigation following an admission for acute diverticulitis in Northland is not aligned with recently published guidelines. The rate of colonic malignancy found was low. Larger local studies are needed to guide clinicians and maximise efficiency of resource utilisation.

Diverticular disease is extremely common in the Western world and is increasing in incidence, especially in younger patients.[1] Diverticulitis is a common manifestation of diverticular disease, and one of the commonest reasons for general surgical hospital admission.[2] It is associated with an increased mortality risk in patients at five years follow-up.[3] Treatment in hospital usually consists of intravenous antibiotic and supportive measures.[4] Occasional operative intervention is needed, but the majority of patients are discharged without undergoing colonic resection.[5]

Follow up, investigation and long-term management of these patients remains controversial, and is heavily dependent on resource availability.

Diverticulitis can be categorised as complicated or uncomplicated, which is determined radiologically with HR-CT (high resolution computed tomography) imaging.[6] In those with complicated diverticulitis, the rate of malignancy is estimated to be as high as 10%, compared to 0.7% in those with uncomplicated disease.[7] Historically, international guidelines including the American Gastroenterology Association (AGA)[8] guidelines, have suggested colonic investigation in all patients following resolution of acute diverticulitis; however, these recommendations are based on older data and expert opinion,[9] are likely to be outdated and do not take into account resource availability.

More recent guidelines from Society of American Gastrointestinal and Endoscopic Surgeons (SAGES)[10] and European Society of Coloproctology (ESC) recommend colonic investigation (colonoscopy or CT colonography) in patients with complicated diverticulitis only.[11] This is due to developments in CT imaging quality, and more recent meta-analyses that have shown the prevalence of colorectal cancer (CRC) in uncomplicated patients is low.[12,13] Interestingly although the overall rate of diverticulitis is increasing the prevalence of complicated disease has remained static.[3]

New Zealand has high rates of colonic cancer,[14] and worse outcomes compared to other countries.[15] There is also increasing pressure on endoscopy units throughout New Zealand, especially with bowel cancer screening being rolled out nationally. Decision making around selecting the most appropriate patients for whom to perform colonic investigation is therefore important in a resource constrained environment.

The aim of this study was to investigate which patients in Northland undergo colonic investigation following an episode of diverticulitis, define malignancy detection rate and aid in the formulation of local guidelines.

Methods

Setting

Whangārei Hospital is the largest hospital (249 beds) in Northland, New Zealand. It has the only General Surgical Unit in Northland, as well as the only hospital with CT and intensive care capability, and serves a population of 194,600.[16] During the study period there was no hospital policy regarding colonic investigation following an episode of diverticulitis. This decision was at the discretion of the treating clinician.

Study design

A retrospective study of all adults aged >18 who were admitted to Whangārei Hospital with diverticulitis between 1 January 2015 and 31 December 2019 was performed. Patients were identified using the International Classification of Disease, 10th revision code (see Appendix 1). Electronic medical records including emergency department (ED) notes, operation notes, and written clinical notes were interrogated to confirm inclusion criteria and record clinical outcomes. Baseline demographics, diverticulitis grading and complications, operative management and complications, length of stay, and 30-day, 90-day and 1-year readmission rates were collected.

Inclusion and exclusion criteria

Patients were excluded if aged younger than 18 years. The first presentation with diverticulitis during the study period was included with readmission data collected but not included as a separate case. Patients were excluded if a colonoscopy or CT colonography had been performed within three years.

Diverticulitis complexity

Patients were grouped into two groups based on the complexity of their diverticulitis. The Hinchey classification was used.[6] Uncomplicated diverticulitis was defined as Hinchey grade 1a and an absence of perforation, abscess or fistula. Hinchey Classification Grade was determined based on a CT report from a consultant radiologist or operative findings.

Outcomes of interest

The primary outcome of interest is rate of colonic investigation following admission for diverticulitis, according to diverticulitis severity grade. Secondary outcomes of interest are the rate of malignancy in patients who undergo colonic investigation after an admission for diverticulitis and the rate of non-malignant polyp detection found on colonic investigation following an admission diverticulitis.

Follow-up

All patients were followed up to a minimum of 24 months. The median time of follow up was 55.1 months. Clinical and electronic records were used to follow up patients, and will capture all endoscopic investigations in the Northland and Auckland regions.

Statistical analysis

Normally distributed data were presented as mean, standard deviation (SD) and tested with a student t-test. Categorical data were presented a number (n), percentage (%) and tested with a Chi-squared test. A binomial logistic regression was performed to investigate the factors associated with colonic investigation (colonoscopy or CT colonography). A $p<0.05$ was deemed significant. Statistical analysis was performed in SPSS for Mac.

Results

Patient characteristics

Four hundred and sixty-five patients were identified with diverticulitis during the study period. Forty-nine patients were excluded due to having colonic investigation in the past three years. Thirty-seven (8%) patients were excluded as they had a colonic resection during their index admission.

Three hundred and seventy-nine patients therefore formed the primary cohort: 97 (26%) with complicated disease and 282 (74%) with uncomplicated disease. Demographic characteristics are presented in Table 1.

The median age was 60 and 76 (20%) patients were Māori. There was no statistically significant difference in age or ethnicity between the two groups. A significantly higher proportion of male patients was seen in the complicated group with 58 (58%) of patients being male compared to 123 (44%) in the uncomplicated group.

Primary outcome

Overall, 182 (48%) patients underwent colonic investigation following an admission with diverticulitis; 50 (53%) in the complicated group and 132 (47%) in the uncomplicated group. Colonoscopy was more commonly performed compared to CTC as seen in Table 2.

Table 1: Patient demographics.

	Total	**Complicated**	**Uncomplicated**	**p-value**
	379	**97 (26%)**	**282 (74%)**	
Age, median	60	59	60	
Gender				
Female, n (%)	200 (53%)	41 (42%)	159 (56%)	0.016
Male, n (%)	179 (47%)	56 (58%)	123 (44%)	
Ethnicity				**0.310**
Māori, n (%)	76 (20%)	16 (16%)	60 (21%)	
Non-Māori, n (%)	303 (80%)	81 (84%)	222 (79%)	

Table 2: Primary outcomes

	Total	**Complicated**	**Uncomplicated**
Colonic investigation, n (%)			
Yes	182 (48%)	50 (52%)	132 (47%)
No	196 (52%)	47 (48%)	150 (53%)
Colonoscopy, n (%)			
Yes	170 (45%)	47 (48%)	123 (44%)
No	209 (55%)	50 (52%)	159 (56%)
CT colonography, n (%)			
Yes	18 (5%)	5 (5%)	13 (5%)
No	361 (95%)	92 (95%)	269 (95%)

Table 3: Secondary outcomes.

	Total N (182)	**Complicated N (50)**	**Uncomplicated N (132)**
Malignancy, n (%)	2 (1.1%)	0 (0%)	2 (1.5%)
Polyp, n (%)	61 (33.5%)	10 (20%)	51 (38.6%)
Benign stricture, n (%)	3 (1.7%)	2 (4%)	1 (0.8%)
Colitis, n (%)	4 (2.2%)	1 (2%)	3 (2.3%)
Haemorrhoids, n (%)	3 (1.7%)	2 (4%)	1 (0.8%)

Table 4: Univariate and multivariate analysis of factors associated with colonic investigation.

	Univariate analysis				**Multivariate analysis**			
		95% CI				**95% CI**		
Variables	OR	Lower	Upper	p	OR	Lower	Upper	p
Complicated disease	1.209	0.762	1.918	0.421	1.215	0.761	1.939	0.415
Māori ethnicity	0.848	0.512	1.405	0.522	0.848	0.496	1.449	0.546
Age	1	0.985	1.015	0.952	1.001	0.985	1.017	0.872
Female gender	1.087	0.726	1.627	0.687	1.112	0.736	1.679	0.614

Abbreviations: OR = odds ratio; CI = confidence interval.

Colonoscopy was performed in 170 (45%) patients and CTC in 18 (5%) of patients. Five patients had both colonoscopy and CTC. Four patients underwent a CTC due to inability to complete colonoscopy and in one patient it was unclear why they had both.

The acute presentation of diverticulitis was the reason for booking colonic investigation in all but two patients; both who had a change in bowel habit with concern for an underlying malignancy. Five patients (four with uncomplicated and one with complicated disease) had a plan made on discharge for colonoscopy that was not performed.

Secondary outcomes

Findings from colonic investigation are presented in Table 3.

A colonic malignancy was identified in two patients, both in the uncomplicated group. The CT scan reports of these two patients were reviewed in detail. There was no suggestion of malignancy on imaging. Benign strictures, colitis and haemorrhoids were uncommon findings and found in 3 (1.7%), 4 (2.2%), 3 (1.7%) patients, respectively.

Seventy-four polyps were found and resected in 61 patients (33.5%): 10 in the complicated group and 64 in the uncomplicated group. Low grade tubular adenomas and hyperplastic polyps were the most commonly found polyps, making up 42.9% and 41.6% of the polyps found respectively. Only two polyps were high grade tubular adenomas.

One patient with uncomplicated diverticulitis had a tubulovillous adenoma found in the caecum, and at repeat colonoscopy at one year was found to have a caecal adenocarcinoma.

No further malignancies were found on colonic investigation over the follow-up period.

Factors associated with colonic investigation

The performance of a colonic investigation was not associated with complicated disease, ethnicity, gender or age on univariate or multivariate analysis as seen in Table 4.

Discussion

This study demonstrated that colonic investigation following an admission for acute diverticulitis in Northland does not appear to be consistent with published guidelines. These guidelines[9,10] were, however, published later than the start of the data collection period for this study. Malignancy and polyp detection rate was higher in patients with uncomplicated disease, but remained low across the whole cohort. These data is important as an aid to formulating local guidelines and guiding use of hospital resource in a constrained environment.

Improvements in availability and resolution of CT imaging have resulted in it being used far more often to diagnose acute diverticulitis[17] and has led to more accurate diagnosis,[18] which may distinguish between diverticulitis and colorectal cancer. Multiple recent studies have questioned the need for follow up colonoscopy in those with uncomplicated disease due to developments in HR-CT, and the low rate of CRC seen in this group.[19,20]

The findings of this study are similar to those seen previously with regards to outcomes in patients with uncomplicated diverticulitis. Eight systematic reviews have investigated the role of colonic investigation following acute diverticulitis since 2012. The rate of CRC in those with uncomplicated diverticulitis in these reviews ranged from 0.5–

2.1%.[7,9,21–26] Given the rate of CRC in those with uncomplicated diverticulitis being the same as those in a screening population, these reviews have questioned the need for colonic investigation in those with uncomplicated disease; however, none have made strong recommendations. Westwood et al.[27] provides the only New Zealand based data on colonic investigation following uncomplicated diverticulitis, from over ten years ago. In patients with uncomplicated diverticulitis a low rate of colonic malignancy (1.1%) was found.

In patients with complicated disease the pick-up rate in this study for both carcinoma and polyps was low. This is in contrast to four previous systematic reviews that have assessed malignancy rate following complicated diverticulitis where the rate ranged from 6.14–10.8%.[7,9,25–26] It should also be noted that although there was a significant proportion of patients who did not have colonic investigation arranged following admission (48%), at a median follow-up time of 55.1 months, none of these patients had represented to a hospital service with a new diagnosis of colorectal malignancy. It is possible that international data is not generalisable to a New Zealand population, but it is also likely that the increasing rate of diverticulitis and its detection in younger patients, coupled with easy access to improved imaging, has affected this.

The colonic investigation rate seen in the only New Zealand study was 70%, which is higher than that seen in Northland.[27] During our study colonic investigation following diverticulitis was an individual clinician decision with no hospital specific or New Zealand specific guidelines to aid decision making. The reason for the low investigation rate in patients with complicated disease is unclear but may include resource constraints, clinician decision making and patient factors or wishes.

The authors accept and acknowledge the limitations of this study. It is a single-centre retrospective study with a relatively small number of patients with complicated disease. The investigation rate was also low compared to previous local data. Patients were followed up with clinical records only, and those who had colonic investigation or malignancy diagnosed outside of the Northland Region were may have been missed. Patients who were discharged directly from ED were not included in this study. Despite this, it remains the largest study in New Zealand of colonic investigation following acute diverticulitis, and all patients were followed up for a minimum of two years to determine outcomes.

Conclusion

Colonic investigation following an admission for acute diverticulitis in Northland is not aligned with recently published guidelines. Rate of colonic malignancy on colonic investigation was low and no patients represented with a missed cancer diagnosis to a hospital service during the study follow-up. Larger studies and national guidance are needed to guide clinicians and maximise efficiency of resource utilisation.

COMPETING INTERESTS

Nil.

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Alcohol-related presentations to emergency departments on Crate Day in Waikato, New Zealand

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ABSTRACT

AIM: To describe the effect of Crate Day on alcohol-related presentations (ARPs) to Waikato District Health Board (WDHB) emergency departments (EDs).

METHOD: This retrospective observational study used a descriptive analytical approach to examine alcohol-related ED attendance. Age-standardised ED ARP rates and relative rates (RR) were calculated for the weekends on which Crate Day falls (pooled 2019 and 2020) with respect to reference weekends. A sub-group analysis was performed for various age, ethnicity, gender and socio-economic factors.

RESULTS: The age-standardised RR of ARPs for Crate Day weekends relative to the reference weekends was 1.5 (95% confidence interval (CI): 0.96–2.26). The rate of ARPs of 20- to 34-year-olds was significantly higher during Crate Day weekends with a RR of 2.00 (95% CI: 1.11–3.59). There was a disproportionate non-significant increase in ED ARPs in males, those who are living in areas of high deprivation, and people of non-Māori ethnicity on Crate Day weekends compared to reference weekends. Alcohol-related presentations were more frequent (72%) between 5pm and 3am on Crate Day weekends.

CONCLUSIONS: The findings from this study suggest an association between ARPs and Crate Day, which varies between demographic groups. Further research is required to determine if this is a reproducible and national finding. Crate Day is a potential target for public health intervention and policy change aimed at reducing alcohol-related harms.

Alcohol causes a myriad of socio-economic and physical health issues in Aotearoa New Zealand including road traffic injuries, self-inflicted injuries, alcoholic liver cirrhosis, colorectal and breast cancer, alcohol use disorder, foetal alcohol spectrum disorder, depression, and domestic violence.[1] It has been estimated that 5.4% of deaths in New Zealanders are attributable to alcohol.[2]

There are large inequities in the distribution of alcohol-related harm between ethnicities such that the alcohol-related mortality rate for Māori is 2.5 times higher than non-Māori.[1,2] Males are also disproportionately affected, experiencing almost two times the rate of disability-adjusted life years than females.[2] Furthermore, 15- to 29-year-old Māori males have the highest rate of years of life lost due to alcohol than any other population group.[2]

Alcohol-related health issues bear a significant economic burden, estimated to cost New Zealand $5.3 billion each year.[3] The pattern of drinking is an important consideration, with heavy episodic drinking (HED) being associated with greater harm.[4] In general, HED is defined as the consumption of 60g or more of pure alcohol on at least one single occasion at least once per month.[1] Hospital emergency departments (EDs) are significantly burdened by alcohol-related harm.[5,6] There is a high frequency of alcohol-related presentations (ARPs) during weekends, particularly late at night or in the early hours of the morning, and more commonly presenting with physical injuries, which can be severe and life threatening.[5] Alcohol is also reported to be the most common factor contributing to aggressive behaviour directed at ED staff by patients and visitors.[7,8] Intoxicated ED patients draw resources away from other patients.[5,7]

Crate Day is an unofficial observance held annually on the first Saturday of December, during which each participant attempts to consume one entire crate of beer.[9] A crate comprises of 12 large 745mL bottles of beer, containing 300g of pure alcohol.[9,11] This tradition was started by a radio station in 2009 who have continued to promote it alongside alcohol industry members.[9,11–13]

Crate Day is of public health concern because of the potential alcohol-related harm due to an increase in alcohol consumption, and in a high-risk manner that is likely to be distributed inequitably across society. In addition, it normalises HED, which could beget HED at other times of the year. Furthermore, Crate Day could cause indirect harm through consumption of scarce healthcare resource, and the associated opportunity cost of delaying other patients' care.

Despite the potential harms of this event, there is a paucity of information about participation and consequences. Newspaper reports have raised concern about an increased burden on EDs from ARPs on Crate Day, one suggesting a doubling of alcohol-related injuries compared to an average December weekend.[12,14,15] Formal assessment of ARPs on Crate Day are required to inform alcohol promotion strategies, alcohol licensing decisions, local alcohol policies, and national legislation and policy to design a healthier alcohol environment. This knowledge could also inform ED workload planning to ensure safe staffing levels.

This study aims to describe the pattern of ED ARPs on Crate Day in the Waikato. Waikato District Health Board (WDHB) served a population of over 400,000, 25% of whom identify as Māori. Within WDHB, there is one urban hospital (Waikato Hospital) and four rural hospitals. To our knowledge, this is the first study examining the relationship between Crate Day and ARPs to New Zealand hospital EDs.

Method

This retrospective observational study used a descriptive analytical approach to examine ED attendance during the Crate Day weekends in 2019 and 2020 and adjacent weekends. Data were extracted from WDHB electronic records including data from all five WDHB hospitals. Alcohol-related presentations were identified using a "alcohol involved" flag, a compulsory electronic field completed by staff for each patient which became a mandatory reporting requirement to the Ministry of Health in 2017.[16] There are four response types available for the alcohol involved field: "Yes", where the patient was themselves intoxicated; "Secondary", where the patient was not intoxicated, but their presentation was caused by another intoxicated individual; "No", where the patient was not intoxicated; and "Unknown", where the association with alcohol was not known or could not be determined.[5,17] Alcohol involvement is determined by healthcare staff based on clinical judgement and there is no formalised questioning or investigation. The vast majority of alcohol-related presentations identified with this flag are due to acute alcohol intoxication, such as trauma and toxicity, because the contribution of alcohol to those diagnoses can be clinically determined; unlike chronic harms e.g., breast cancer, where the relationship to alcohol is obscured (see Appendix 1). In this study ARPs refers to both primary and secondary cases.

Data from the Crate Day weekend (Crate Day and the day after) in 2019 and 2020 were pooled to form the Crate Day group. Weekends immediately before and after a Crate Day weekend for both 2019 and 2020 were pooled to form the reference group.

These weekends were selected to mitigate systematic bias secondary to seasonal variation in ARPs.[5] Reference weekends did not appear to be outliers on visual inspection of plots of ARPs vs time. Age-standardised rates (ASRs) per 100,000 person-weekends and age-standardised relative rate (ASRR) with estimated 95% confidence intervals (CIs) were calculated. The 2018 Census population was used as the standard population for age-standardisation.[18] A subgroup analysis was performed for sex, ethnicity, socio-economic deprivation as measured by the New Zealand Deprivation Index 2013 (NZDep2013)[19] and hospital rurality.

Multiple ethnicities were managed using prioritised ethnicity.[20] Age-specific rates were calculated for the age groups 0–19, 20–34 and 35 years and over. Ideally, the lower age group would have been 0–17 years because the legal alcohol purchasing age in New Zealand is 18 years; however, population data were restricted to five-year bands. The grouping used (0–19 years) minimises the mixing of legal and non-legal alcohol purchasers as compared to the next best grouping (0–14 years). Statistical testing was performed using Chisquared tests. Population estimates were taken from a demographic model developed by WDHB derived from Waikato Integrated Scenario Explorer model.[21] Data analysis was performed on Qlik Sense software,[22] Microsoft Excel and the online statistical calculator available at www.socscistatistics.com. Analysis for the study was done as part of a routine public health audit; therefore, ethics approval was deemed unnecessary.

Results

During the pooled 2019 and 2020 Crate Day period, there were 1,533 presentations to WDHB EDs, 100 (6.5%) of which were ARP and 277 (18.7%) where the alcohol involvement was unknown. Seventy-two percent (72/100) of ARPs were male and 36.0% (36/100) were of Māori ethnicity. In comparison, during the reference period, there were 2,969 presentation, 136 (4.6%) of which were alcohol related and 457 (15.4%) of unknown alcohol involvement. Of the ARPs, 64.7% (88/136) were male and 36.1% (48/133) were of Māori ethnicity. There were no statistically significant differences in sex, ethnicity, hospital or deprivation between Crate Day period and reference period (see Table 1). A majority (72.0%) of ARPs occurred between 5pm and 3am during the Crate Day period.

The estimated crude incidence rate was 12.6 per 100,000 person-weekends (95% CI: 9.13 to 16.13) during the Crate Day period and 8.6 per 100,000 person-weekends (95% CI: 5.70 to 11.47) during the reference period (see Appendix 2). This equates to a crude relative rate of 1.5 (95% CI: 0.97 to 2.32). The ASR was 12.8 per 100,000 person-weekends (95% CI: 4.31 to 21.36) during the Crate Day period and 8.7 per 100,000 person-weekends (95% CI: 1.69 to 15.61) during the reference period, a relative rate of 1.5 (95% CI: 0.96 to 2.26) (see Table 2).

The ASR (per 100,000 person-weekends) of ARPs was 16.9 for Māori during the Crate Day period compared to 12.5 during the reference period, a relative rate of 1.4 (95% CI: 0.66 to 2.78). The ASRs were 10.2 and 6.6 respectively for non-Māori, a relative rate of 1.6 (95% CI: 0.89 to 2.68). Age-standardised ARP rates increase as socio-economic deprivation increases for both Crate Day period and reference period; however, the ASR was 1.5 times higher in areas of high (NZDep 8–10) and medium (NZDep 4–7) deprivation during the Crate Day period compared to the reference period. Estimated 95% CIs for the relative rates cross 1, suggesting differences are not statistically significant. The relative rate in low deprivation (NZDep 1–3) areas was 1.0. Following age-standardisation, males were 1.7 (95% CI: 0.98 to 2.82) times more likely to present to EDs for alcoholrelated issues during the Crate Day period than reference period. Those of Māori ethnicity were 1.4 (95% CI: 0.66 to 2.78) times more likely, and non-Māori were 1.6 (95% CI: 0.89 to 2.68) times more likely, to present to ED for an alcoholrelated issue during the Crate Day period compared to reference period.

Rates of ARPs also differed by age (see Figure 1).

Table 1: Demographics and statistical test values of alcohol-related presentations to Waikato District Health Board Emergency Departments during Crate Day and reference periods.

	Crate Day period n (mean per weekend)	**Reference period n (mean per weekend)**	**Statistical test (Crate day vs reference period)**
Total	**100 (50)**	**136 (34)**	
Sex			
Male	72 (36)	88 (22)	χ^2=1.404, p=0.236
Female	28 (14)	48 (12)	
Ethnicity			
Māori	36 (18)	48 (12)	χ^2= 0.0002, p=0.989
Non-Māori	64 (32)	85 (21)	
Deprivation			
High deprivation	53 (27)	71 (18)	χ^2=0.390, p=0.823
Medium deprivation	30 (15)	39 (10)	
Low deprivation	6 (3)	11 (3)	
Hospitals			
Urban (Waikato Hospital)	83 (42)	104 (26)	χ^2=1.493, p=0.222
Rural	17 (9)	32 (8)	

Table 2: Age-standardised rates, relative rates and estimated 95% confidence intervals of alcohol-related presentation to Waikato District Health Board Emergency Departments during Crate Day and reference periods.

	Age-standardised rates per 100,000 person-weekends		**Relative rates (95% confidence interval)**
	Crate day period	**Reference period**	
Total	**12.8**	**8.7**	**1.5 (0.96–2.26)**
Sex			
Male	16.6	10.0	1.66 (CI: 0.98–2.82)
Female	6.7	5.6	1.19 (CI: 0.54–2.58)
Ethnicity			
Māori	16.9	12.5	1.35 (CI: 0.66–2.78)
Non-Māori	10.2	6.6	1.55 (CI: 0.89–2.68)
Deprivation			
High deprivation	14.9	9.8	1.52 (CI: 0.83–2.78)
Medium deprivation	9.7	6.3	1.54 (CI: 0.69–3.44)
Low deprivation	3.5	3.5	1.01 (CI: 0.20–5.02)

Figure 1: Age-specific rates of alcohol-related presentations to Waikato District Health Board Emergency Departments during Crate Day and reference periods.

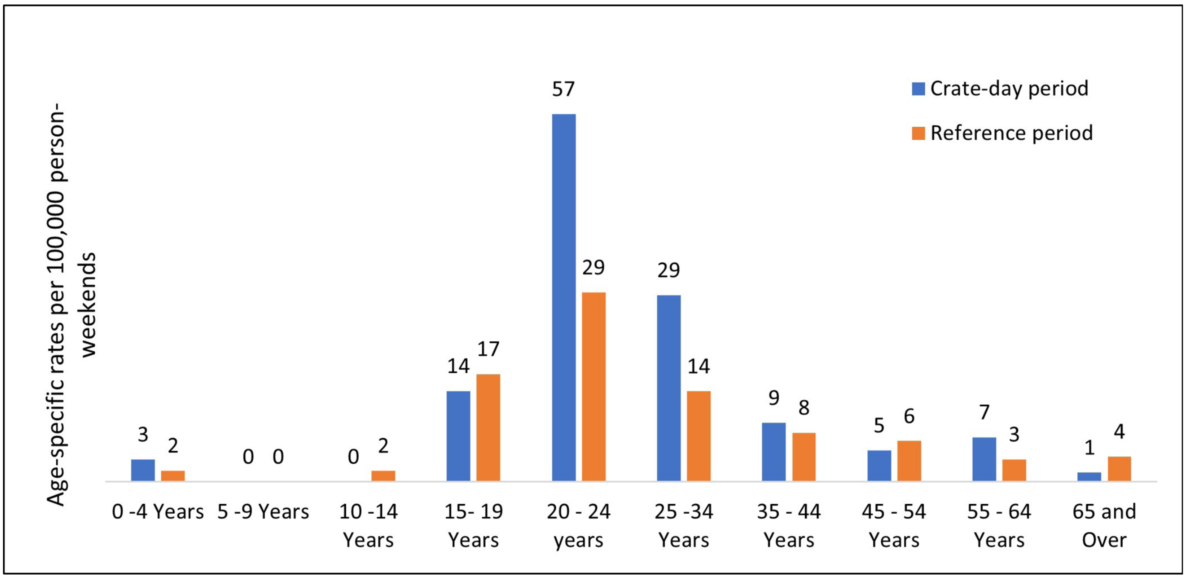

Table 3: Age-specific rates, relative rates and estimated 95% confidence intervals of alcohol related presentation to Waikato District Health Board Emergency Departments during Crate Day and reference periods.

Age group	Age-specific rates per 100,000 person-weekends		Relative rates (95% confidence intervals)
	Crate Day period	Reference period	
0–19 years	4.3	4.9	0.87 (0.26–2.88)
20–34 years	38.6	19.2	2.00 (1.11–3.59)
35 years and over	5.2	5.2	1.00 (0.44–2.26)

The rates of ARPs were approximately twice as high for those aged 20–24 years and 25–34 years during the Crate Day period.

There was a statistically significant association between ARPs and Crate Day with a relative rate of 2.00 (95% CI: 1.11 to 3.59), but not in other age groups (see Table 3).

Discussion

New Zealand has a liberal alcohol consumption culture, where drinking is deeply ingrained in social norms and binge drinking is commonplace, especially amongst youths.[23,24] It is no surprise that alcohol-related harm places a significant burden on New Zealand EDs.[25] The purpose of this study is to identify and quantify any burden that Crate Day may place on EDs in Waikato, New Zealand and in doing so identify populations most at risk. To our knowledge, this is the first study to examine the effect of Crate Day on alcohol-related presentations to New Zealand hospital EDs. The study shows that alcohol played a role in 6.5% of presentations, equating to 100 patients, on Crate Day weekends across 2019 and 2020, which was greater than the proportion of ARPs on reference weekends (136/2969; 4.6%).

Analysis of ARPs by ethnicity showed that Māori have higher rates of ARP to ED than non-Māori at baseline. This result is consistent with findings from Svensen et al., who found that Māori were overrepresented in ARPs to Auckland City Hospital ED.[5] The higher rate of ARPs on Crate Day are similar between Māori and non-Māori on crude analysis (Appendix 2), and slightly lower (though not statistically significant) after age-standardisation, with an estimated ASRR of 1.4 and 1.6 respectively. This raises the possibility that the social practice of Crate Day may be more integrated into non-Māori, mainly New Zealand European, culture. However, on a population scale Māori may be more vulnerable to the harms associated with Crate Day due, in part, to their younger age structure.

The age group analysis of the study shows a significantly higher ASR for those aged 20–34 years on Crate Day weekends with an ASRR of 2.00. Though causality between Crate Day and ARPs cannot be established from this study, this finding is consistent with the hypothesis that young adults are more likely to drink to excess on Crate Day than other age groups. This vulnerability is not surprising given that young adults are known to have a higher risk of ARPs at baseline.[5,26,27] An alternative explanation of this association could be that healthcare staff are more likely to categorise presentations as alcohol related on Crate Day due to their knowledge of the event. This measurement bias would result in an artificial large effect size, especially in young adults who may be perceived as more likely to participate in Crate Day.

This study shows that males accounted for two thirds of ARPs on any weekend (either Crate Day or reference) and were approximately twice as likely to present during the Crate Day period compared to the reference period. This is in line with the study by Sevensen et al.,[5] which found that 65% of ARPs were male. By studying 1,000 ARPs to New South Wales EDs in Australia, Whitlam et al.[28] also showed that two thirds of ARPs were male. In our analysis, we were unable to detect a statistically significant change in the gender composition of ARPs.

Analysis by deprivation areas enables socioeconomic trends to be explored. Our results are consistent with Sevensen et al.,[5] Collins,[29] and Katikireddi et al.,[30] who found that a higher proportion of ARPs were from people who live in high socio-economic deprivation areas. The present results also suggest a possible interaction between socio-economic status and Crate Day such that people of medium and high deprivation are at an increased risk of requiring ED care on

Crate Day, an effect not observed in areas of low deprivation. Based on the power analysis calculation performed by Cohen (1992, p.158),[31] the sample size required to attain a statistical power of 80% (at 5% significance level), for comparing the two samples using Chi-squared test, for a small size relationship ("small effect"), is 785 observations in each group. Though the aforementioned findings are not statistically significant, in what is an underpowered analysis, these findings are consistent with a general trend of higher vulnerability to stressors[32] seen in people of low socioeconomic status. The corollary is that people of medium–high deprivation have the most to gain from public health intervention. Given the predictable geographic distribution of deprivation, some interventions, such as lowering the density of alcohol outlet stores, which are known to be more concentrated in high-deprivation areas,[39] and limiting alcohol promotion can be easily targeted in these areas. If true, this finding would have implication on equity between ethnicities because Māori are over-represented in areas of high deprivation; therefore, may be vulnerable to the harmful effects of alcohol promoting activities.

This study supports the existing literature by confirming that high proportion of ARPs during the reference period occurred late at night.[5,26,33,34] Moreover, it shows that ARPs were more frequent from 5pm to 3am during the Crate Day period, compared to the reference period. By reviewing 12 months of ARP data to the Auckland City Hospital ED, Sevensen et al. found that ARPs were more frequent at night, during the weekends, public holidays and during summer.[5]

Quantification of the burden and characteristics of ARPs associated with Crate Day can help inform ED planning. For example, this information could help determine the number of additional doctors, nurses and security staff required on Crate Day to maintain normal service. This information can also inform alcohol promotion strategies, licencing decisions and local alcohol policy development. For example, if there is evidence of alcohol-related harm in the form of a rise in ARPs on Crate Day, a local alcohol policy might implement narrower opening hours in the first weekend of December.

This study has several limitations; notably, it is significantly underpowered to detect changes in the rate of ARPs for the population, let alone for the subgroups. As a result, the chance of a type two (false negative) result is high. This should be taken into consideration while interpreting these results and the lack of statistical significance should not be taken as the absence of difference. Furthermore, the small number of weekends included in the analysis leave the analysis vulnerable to bias from major public events such as international sporting events which may increase the rate of ARPs.[35] There were no public holidays during the observed weekends; however, there were two international cricket test matches played in Waikato, one on a Crate Day weekend and another on a reference weekend. There was also an international rugby match, and two Waikato horse-racing events on reference weekends, which would be likely to, if anything, reduce the magnitude of association between Crate Day and ARPs. Additionally, the COVID-19 pandemic might have an impact on alcohol consumption; however, the effect of the pandemic on Crate Day behaviours are unknown.[36] Notably, there were no lockdowns during the observed period and Waikato Region was on alert level one during the 2020 Crate Day and reference periods. Another limitation is high number of unknown presentations, which introduces risk of selection bias and limits the sample size, thus reducing statistical power. A fourth limitation is a lack of definition of what qualifies as alcohol related or not. Judgement is up to the treating clinicians, which is likely to cause a reporting bias. Due to limitations in data availability, this study used NZDep2013 as the socio-economic status dataset. This is not the most recent available; therefore, the deprivation level attributed to a patient may not reflect their actual status. Furthermore, area-level deprivation may misclassify individuals when the geographic distribution of socio-economic status fails to align with NZDep2013 boundaries. Another limitation is that ethnicity data was obtained from the WDHB patient management database, which is known to have poor concordance with Census data, and to undercount Māori.[37] This misclassification bias adds uncertainty to estimates by ethnicity and likely results in underestimates of Māori incidence rate. These data exclusively pertain to Crate Day in the WDHB region, which may limit generalisability of the findings to wider Aotearoa New Zealand and to other organised binge drinking activities.

The present study highlights the burden of alcohol consumption and binge drinking on EDs. There is significant need for public health interventions aimed to reduce alcohol-related harm presenting to EDs and generally. Such interventions would need to target deep structural issues, such as the inequitable distribution of resources, as well as ingrained cultural norms. Possible interventions include tightening restrictions on advertising and promotion, alcohol regulations, and changing the drinking context using community-based solutions.[5,38]

Crate Day appears to have originated from a radio broadcast in 2009. There have been several Crate Day promotion campaigns since, despite the Sale and Supply of Alcohol Act 2012.[12,14] Given the influence of broadcast media and advertising, and the potential harms of alcohol promotion, as is the case with Crate Day, further restriction of alcohol promotion in New Zealand would be justified. Furthermore, broadcast media should appreciate their significant and lasting social impact and ensure internal policy and culture results in content that discourages harmful alcohol use.

The findings of the present study provide the evidence for continued efforts to develop effective national policy that addresses alcohol promotion and drinking culture in an effort to minimise alcohol harm. In addition, the information can support ED workload planning across the five hospitals in Waikato and provides evidence that may inform alcohol health promotion, licensing and policy decisions.

COMPETING INTERESTS
The authors declare no competing interests.

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Appendices

Appendix 1: Principal Diagnosis of alcohol related presentations to Waikato District Health Board Emergency Departments on Crate Day and reference periods.

Principal Diagnosis reported on Crate Day	Count	Principal Diagnosis reported on reference period	Count
Other specified general symptoms and signs	19	Other specified general symptoms and signs	26
Unspecified injury of head	6	Open wound of wrist and hand, part unspecified	6
Open wound of wrist and hand, part unspecified	3	Unspecified injury of head	4
Moderate alcohol intoxication	3	Suicidal ideation	3
Injury, unspecified	3	Multiple superficial injuries, unspecified	3
Other	66	Unspecified injury of head	3
		Other	91

Note: *Presentation counts less than three categorise as “Other”.

Appendix 2: Crude rates, relative rates and estimated 95% confidence intervals of alcoho-related presentation to Waikato District Health Board Emergency Departments during Crate Day and reference periods.

	Crude rates per 100,000 person-weekends		Relative rate (95% confidence interval)
	Crate Day period	Reference period	
Total	**12.6**	**8.6**	**1.5 (0.97–2.32)**
Sex			
Male	16.7	10.2	1.6 (0.96–2.78)
Female	6.1	5.5	1.1 (0.52–2.45)
Ethnicity			
Māori	17.0	12.1	1.41 (0.69–2.89)
Non-Māori	9.7	6.6	1.51 (0.87–2.61)
Deprivation			
High deprivation	15.2	10.2	1.49 (0.82–2.72)
Medium deprivation	8.1	5.3	1.54 (0.69–3.45)
Low deprivation	3.9	3.9	1 (0.20–4.95)

Is success written in the stars? The effect of zodiac sign on the outcome of total knee arthroplasty

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ABSTRACT

AIM: There are 12 signs of the zodiac, each attributed with its own specific personality traits, desires and attitudes. The aim of the study was to evaluate the effect of zodiac sign on patient-reported outcome measures (PROMS) following primary total knee arthroplasty (TKA).

METHOD: Patients undergoing primary TKA during a 2-year period (January 2019 to December 2020) were identified retrospectively. Patient demographics, Oxford Knee Score (OKS), EuroQol 5-dimension (EQ-5D) (baseline, 1 and 2 years) and patient satisfaction scores (1 and 2 years) were collected. Each patient's zodiac sign was assigned from their date of birth.

RESULTS: There were 509 patients (228 males [44.8%] and 281 females [55.2%]) with a mean age of 70.9 years and a mean BMI of 30.3. There were no significant differences in gender (p=0.712), age (p=0.088), BMI (p=0.660), or pre-operative OKS (p=0.539). Aries and Gemini (0.366) had the worst and Pisces the best (0.595) pre-operative EQ-5D scores (p=0.038). When adjusting for confounding, Aries (p=0.031) had a greater improvement in EQ-5D at 1 year, although this was not maintained at 2 years. When adjusting for confounding, Pisceans had significantly less of an improvement in OKS at both 1 (p=0.022) and 2 years (p=0.042) and also had a significantly lower risk of satisfaction at 2 years (odds ratio 0.41, p=0.043).

CONCLUSION: Zodiac sign was associated with outcome following TKA. Pisceans had the best pre-operative EQ-5D scores, but the least improvement in the post-operative joint specific score (OKS) and were less likely to be satisfied, despite achieving an equal improvement in their health-related quality of life (EQ-5D). Aries started with the lowest pre-operative EQ-5D scores but achieved the best scores at 1 year. Our study shows that an individual's zodiac sign may serve as a useful predictive factor for functional outcomes and satisfaction following TKA. However, our findings are the result of multiple testing in a large dataset following a data trawl, and correlation does not necessarily equal causation even in a real-world registry.

KEYWORDS: EQ-5D; Oxford Knee Score; knee; arthroplasty; outcome; zodiac sign; star sign.

Introduction

The position of the sun at the time of a person's birth, placed within one of the 12 sections of the zodiac, is referred to as their zodiac sign.[1] It has been suggested that aspects of an individual's personality and future can be predicated on their zodiac sign,[2] and from the position of planets, moons and stars. Previous studies evaluating the influence of astrology have noted an association between the severity of myocardial infarction and the presence of the sun,[3] as well as a correlation between the position of the moon (lunar phase) and post-surgical pain.[4]

Little explanation can, however, be given for why a particular zodiac sign is associated with certain personality traits, or how these associations were originally derived.[1,5] Despite the lack of scientific evidence, horoscopes forecasting a person's future based purely on their zodiac sign first appeared in English newspapers in the 1930s and continue to feature in glossy magazines and on the internet, with birth charts being popular, or essential, in many cultures.[6,7]

Patient-reported outcome measures (PROMs) are used to assess the efficacy of a surgical intervention from the patient's perspective,[8] improving the understanding of which outcomes are most relevant for everyday functioning.[9] The Oxford Knee Score (OKS) is a validated joint-specific PROM[10] that correlates with patient satisfaction and the outcome of total knee arthroplasty (TKA).[11,12] The EuroQol five dimensions (EQ-5D) is a widely administered PROM for measuring overall health-related quality of life (HRQoL)[13,14] and is used by many national arthroplasty registries.[15]

Despite the optimisation of surgical techniques and implant designs, more than 10% of patients remain dissatisfied following TKA,[16,17] the outcome of which can also be influenced by factors including age, gender, comorbidities and personality traits.[18–21] In spite of enduring public fascination, there have, however, been no previous publications evaluating the association between signs of the zodiac and the outcome of joint replacement surgery. The primary aim of the study was therefore to evaluate the effect of zodiac sign on knee-specific outcome (OKS) following TKA. The secondary aims were to assess the effect of zodiac sign on health-related quality of life (EQ-5D) as well as patient satisfaction up to 2 years following TKA.

Method

Patients undergoing primary TKA during a 2-year period (January 2019 to December 2020) were identified retrospectively from a prospectively compiled arthroplasty database at an Elective Orthopaedic Centre. Only patients undergoing revision TKA were excluded from the database search to keep the sample representative of all patients undergoing primary TKA.

Patient demographics were recorded pre-operatively, and PROMs questionnaires were completed pre-operatively and then at 1 and 2 years. The Oxford Knee Score (OKS) was used to assess the joint-specific outcome measure (primary aim), the EuroQol 5-dimension (EQ-5D) to assess health-related quality of life, and patient satisfaction was assessed. Each patient's zodiac sign was assigned from their date of birth, taking into account leap years.

The OKS consists of 12 questions, assessed using a Likert scale, with values from 0 to 4. A summative score is calculated with 48 being the best possible score (least symptomatic) and 0 the worst possible score (most symptomatic).[22,23] The minimal clinically important difference (MCID) is the smallest change of score, deemed to be of clinical importance, and has been defined as 5-points following TKA.[24]

The EQ-5D general health questionnaire evaluates five dimensions including mobility, self-care, usual activities, pain/discomfort and anxiety/depression.[13] The 3L version of the EQ-5D questionnaire was used in the current study, with the responses to the five domains being recorded at three levels of severity. The health state can then be reported based on a three-digit code for each domain, resulting in 243 possible health states.[25] Each health state was converted to a single summary index by applying a weighting, specific to the United Kingdom (UK) population, based on a time trade-off technique. The index is on a scale of -0.584 to 1, with 1 being perfect health, 0 being dead and negative values representing a state perceived as being worse than death. A MCID has not yet been defined following TKA, but a review found the MCID to vary from 0.03 to 0.54 depending on the orthopaedic intervention being assessed.[26] For the current study 0.1 was defined as the MCID.

Patient satisfaction was assessed by asking the patient to rate their "*overall satisfaction with the outcome of your operation?*" using a visual analogue scale (VAS)[13] from 0 (not satisfied) to 100 (very satisfied). Patients scoring 50 or more were defined as being satisfied, with those scoring under 50 being dissatisfied.

Statistical analysis

Statistical analysis was performed using Statistical Package for Social Sciences version 17.0 (SPSS Inc., Chicago, IL, USA). Simple descriptive analysis was undertaken. Student's t-Tests, paired and unpaired, or analysis of variance (ANOVA) were used to compare linear variables between groups with Bonferroni correction. *Post hoc* testing was undertaken between star signs using a Bonferroni correction. Dichotomous variables were assessed using a Chi-squared test. Linear regression analyses were used to assess for variables independently associated with improvement in the OKS and EQ-5D utility at 1 and 2 years, when adjusting for confounding using step-wise methodology. Logistic regression analyses were used to assess for variables independently associated with patient satisfaction at 1 and 2 years, when adjusting for confounding using forward conditional methodology. Each star sign was included in the models as a categorical variable, with no base star sign identified on unadjusted analysis; the "rest" of the cohort was used as the reference group e.g., Taurus versus all other star signs. A p-value of <0.05 was defined as statistically significant.

A power calculation was performed using the OKS as the primary outcome measure, with change in the score relative to baseline at 1-year as the end point. MCID of 5[24] was used for the OKS with a standard deviation of 10, giving an effect size of 0.5, an alpha of 0.05 and a power of 95%—for 12 groups (the zodiac signs) using a one-way ANOVA, 120 patients would be required.

No additional patient contact was required and the project was performed as a service evaluation, without the need for formal ethical approval. The project was registered with the institution's Audit Department and was conducted in accordance with the Declaration of Helsinki and the guidelines for Good Clinical Practice.

Results

Cohort

There were 228 (44.8%) males and 281 (55.2%) females with a mean age of 70.9 years (range 44 to 94). The mean pre-operative OKS was 21.8 (standard deviation [SD] 8.1) and the mean pre-operative EQ-5D was 0.474 (SD 0.036). There were no significant differences according to Zodiac sign for age, sex, BMI or OKS pre-operatively (Table 1). Zodiac sign was, however, related to pre-operative HRQoL, with Aries and Gemini having the worst (lowest) EQ-5D utility scores and Pisces having the best (highest) (Table 1). On *post hoc* testing the only significant difference was between Aquarius and Taurus (difference 0.229, 95% CI 0.000 to 0.458, p=0.049).

Primary aim: knee-specific outcome following TKA

There was a significant (p<0.001, paired t-Tests) post-operative improvement, relative to the pre-operative OKS for all Zodiac signs at both 1 and 2 years (changes in Table 2). On unadjusted analysis there was no significant difference according to Zodiac sign at 1 (p=0.196 ANOVA) or 2 years (p=0.392 ANOVA) (Table 2). When adjusting for confounding factors (age, gender, BMI), Pisces was independently associated with a significantly worse improvement at both 1 (difference -2.8 points, p=0.022) and 2 years (-2.5 points, p=0.035) (Table 3). These were, however, less than the MCID (5 points).

Secondary aim: HRQoL

There was a significant (p<0.001, paired T-tests) improvement in the post-operative EQ-5D at both 1 and 2 years compared to baseline for all patients following TKA (changes in Table 4). On un-adjusted analysis there was no significant difference in HRQoL according to zodiac sign at 1 year (p=0.113 ANOVA) but by 2 years Taureans had the least improvement in EQ-5D, and Aquarians the greatest (p=0.023 ANOVA) (Table 4). However, when adjusting for confounding factors (age, gender, BMI) Aries was the only sign associated with a greater improvement at 1 year, although this was lower than the MCID and was not maintained at 2 years (Table 3).

Secondary aim: patient satisfaction

Overall, patient satisfaction was 93.9% at 1 year and 91.9% at 2 years. On unadjusted analysis there was no association between zodiac sign and satisfaction at either 1 (p=0.272) or 2 years (p=0.409) (Table 5), but, when adjusting for confounding factors (age, gender, BMI), Pisces was associated with a significantly lower risk of satisfaction at 2 years (odds ratio 0.41, p=0.043) (Table 6).

Discussion

Zodiac sign was associated with post-operative knee-specific function and patient satisfaction following TKA. Pisceans started with the highest pre-operative EQ-5D scores, but experienced significantly worse improvement in their post-operative joint-specific score (OKS) at both 1 (difference -2.8 points, p=0.022) and 2 years (-2.5 points, p=0.035). Whether this is clinically significant is not clear since the differences were lower than the MCID of 5 points, although the authors of the Oxford Knee Score suggest that the MCID may actually be lower, at 3 points. Pisceans were also less likely to be satisfied with the outcome of their knee, which supports the potential clinically significant effect they experience due to the lower improvement in their knee-specific outcome.

Pisces is the final sign of the zodiac (19 February to 20 March), spanning 330 to 360 degrees of celestial longitude,[27] and along with Scorpio and Cancer is a water sign. Its symbol is two fish tied to one another, but swimming in opposite directions amid shifting emotional desires, plagued by conflict and extremes of temperament.[7] The great advocate of science and astrology, Cosmopolitan,[7] concluded that Pisceans feel everything more deeply and are thin-skinned in a cruel world.

Abdel-Khalek and Lester[28] found Pisceans to be significantly more anxious than other star signs, a psychological trait associated with poorer OKS at 1 year following TKA.[29] Pisceans also tend to be more sensitive and emotional than other star signs,[30] consistent with other studies reporting that individuals with greater emotional instability were significantly more likely to be dissatisfied, to experience greater psychological distress and to have poorer coping skills in times of stress.[21,31]

In contrast to the poor OKS and satisfaction scores, Pisceans enjoyed an equal improvement in their HRQoL, which begs the question—are these findings real, or is this simply a red herring?

In the current study, three different outcome measures were assessed at three different time points, six different statistical tests were performed for the 12 zodiac signs and three regression models were undertaken. Pisces was caught in the net at several time points in different statistical tests and we therefore believe that the results represent a real association. Whether there is causation is a different matter, and there is the possibility that our findings may be due to multiplicity or chance given the number of analyses that were performed, so our findings on Pisces must therefore be taken with a pinch of salt (and possibly a dash of vinegar!).

In contrast to Pisces, Aries is the first sign of the zodiac (21 March to 19 April), spanning the first 30 degrees of celestial longitude,[27] and along with Sagittarius and Leo is a fire sign. The symbol is the ram, with a brave, competitive, tenacious ability to climb to the top of the mountain.[7] Perhaps these attributes help Aries to overcome the initial vagaries of TKA, achieving the greatest post-operative improvement in HRQoL at 1 year. Unsurprisingly, due to the effort involved, they might be expected to run out of steam, as this improvement was not maintained at 2 years.

Limitations of the current study include its retrospective nature, but despite this there were no significant pre-operative differences in patient demographics (age, sex, BMI) or OKS according to zodiac sign, all of which are known to be independent predictors of pain and functional outcome following TKA.[32] Another limitation is the lack of other comorbidity data such as mental health status, diabetes, severity of osteoarthritis and knee malalignment, which are also factors associated with poorer outcomes following TKA.[33–38] Additionally, the study was conducted during the pre-COVID and COVID pandemic period, however, any impact on outcomes was expected to be evenly and randomly distributed across all patient groups.

Our study evaluated the influence of the position of the sun at the time of a person's birth, since this is how astrological dates are determined in the United Kingdom (UK). However, it should be noted that not all astrological calendars use the sun. For example, the Māori calendar (Maramataka) uses different dates by following the movements of the moon over a typical month and year, and there is evidence that moon phases may affect outcomes following surgery.[4] Furthermore, birthplace and religion may have an impact on an individual's astrological sign, and this was not taken into account in the current study. This study may therefore need to be adapted to the local calendar, and further research is required into the effect of different astrological systems on surgical outcomes, accounting for other variables such as birthplace and religion.

The validity of zodiac sign astrology must also be considered. It has been described as a pseudoscience, with little evidence for the existence of relevant relationships between zodiac sign and individual personality traits.[39] The occasional associations in personality between zodiac signs observed in studies[30,40] are thought likely to be accounted for by self-attributions, with individuals believing in astrology attributing personality traits consistent with their zodiac sign to themselves.[1]

Nevertheless, there is no point carping about it, or perching on the fence, and having had the opportunity to mullet over the current study did reveal some significant findings, which cod be of importance to both physicians and sturgeons.

Conclusion

Zodiac sign was associated with outcome following TKA. Pisceans had less improvement in the joint-specific score (OKS) that persisted at 2 years and were less likely to be satisfied with their TKA, despite which they enjoyed an equal improvement in their quality of life. Aries showed the greatest improvement in EQ-5D 1 year after TKA, but this benefit was not maintained at 2 years. Our study shows that an individual's zodiac sign may serve as a useful predictive factor for functional outcomes and satisfaction following TKA. However, our findings are the result of multiple testing in a large dataset following a data trawl, and correlation does not necessarily equal causation even in a real-world registry.

Table 1: Pre-operative patient demographics, Oxford Knee Score (OKS) and EuroQol 5-dimension (EQ-5D), according to zodiac sign.

Star sign	Gender			Age			BMI			OKS			EQ-5D		
	Male	Female	P-value*	Mean	SD	P-value*	Mean	SD	P-value*	Mean	SD	P-value*	Mean	SD	P-value*
Aquarius	17 (45.9%)	20 (54.1%)	0.712	72.8	7.7	0.088	29.9	7.5	0.660	24.3	8.6	0.539	0.557	0.281	0.038
Aries	19 (48.7%)	20 (51.3%)		72.6	7.6		30.8	6.3		20.8	7.7		0.366	0.310	
Cancer	13 (36.1%)	23 (63.9%)		69.7	9.1		29.5	4.4		20.3	7.4		0.459	0.291	
Capricorn	27 (56.3%)	21 (43.8%)		72.6	7.9		31.2	5.2		21.7	9.3		0.471	0.330	
Gemini	16 (34.8%)	30 (65.2%)		70.7	9.3		29.4	4.6		20.0	7.2		0.366	0.314	
Leo	24 (42.9%)	32 (57.1%)		71.7	7.0		31.7	6.4		22.8	7.4		0.474	0.283	
Libra	20 (47.6%)	22 (52.4%)		71.8	6.3		30.2	4.5		21.7	7.7		0.483	0.292	
Pisces	23 (46%)	27 (54%)		70.7	8.0		30.6	5.0		22.4	6.8		0.595	0.234	
Sagittarius	14 (36.8%)	24 (63.2%)		68.9	6.1		30.5	6.0		22.6	8.9		0.492	0.334	
Scorpio	17 (41.5%)	24 (58.5%)		70.9	8.2		30.1	5.5		22.3	7.8		0.500	0.278	
Taurus	22 (50%)	22 (50%)		68.0	7.6		30.1	4.9		20.7	9.3		0.433	0.351	
Virgo	16 (50%)	16 (50%)		71.3	7.8		29.5	3.9		21.4	8.4		0.441	0.332	
Total	228 (44.8%)	281 (55.2%)		70.9	7.8		30.3	5.5		21.8	8.1		0.474	0.306	

* ANOVA corrected for multiple testing for comparison of change between all zodiac signs.

Table 2: Change in Oxford Knee Score (OKS) at 1-year and 2-years post-operative compared to pre-operative values, according to zodiac sign.

Star sign	N	One year				Two years			
		Mean	95% CI	P-value*	P-value**	Mean	95% CI	P-value*	P-value**
Aquarius	37	15.4	12.2 to 18.7	<0.001	0.196	18.2	15.0 to 21.3	<0.001	0.392
Aries	39	18.9	15.8 to 22.1	<0.001		19.8	17.4 to 22.2	<0.001	
Cancer	36	17.8	14.8 to 20.7	<0.001		19.2	15.8 to 22.6	<0.001	
Capricorn	48	18.1	15.6 to 20.5	<0.001		17.0	14.5 to 19.6	<0.001	
Gemini	46	15.5	12.5 to 18.4	<0.001		17.3	14.6 to 20.1	<0.001	
Leo	56	15.3	12.7 to 17.8	<0.001		16.9	14.6 to 19.2	<0.001	
Libra	42	15.9	13.0 to 18.7	<0.001		16.5	14.2 to 18.9	<0.001	
Pisces	50	13.7	11.0 to 16.4	<0.001		14.6	12.0 to 17.2	<0.001	
Sagittarius	38	16.8	13.7 to 19.8	<0.001		16.1	13.0 to 19.1	<0.001	
Scorpio	41	14.8	11.8 to 17.8	<0.001		15.5	12.6 to 18.4	<0.001	
Taurus	44	17.8	15.3 to 20.3	<0.001		17.2	14.1 to 20.3	<0.001	
Virgo	32	18.1	14.8 to 21.5	<0.001		16.4	12.6 to 20.2	<0.001	
Total	509	16.4	15.6 to 17.2	<0.001		17.0	16.2 to 17.8	<0.001	

* Paired Student's t-Test for change in score relative to baseline.
**ANOVA corrected for multiple testing for comparison of change between all zodiac signs.

Table 3: Linear regression models for factors associated with change in Oxford Knee Score (OKS) or EuroQol 5-dimension (EQ-5D) at 1-year and 2-years post-operative compared to pre-operative values.

PROM & timepoint	Variables	B	Lower	Upper	P-value
OKS 1 year	OKS baseline	-0.6	-0.7	-0.5	0.000
	BMI	-0.2	-0.3	0.0	0.015
	Pisces	-2.8	-5.2	-0.4	0.022
OKS 2 years	OKS baseline	-0.6	-0.7	-0.5	0.000
	BMI	-0.3	-0.4	-0.1	0.000
	Pisces	-2.5	-4.8	-0.2	0.035
	Male1Female2	-1.4	-2.8	0.0	0.042
EQ-5D 1 year	EQ-5D baseline	-0.869	-0.952	-0.786	0.000
	OKS baseline	0.006	0.003	0.009	0.000
	Age	0.003	0.001	0.006	0.006
	Aries	0.076	0.007	0.145	0.031
EQ-5D 2 years	EQ-5D baseline	-0.864	-0.951	-0.776	0.000
	OKS baseline	0.005	0.001	0.008	0.005
	BMI	-0.005	-0.009	-0.001	0.008

Table 4: Change in EuroQol 5-dimension (EQ-5D) utility index at 1-year and 2-years post-operative compared to pre-operative values, according to zodiac sign.

Star sign	N	1 year				2 years			
		Mean	95% CI	P-value*	P-value**	Mean	95% CI	P-value*	P-value**
Aquarius	37	0.337	0.213 to 0.461	<0.001	0.113	0.460	0.338 to 0.582	<0.001	0.023
Aries	39	0.411	0.304 to 0.519	<0.001		0.410	0.299 to 0.521	<0.001	
Cancer	36	0.333	0.219 to 0.448	<0.001		0.382	0.260 to 0.503	<0.001	
Capricorn	48	0.322	0.236 to 0.407	<0.001		0.320	0.237 to 0.402	<0.001	
Gemini	46	0.292	0.201 to 0.383	<0.001		0.316	0.207 to 0.426	<0.001	
Leo	56	0.327	0.245 to 0.409	<0.001		0.372	0.292 to 0.451	<0.001	
Libra	42	0.279	0.182 to 0.376	<0.001		0.288	0.195 to 0.382	<0.001	
Pisces	50	0.281	0.191 to 0.370	<0.001		0.257	0.161 to 0.353	<0.001	
Sagittarius	38	0.343	0.245 to 0.441	<0.001		0.337	0.247 to 0.427	<0.001	
Scorpio	41	0.230	0.119 to 0.344	<0.001		0.261	0.167 to 0.355	<0.001	
Taurus	44	0.222	0.163 to 0.281	<0.001		0.224	0.150 to 0.298	<0.001	
Virgo	32	0.430	0.309 to 0.552	<0.001		0.406	0.276 to 0.536	<0.001	
Total	509	0.313	0.286 to 0.341	<0.001		0.332	0.303 to 0.360	<0.001	

*Paired Student's t-Test for change in score relative to baseline.

**ANOVA corrected for multiple testing for comparison of change between all zodiac signs.

Table 5: Patient satisfaction with their total knee arthroplasty (TKA) at 1-year and 2-years post-operative, according to zodiac sign.

Star sign	1 year			2 years		
	Satisfied	Dissatisfied	P-value	Satisfied	Dissatisfied	P-value
Aquarius	35 (95%)	2 (5%)	0.272	34 (92%)	3 (8%)	0.409
Aries	38 (97%)	1 (3%)		37 (95%)	2 (5%)	
Cancer	35 (97%)	1 (3%)		33 (92%)	3 (8%)	
Capricorn	46 (96%)	2 (4%)		44 (92%)	4 (8%)	
Gemini	40 (87%)	6 (13%)		41 (89%)	5 (11%)	
Leo	54 (96%)	2 (4%)		56 (100%)	0 (0%)	
Libra	40 (95%)	2 (5%)		40 (95%)	2 (5%)	
Pisces	45 (90%)	5 (10%)		42 (84%)	8 (16%)	
Sagittarius	35 (92%)	3 (8%)		34 (90%)	4 (11%)	
Scorpio	38 (93%)	3 (7%)		37 (90%)	4 (10%)	
Taurus	44 (100%)	0 (0%)		40 (91%)	4 (9%)	
Virgo	28 (88%)	4 (13%)		30 (94%)	2 (6%)	
Total	478 (94%)	31 (6%)		468 (92%)	41 (8%)	

Table 6: Logistic regression models for factors associated with patient satisfaction at 6 months, 1-year and 2-years post-operative.

		OR	Lower	Upper	P-value
1 year	EQ-5Dbaseline	7.00	2.28	21.52	0.001
2 years	Age	1.05	1.01	1.09	0.015
	OKS baseline	1.08	1.03	1.13	0.001
	Pisces	0.41	0.17	0.97	0.043

COMPETING INTERESTS

The authors declare that they have no competing interests.

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All available data are provided. Additional data, if needed, may be made available from the corresponding author on reasonable request.

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Impacts of the COVID-19 lockdown on self-reported mood and self-rated health of community-dwelling adults with chronic illness

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ABSTRACT

AIM: To determine whether self-reported mood or self-rated health were affected in community-dwelling adults with chronic illness following COVID-19 lockdown.

METHODS: This was a repeated cross-sectional study using secondary data. We included New Zealanders aged 40+ who underwent International Residential Instrument (interRAI) assessments in the year prior to COVID-19 lockdown (25 March 2019–24 March 2020) or in the year following COVID-19 lockdown (25 March 2020–24 March 2021). Pairwise comparisons were made between each pre-lockdown quarter and its respective post-lockdown quarter to account for seasonality patterns. Data from 45,553 (pre-lockdown) and 45,349 (post-lockdown) assessments were analysed. Outcomes (self-reported mood, self-rated health) were stratified by socio-demographic variables.

RESULTS: Self-reported mood improved in the first quarter post-lockdown among those aged 80+, as well as among women, people of European ethnicity, those living alone and those living in more deprived areas. Self-rated health improved in these same groups, as well as among those aged 65–79, and among men. No differences in self-reported mood or self-rated health were found in the second, third, or fourth quarters post-lockdown.

CONCLUSIONS: Self-reported mood and self-rated health of community-dwelling adults with chronic illness were not negatively affected following COVID-19 lockdown, and temporarily improved among some sub-groups. However, the longer-term impacts of the COVID-19 pandemic need to be closely monitored.

KEYWORDS: interRAI, depression, self-rated health, COVID-19, chronic illness.

Introduction

During the COVID-19 pandemic New Zealand implemented some of the strictest physical distancing restrictions in the world, including an initial national lockdown from 25 March 2020–27 April 2020. During this lockdown, residents were required to stay in their homes and were only permitted to leave for essential personal movement.

Previous studies have suggested that this national lockdown negatively affected adults’ mental health. A New Zealand survey conducted during the lockdown found adults aged 18–90 reported higher levels of psychological distress compared to a pre-pandemic national health survey.[1] A second survey of adults aged 18+ conducted between May and June 2020 found all age groups, except the 75+ age group, had higher levels of depressive symptoms than pre-pandemic normative data.[2]

Internationally, there is evidence that these effects were more pronounced in middle-aged and older adults with pre-existing chronic illness. For example, this population had a higher risk of developing depression during the COVID-19 pandemic.[3–8] There have also been reports of physical deterioration among older adults during the pandemic.[9] It is possible that strict lockdown measures could directly or indirectly impact the health and wellbeing of adults with pre-existing chronic illness due to drastic changes to daily routines, physical activities and family and social supports; reduced access to community services; and delays in the treatment of chronic illness.[9–12]

Previous New Zealand studies that investigated the psychological impacts of the COVID-19 pandemic included a relatively small number of older adults and did not specifically target people with chronic illness.[1,2] To avoid these shortcomings, this study aimed to compare self-reported mood and self-rated health among a large cohort of adults with chronic illness in the 12 months before and after the first national COVID-19 lockdown. We utilised routinely collected national health data captured by the International Residential Assessment Instrument (interRAI) during this period (25 March 2019–24 March 2021). interRAI is a comprehensive clinical assessment that determines medical and support needs; this assessment is mandated for all community-dwelling New Zealanders being assessed for publicly funded home support services or aged residential care. Community-dwelling people assessed by interRAI typically have chronic illness and functional impairment. Given the pre-existing high rates of loneliness, depression, and poor/fair self-rated health in the interRAI population,[13] this population is at risk of further decline in their health and wellbeing as a result of the COVID-19 lockdown. To account for seasonality patterns, we used a repeated cross-sectional design whereby we compared all people who underwent an interRAI assessment in the first 3 months following lockdown (25 March–24 June, 2020) with all people who underwent an interRAI assessment during the same 3 months of the previous year (25 March–24 June, 2019). To determine whether any effects of the lockdown were temporary or long-lasting, we repeated this comparison 3–6 months, 6–9 months and 9–12 months post-lockdown (Figure 1).

We hypothesised that the community-dwelling interRAI population in the first year post-lockdown would have worse self-reported mood and self-rated health than those in the comparative pre-lockdown period.

Methods

Setting

This was an observational study of routinely collected national health information. The study population was a continuously recruited national cohort who received an interRAI Home Care assessment (interRAI-HC) or an interRAI Contact Assessment (interRAI-CA) anywhere in New Zealand between 25 March 2019 and 24 March 2021.

The interRAI-CA is a brief assessment that is used as a triage tool to determine the support needs of adults living at home. It contains approximately 50 demographic, clinical and psychosocial measures and is delivered in 20 minutes over the phone. An "urgency for assessment score" determines which individuals progress to an interRAI-HC assessment. The interRAI-HC is an assessment tool that determines whether the individual requires long-term support services while living at home (i.e., household management and/or personal care), or whether their needs are too high to be met in the community and residential care is required. The interRAI-HC contains information on approximately 250 demographic, clinical and psychosocial factors and takes up to 1.5 hours to complete face-to-face. If a person is receiving home care support services and their needs change, they are re-assessed with an interRAI-HC. During the first wave of the COVID-19 pandemic (25 March–30 June, 2020), interRAI-CA was used instead of interRAI-HC assessments, as it is shorter and could be completed over the telephone. All people who access home support services are expected to be captured in this interRAI dataset. The interRAI facility at the Ministry of Health provided access to deidentified data. Ethics approval was obtained from Auckland Health Research Ethics Committee (reference AH2579).

New Zealand had its first confirmed COVID-19 case on 28 February 2020 and went into lockdown on 25 March 2020. Prior to lockdown, there were minimal restrictions on movement. During lockdown, all residents were required to stay in their homes and were only permitted to leave for essential personal movement (e.g., to provide or access essential services). This lockdown ended on 27 April 2020. From this date until the end of our study period (24 March 2021) varying restrictions were in place, but there were no further lockdowns.

Participants

We included all people aged 40+ who received an interRAI-CA (version 9.3.1, New Zealand Customisation) or an interRAI-HC (version 9.1, New Zealand Customisation) between 25 March 2019 and 24 March 2021 and gave consent for their data to be used for research. A previous study using the New Zealand interRAI database reported that 93.1% of people provided consent for research.[14] interRAI data were requested from Technical Advisory Services. Participant flow is illustrated in Figure 2.

Adults assessed for home support services typically have long-term physical illness and functional impairment. Referrals for initial interRAI-CA are generally made by the individual's general practitioner or to support hospital discharge; however, self-referral is possible. Individuals assessed by interRAI-CA are generally

Figure 1: Study design indicating comparisons between pre- and post-lockdown quarters.

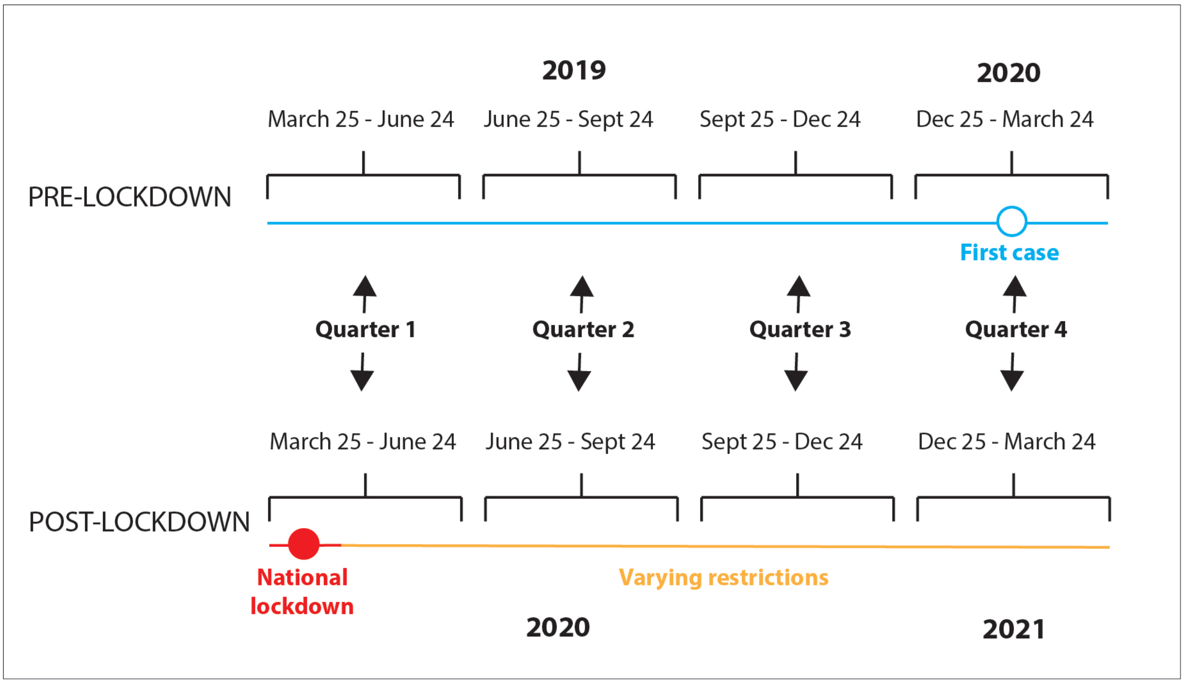
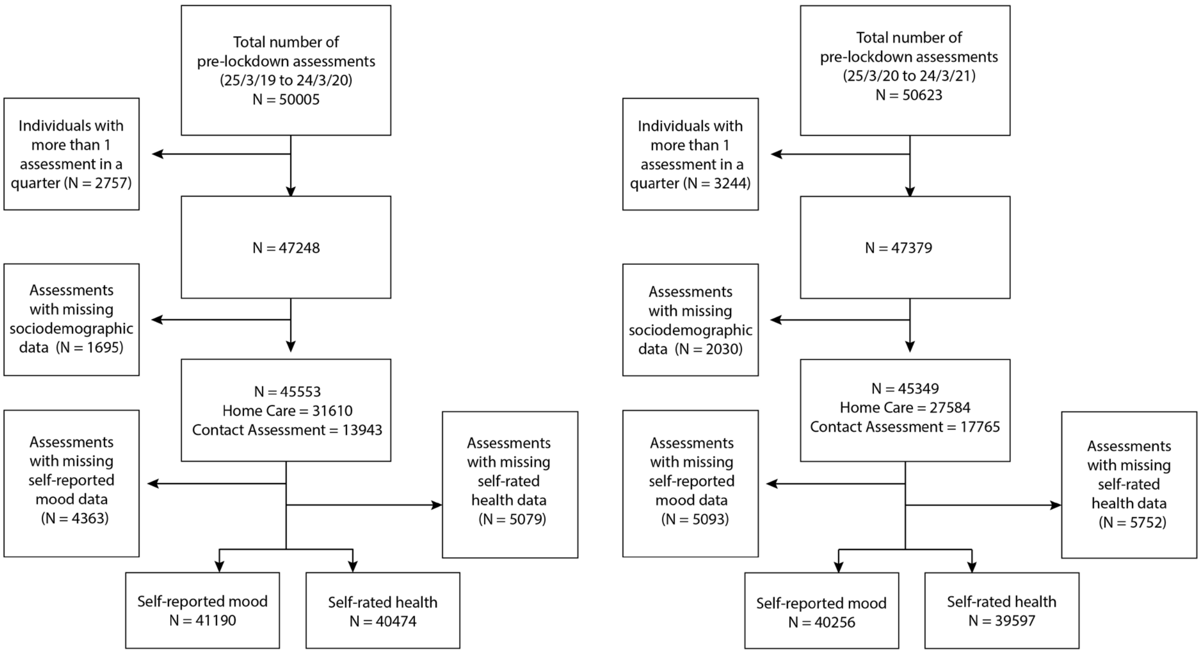


Figure 2: Participant flow in pre- and post-lockdown periods.



aged 65+, but younger people may undergo interRAI assessment if they qualify for disability funding or have long-term support needs for chronic health conditions. Individuals assessed by interRAI-HC fall into one of two categories: either they require long-term support services while living at home, or they are currently living in the community but the interRAI-HC assessment indicates that their needs are high enough to require long-term residential care. There were 36,000 interRAI-HC assessments completed in 2018/2019; 10% and 40% of all New Zealanders aged 65 years and 85 years respectively had an interRAI-HC assessment during this period.[15]

Measures

interRAI assessments are completed by trained interRAI assessors affiliated with healthcare providers and approved agencies. A national competency framework supporting interRAI assessments provides quality assurance, and interRAI assessments have been shown to have good inter-rater reliability.[16]

Self-reported mood

Although more comprehensive measures of mood are included in the interRAI-HC (e.g., the Depression Rating Scale), the only available measure of mood in the interRAI-CA was a single measure of self-reported mood. During the interRAI-CA, individuals are asked "*In the past 3 days, have you felt sad, depressed or hopeless?*" and there are three potential responses: 0 = no; 1 = yes; 8 = person could not (would not) respond. During the interRAI-HC, individuals are asked "*In the last 3 days, how often have you felt sad, depressed, or hopeless?*" and there are five potential responses: 0 = not in the last 3 days; 1 = not in the last 3 days, but often feels that way; 2 = in 1–2 of the last 3 days; 3 = daily in the last 3 days; 8 = person could not (would not) respond. To align these responses, we recoded the responses in the interRAI-HC as: 0 or 1 = no; 2 or 3 = yes. For both assessments, a response of "*Person could not (would not) respond*" was recorded as missing data and excluded from analysis. Therefore, we recorded self-reported mood as a binary variable, defined as whether the individual answered "yes" or "no" to the question, "*In the past 3 days, have you felt sad, depressed or hopeless?*" In a Korean population of older adults accessing home care, self-reported mood as measured by the interRAI-HC had excellent inter-rater reliability (κ=0.87).[17]

Self-rated health

During the interRAI-CA and the interRAI-HC, individuals are asked "*In general, how would you rate your health?*" In both assessments there are five potential responses: 0 = excellent; 1 = good; 2 = fair; 3 = poor; 8 = could not (would not) respond. For the purposes of bivariate analysis of self-rated health, we combined the responses "excellent" and "good" into one category and "fair" and "poor" into another category, with "8" treated as missing data and excluded from analysis. In a Korean population of older adults with home care, self-rated health as measured by the interRAI-HC had excellent inter-rater reliability (κ=0.81).[17]

Socio-demographic variables

Socio-demographic variables comprised age (40–64, 65–79, 80+); gender (female, male); ethnicity in the prioritised order of Māori, Pacific People, Asian, Other, or European; living arrangement (alone, with spouse/partner only, with others); and the New Zealand Deprivation Index (NZDep2013: 1–3, 4–7, 8–10; 1 = the least deprived areas, 10 = the most deprived areas). Age, gender, ethnicity and living arrangement are routinely recorded by the interRAI-CA and the interRAI-HC. interRAI assessments routinely record domicile codes, a classification system used by the New Zealand Health Information Service to describe geographically based administrative units. Each domicile code refers to an area containing a median population of approximately 2,000 people. The domicile code was matched to the NZDep2013 for the area. NZDep2013 was calculated by combining Census information on access to the internet, income, employment, qualifications, owned home, support, living space and access to a car.[18]

Data analysis

R statistical software (version 3.6.0) was used for statistical analysis. Only the first interRAI assessment record of each person in each quarter was used for analysis. Descriptive statistics for self-reported mood and self-rated health were obtained for each of the eight quarters. The results of self-reported mood and self-rated health were stratified by the socio-demographic variables. As shown in Table 1, the socio-demographic data were unbalanced. For example, post-lockdown Quarter 1 had a higher proportion of people aged 80+ years, female, European, living alone, and living in low deprivation areas compared to pre-lockdown Quarter 1. We initially fitted models adjusting for socio-demographic variables and with an interaction between pre- and post-lockdown quarters. Next, we performed Type III Analysis of Variance (ANOVA). Finally, independent sample bivariate analyses with t-Tests were used to compare each of the two primary outcomes in pre-and post-lockdown quarters (Quarter 1, Quarter 2, Quarter 3, Quarter 4). Due to the very large number of comparisons, we set the level of statistical significance at 0.001 for all analyses to minimise type I error.

Results

The total number of interRAI assessments in the community were similar in the pre-lockdown (n=50,005) and post-lockdown (n=50,623) periods (Figure 2). Apart from post-lockdown Quarter 1, approximately 70% of interRAI assessments were conducted using interRAI-HC, while approximately 30% used interRAI-CA (Table 1). In post-lockdown Quarter 1, in-person interRAI-HC assessments were reduced to approximately 40%, while interRAI-CA increased to approximately 60% of total interRAI assessments. Table 1 presents the socio-demographic details of people who had interRAI assessments completed in each of the pre- and post-lockdown quarters.

Self-reported mood

Table 2 presents the results of self-reported mood in each of the pre- and post-lockdown quarters. A lower proportion of the 80+ years old age group (18.9% vs 22.9%, p<.001), women (22.2% vs 26.5%, p<.001), European (22.5% vs 26.0%, p<.001), people who lived alone (21.1% vs 25.8%, p<.001) and people who lived in the NZ Deprivation Index 4–7 areas (22.1% vs 25.8%, p<.001) and 8–10 areas (22.7% vs 26.2%, p<.001) reported sad/depressed/hopeless moods in post-lockdown Quarter 1, relative to pre-lockdown Quarter 1. There were no statistically significant changes in self-reported mood in the second, third or fourth post-lockdown quarters.

Self-rated health

Table 3 presents the results of self-rated health in each of the pre- and post-lockdown quarters. A lower proportion of the 65–79 years old age group (49.9% vs 55.4%, p<0.001), 80+ years old age group (38.7% vs 45.9%, p<.001), women (41.8% vs 49.9%, p<.001), men (48.3% vs 52.3%, p<.001), European (42.4% vs 49.4%, p<.001), people who lived alone (39.6% vs 49.0%, p<.001) and people who lived in the more deprived areas (NZ Deprivation Index 4–7: 43.0% vs 49.7%, p<0.001; NZ Deprivation Index 8—10: 44.8% vs 53.5%, p<.001) reported fair or poor health in post-lockdown Quarter 1, relative to pre-lockdown Quarter 1. There were no statistically significant changes in self-rated health in the second, third, or fourth post-lockdown quarters.

Discussion

This is the first investigation of the psychological impacts of the COVID-19 lockdown on a cohort of adults with chronic illness in New Zealand. To maximise cohort size, we utilised routinely collected national health data captured by interRAI. interRAI-HC and interRAI-CA are routinely used assessments for community-dwelling people with chronic illness who require support services. Given the many potential negative consequences of the COVID-19 lockdown on the health of people with chronic illness, we hypothesised that the community-dwelling interRAI population in the first year of the COVID-19 pandemic would have worse self-reported mood and self-rated health than those in the comparative pre-lockdown period. However, we found no decreases in self-reported mood or self-rated health in the first, second, third, or fourth post-lockdown quarters.

Unexpectedly, we found the 80+ age group, women, Europeans, people who lived alone and people who lived in more deprived areas had *improved* self-reported mood and self-rated health in the first post-lockdown quarter relative to the comparative pre-lockdown period. These groups appear to have "benefitted" from the COVID-19 lockdown and its physical distancing restrictions in the first post-lockdown quarter from 25 March to 24 June 2020. This finding may be explained by the increased supports that were put in place during the COVID-19 lockdown. A New Zealand study suggested there were "silver linings" with improved social cohesiveness during the COVID-19 lockdown.[19] There were examples of increased support for some older adults and people living alone as New Zealand Government agencies, not-for-profit community organisations and academics joined forces to develop strengths-based messages and interventions that addressed the psychological and emotional needs, social connection and social recognition of older adults.[20] Healthcare providers also used innovative ways to deliver services to older adults during lockdowns. For example, dementia community sup-

Table 1: Socio-demographic details of the community-dwelling interRAI populations in pre- and post-lockdown periods.

		Quarter 1		**Quarter 2**		**Quarter 3**		**Quarter 4**	
		Pre-lockdown N (%)	**Post-lockdown N (%)**	**Pre-lockdown N (%)**	**Post-lockdown N (%)**	**Pre-lockdown N (%)**	**Post-lockdown N (%)**	**Pre-lockdown N (%)**	**Post-lockdown N (%)**
Total number of assessments		11,920	12,336	12,685	11,791	11,134	11,119	9,814	10,103
Number of home care assessments		8,208 (68.9)	4,656 (37.7)	8,793 (69.3)	8,147 (69.1)	7,784 (69.9)	7,716 (69.4)	6,825 (69.5%)	7,065 (69.9)
Number of contact assessments		3,712 (31.1)	7,680 (62.3)	3,892 (30.9)	3,644 (30.9)	3,350 (30.1)	3,403 (30.6)	2,989 (30.5)	3,038 (30.1)
Age									
	40–64	633 (5.3)	466 (3.8)	629 (5.0)	631 (5.4)	599 (5.4)	675 (6.1)	508 (5.2)	568 (5.6)
	65–79	4,549 (38.2)	4,574 (37.1)	4,773 (37.6)	4,541 (38.5)	4,275 (38.4)	4,346 (39.1)	3,769 (38.4)	3,856 (38.2)
	80+	6,738 (56.5)	7,296 (59.1)	7,283 (57.4)	6,619 (56.1)	6,260 (56.2)	6,098 (54.8)	5,537 (56.4)	5,679 (56.2)
Gender									
	Female	7,306 (61.3)	7,900 (64.0)	7,705 (60.7)	7,096 (60.2)	6,765 (60.8)	6,693 (60.2)	6,027 (61.4)	6,013 (59.5)
	Male	4,614 (38.7)	4,436 (36.0)	4,980 (39.3)	4,695 (39.8)	4,369 (39.2)	4,426 (39.8)	3,787 (38.6)	4,090 (40.5)
Ethnicity									
	European	10,039 (84.2)	10,700 (86.7)	10,720 (84.5)	9,875 (83.8)	9,373 (84.2)	9,167 (82.4)	8,357 (85.2)	8,489 (84.0)
	Māori	877 (7.4)	712 (5.8)	908 (7.2)	883 (7.5)	815 (7.3)	891 (8.0)	705 (7.2)	765 (7.6)
	Pacific	397 (3.3)	355 (2.9)	461 (3.6)	418 (3.6)	420 (3.8)	408 (3.7)	275 (2.8)	328 (3.3)
	Asian	540 (4.5)	505 (4.1)	542 (4.3)	569 (4.8)	472 (4.2)	593 (5.3)	433 (4.4)	480 (4.8)
	Other	67 (0.6)	64 (0.5)	54 (0.4)	46 (0.4)	54 (0.5)	60 (0.5)	44 (0.5)	41 (0.4)

Table 1 (continued): Socio-demographic details of the community-dwelling interRAI populations in pre- and post-lockdown periods.

		Quarter 1		Quarter 2		Quarter 3		Quarter 4	
		Pre-lockdown N (%)	**Post-lockdown N (%)**	**Pre-lockdown N (%)**	**Post-lockdown N (%)**	**Pre-lockdown N (%)**	**Post-lockdown N (%)**	**Pre-lockdown N (%)**	**Post-lockdown N (%)**
Living arrangement									
	Alone	5,684 (47.7)	6,755 (54.8)	6,193 (48.8)	5,801 (49.2)	5,491 (49.3)	5,245 (47.2)	4,806 (49.0)	4,802 (47.5)
With spouse/partner only		3,741 (31.4)	3,251 (26.4)	3,752 (29.6)	3,423 (29.0)	3,312 (29.8)	3,381 (30.4)	2,987 (30.4)	3,100 (30.7)
	Other	2,495 (20.9)	2,330 (18.9)	2,740 (21.6)	2,567 (21.8)	2,331 (20.9)	2,493 (22.4)	2,021 (20.6)	2,201 (21.8)
NZ Deprivation Index									
	1–3	2,500 (21.0)	2,470 (20.0)	2,590 (20.4)	2,403 (20.4)	2,277 (20.5)	2,340 (21.1)	2,116 (21.6)	2,276 (22.5)
	4–7	5,384 (45.2)	5,395 (43.73)	5,594 (44.1)	5,319 (45.1)	4,870 (43.7)	4,930 (44.3)	4,394 (44.8)	4,449 (44.0)
	8–10	4,036 (33.9)	4,471 (36.24)	4,501 (35.5)	4,069 (34.5)	3,987 (35.8)	3,849 (34.6)	3,304 (33.7)	3,378 (33.4)

Table 2: Type III Analysis of Variance and bivariate analysis of self-reported mood of the interRAI population in pre- and post-lockdown periods.

	Quarter 1			Quarter 2			Quarter 3			Quarter 4		
	Pre-lockdown	**Post-lockdown**	**P-value***	**Pre-lockdown**	**Post-lockdown**	**P-value***	**Pre-lockdown**	**Post-lockdown**	**P-value***	**Pre-lockdown**	**Post-lockdown**	**P-value***
	N (%)	**N (%)**		**N (%)**	**N (%)**		**N (%)**	**N (%)**		**N (%)**	**N (%)**	
Total number of assessments	10,758	10,865		11,485	10,499		10,098	9,935		8,849	8,957	
Self-reported mood: "In the last 3 days, have you felt sad, depressed or hopeless?"												
Age[1]												
40–64	249 (43.8)	153 (39.8)	0.234	238 (42.4)	236 (41.9)	0.932	239 (43.5)	248 (42.5)	0.802	188 (42.2)	195 (39.2)	0.399
65–79	1,126 (27.4)	1,059 (26.2)	0.232	1,193 (27.7)	1,194 (29.7)	0.046	1,155 (30.2)	1,164 (30.1)	1.000	1041 (30.8)	975 (28.9)	0.091
80+	1,395 (22.9)	1,217 (18.9)	<0.001	1,438 (21.7)	1,360 (23.0)	0.097	1,293 (22.6)	1,216 (22.2)	0.575	1,143 (22.8)	1,120 (22.0)	0.392
Gender[2]												
Female	1,780 (26.5)	1,584 (22.2)	<0.001	1,824 (25.8)	1,781 (27.8)	0.010	1,714 (27.5)	1,680 (27.8)	0.754	1,570 (28.5)	14,71 (27.3)	0.161
Male	990 (24.5)	845 (22.6)	0.053	1,045 (23.7)	1,009 (24.7)	0.291	973 (25.3)	948 (24.4)	0.446	802 (24.0)	819 (23.0)	0.326
Ethnicity[3]												
European	2,380 (26.0)	2,143 (22.5)	<0.001	2,457 (25.0)	2,385 (26.8)	0.007	2,294 (26.7)	2,212 (26.7)	1.000	2,041 (26.8)	1,965 (25.8)	0.153
Māori	107 (23.6)	100 (25.0)	0.684	122 (27.4)	127 (27.7)	0.975	119 (30.0)	123 (24.5)	0.075	114 (30.8)	96 (24.4)	0.056
Pacific	216 (28.2)	132 (22.1)	0.013	195 (24.8)	194 (25.6)	0.745	195 (27.2)	214 (28.2)	0.724	163 (27.1)	179 (27.9)	0.799
Asian	43 (13.2)	38 (14.5)	0.746	80 (20.7)	74 (21.8)	0.772	65 (18.8)	58 (17.3)	0.676	42 (18.7)	40 (15.2)	0.370

Table 2 (continued): Type III Analysis of Variance and bivariate analysis of self-reported mood of the interRAI population in pre- and post-lockdown periods.

	Quarter 1			Quarter 2			Quarter 3			Quarter 4		
	Pre-lockdown	Post-lockdown	P-value*	Pre-lockdown	Post-lockdown	P-value*	Pre-lockdown	Post-lockdown	P-value*	Pre-lockdown	Post-lockdown	P-value*
	N (%)	N (%)		N (%)	N (%)		N (%)	N (%)		N (%)	N (%)	
Other	24 (37.5)	16 (27.1)	0.301	15 (31.9)	10 (28.6)	0.934	14 (32.6)	21 (40.4)	0.566	12 (31.6)	10 (29.4)	1.000
Living arrangement[4]												
Alone	1,389 (25.8)	1,331 (21.1)	<0.001	1,449 (24.7)	1,459 (26.8)	0.009	1,370 (26.3)	1,284 (26.2)	0.967	1,246 (27.4)	1,147 (25.6)	0.048
With spouse/partner only	853 (25.7)	632 (23.2)	0.026	804 (24.4)	771 (26.0)	0.168	761 (26.1)	773 (26.4)	0.815	673 (25.6)	668 (25.2)	0.731
With others	528 (25.5)	466 (25.6)	1.000	616 (26.5)	560 (26.7)	0.906	556 (28.3)	571 (27.1)	0.413	453 (27.0)	475 (26.2)	0.601
NZ Deprivation Index[5]												
1–3	552 (24.9)	469 (22.2)	0.040	556 (24.0)	563 (26.5)	0.063	542 (26.5)	535 (25.9)	0.704	521 (27.4)	502 (25.6)	0.220
4–7	1,260 (25.8)	1,054 (22.1)	<0.001	1,274 (25.1)	1,223 (25.8)	0.485	1,181 (26.7)	1,168 (26.4)	0.778	1,055 (26.5)	1,011 (25.3)	0.221
8–10	958 (26.2)	906 (22.7)	<0.001	1,039 (25.4)	1,004 (27.7)	0.021	964 (26.6)	925 (26.8)	0.828	796 (26.8)	777 (25.9)	0.447

* Bivariant analysis t-test

[1] Type III ANOVA p-values: Quarter 1<0.001; Quarter 2=0.013; Quarter 3=0.607; Quarter 4=0.048

[2] Type III ANOVA p-values: Quarter 1<0.001; Quarter 2=0.007; Quarter 3=0.830; Quarter 4=0.081

[3] Type III ANOVA p-values: Quarter 1<0.001; Quarter 2=0.007; Quarter 3=0.774; Quarter 4=0.067

[4] Type III ANOVA p-values: Quarter 1<0.001; Quarter 2=0.007; Quarter 3=0.769; Quarter 4=0.060

[5] Type III ANOVA p-values: Quarter 1<0.001; Quarter 2=0.007; Quarter 3=0.806; Quarter 4=0.060

Table 3: Type III Analysis of Variance and bivariate analysis of self-rated health of the interRAI population in pre- and post-lockdown periods.

	Quarter 1			Quarter 2			Quarter 3			Quarter 4		
	Pre-lock-down	Post-lock-down	P-value*	Pre-lock-down	Post-lock-down	P-value*	Pre-lock-down	Post-lock-down	P-value*	Pre-lock-down	Post-lock-down	P-value*
	N (%)	N (%)		N (%)	N (%)		N (%)	N (%)		N (%)	N (%)	
Total number of assessments	10,577	10,665		11,299	10,326		9,893	9,754		8,705	8,852	
Self-reported health: fair/poor												
Age[1]												
40–64	374 (71.5)	262 (73.8)	0.503	383 (73.5)	377 (71.3)	0.456	371 (70.9)	399 (72.4)	0.639	303 (71.8)	333 (69.2)	0.441
65–79	2,248 (55.4)	1,971 (49.9)	<0.001	2,336 (54.6)	2,168 (54.8)	0.923	2,081 (55.0)	2,206 (57.8)	0.015	1,864 (55.8)	1,852 (55.3)	0.735
80+	2,753 (45.9)	2,463 (38.7)	<0.001	3,092 (47.6)	2,669 (45.7)	0.043	2,594 (46.4)	2,478 (46.0)	0.672	2,301 (46.6)	2,306 (45.9)	0.515
Gender[2]												
Female	3,281 (49.9)	2,925 (41.8)	<0.001	3,471 (49.8)	3,094 (49.1)	0.417	3,034 (49.7)	3,036 (51.0)	0.181	2,731 (50.3)	2,604 (49.1)	0.197
Male	2,094 (52.3)	1,771 (48.3)	<0.001	2,340 (54.1)	2,120 (52.7)	0.227	2,012 (53.1)	2,047 (53.9)	0.471	1,737 (53.0)	1,887 (53.2)	0.852
Ethnicity[3]												
European	4,456 (49.4)	3,992 (42.4)	<0.001	4,845 (50.2)	4,328 (49.3)	0.202	4,215 (49.9)	4,076 (50.0)	0.929	3,741 (50.0)	3,748 (49.6)	0.627
Māori	297 (65.9)	221 (57.6)	0.017	309 (70.4)	280 (63.5)	0.036	252 (66.0)	328 (69.2)	0.352	246 (69.5)	234 (61.6)	0.030
Pacific	419 (56.5)	314 (54.3)	0.470	416 (52.8)	419 (56.2)	0.192	372 (53.5)	461 (61.7)	0.002	341 (56.0)	366 (57.5)	0.643

Table 3 (continued): Type III Analysis of Variance and bivariate analysis of self-rated health of the interRAI population in pre- and post-lockdown periods.

	Quarter 1			Quarter 2			Quarter 3			Quarter 4		
	Pre-lockdown	Post-lockdown	P-value*	Pre-lockdown	Post-lockdown	P-value*	Pre-lockdown	Post-lockdown	P-value*	Pre-lockdown	Post-lockdown	P-value*
	N (%)	N (%)		N (%)	N (%)		N (%)	N (%)		N (%)	N (%)	
Asian	165 (53.2)	138 (56.6)	0.486	213 (56.5)	168 (52.2)	0.285	177 (55.3)	184 (57.3)	0.665	122 (56.0)	123 (51.5)	0.385
Other	38 (64.4)	31 (58.5)	0.654	28 (59.6)	19 (57.6)	1.000	30 (68.2)	34 (64.2)	0.840	18 (48.7)	20 (60.6)	0.446
Living arrangement[4]												
Alone	2,603 (49.0)	2,482 (39.6)	<0.001	2,899 (49.9)	2,636 (49.1)	0.393	2,537 (49.2)	2,452 (50.4)	0.246	2,222 (49.5)	2,164 (48.6)	0.405
With spouse/partner only	1,665 (51.2)	1,299 (49.0)	0.099	1,679 (52.1)	1,490 (51.0)	0.408	1,492 (52.4)	1,505 (52.3)	0.986	1,341 (52.0)	1,360 (51.3)	0.634
With others	1,107 (55.0)	915 (52.6)	0.140	1,233 (54.4)	1,088 (53.5)	0.578	1,017 (53.8)	1,126 (55.9)	0.186	905 (55.2)	967 (55.2)	1.000
NZ Deprivation Index[5]												
1–3	1,061 (48.8)	934 (45.0)	0.012	1,119 (49.7)	1,056 (50.7)	0.516	980 (48.9)	979 (48.9)	1.000	878 (47.5)	960 (49.6)	0.213
4–7	2,379 (49.7)	2,015 (43.0)	<0.001	2,552 (51.2)	2,284 (49.0)	0.031	2,184 (50.6)	2,205 (50.6)	0.987	2,010 (51.2)	1,949 (49.2)	0.079
8–10	1,935 (53.5)	1,747 (44.8)	<0.001	2,140 (52.7)	1,874 (52.3)	0.774	1,882 (52.7)	1,899 (55.9)	0.008	1,580 (53.9)	1,582 (53.6)	0.806

* Bivariant analysis t-test

[1] Type III ANOVA p-values: Quarter 1<0.001; Quarter 2=0.101; Quarter 3=0.191; Quarter 4=0.363
[2] Type III ANOVA p-values: Quarter 1<0.001; Quarter 2=0.158; Quarter 3=0.127; Quarter 4=0.371
[3] Type III ANOVA p-values: Quarter 1<0.001; Quarter 2=0.143; Quarter 3=0.226; Quarter 4=0.390
[4] Type III ANOVA p-values: Quarter 1<0.001; Quarter 2=0.179; Quarter 3=0.156; Quarter 4=0.382
[5] Type III ANOVA p-values: Quarter 1<0.001; Quarter 2=0.183; Quarter 3=0.104; Quarter 4=0.448

port services used video-conferencing to deliver evidence-based group treatment for people with dementia, which provided social connection for them and their carers.[21] It is possible these community strategies put in place to "reach out" to people during lockdowns benefitted some of our study population.

It is also possible that New Zealand's explicit use of an "elimination strategy" mitigated the potential negative consequences of COVID-19 lockdown on wellbeing. The stated aim of New Zealand's first lockdown from 25 March 2020 was to eliminate COVID-19 in the community, thereby allowing a return to near normality.[22] This approach may have mitigated some of the negative consequences experienced by populations that experienced multiple successive lockdowns with a focus on suppression, rather than elimination. However, a global comparison between countries that pursued elimination versus countries that pursued suppression suggested that an elimination strategy was associated with a small decrease in mental health (psychological distress and life evaluations).[23] Further investigation into the relative merits of elimination and suppression strategies with respect to mental health outcomes is warranted.

New Zealand experienced one of the lowest cumulative COVID-19 case counts, incidence and mortality in its first wave of COVID-19 due to the timely implementation and rapid escalation of COVID-19 elimination strategies.[24] These strategies resulted in an unprecedented reduction of influenza and other respiratory viral infections in 2020,[25] which could have led to better health status and self-rated health in adults with chronic illness. However, we cannot definitively explain why self-reported mood and self-rated health improved in the 80+ age group, women, Europeans, people who lived alone, and people who lived in more deprived areas in the first post-lockdown quarter. It would be useful to determine whether similar findings were observed in subsequent lockdowns.

The lack of any negative effect on self-reported mood and self-rated health in the first year of the COVID-19 pandemic in this study may be explained by resilience in older adults. Older adults have been shown to be more psychologically resilient than young adults, particularly in the domains of emotional regulation and problem solving.[26] Two New Zealand surveys conducted within the first few months of the COVID-19 pandemic and two international literature reviews concluded that older adults had lower levels of depression and psychological distress and fewer negative psychological outcomes than younger age groups.[1,2,9,27] A UK study of middle-aged and older adults also found older age was a protective factor for depression in women during the COVID-19 pandemic.[6] A European study of adults aged 50+ used a within-subject design to examine self-reported depression between 2005 and 2017 and directly following the first wave of the COVID-19 pandemic in 2020.[28] It reported changes in self-reported depression prior to the pandemic were not significant across 11 European countries, but decreased by 14.5% across all countries between 2017 and 2020. A study in Hong Kong showed that loneliness, anxiety and insomnia in older patients with multi-morbidity deteriorated markedly after the COVID-19 pandemic. However, the level of depression did not change significantly, with 62.4% and 60.2% of participants scoring within the normal range on the Patient Health Questionnaire 9 before and after the COVID-19 pandemic, respectively.[29]

Strengths and limitations

Our study has a large sample size of 45,349 adults aged 40+ years in the first year of the COVID-19 pandemic, compared to 45,553 adults aged 40+ in the preceding year. It is also one of the first studies that has used a globally validated assessment tool and nationwide data to examine the impact of COVID-19 on people accessing publicly funded home support services.

However, there are limitations to this study. First, interRAI assessment forms part of the process for government-funded support in order for the person to stay safely at home; our findings may not be able to be extrapolated to people with chronic illness that did not have an interRAI assessment. Second, we decided not to use a longitudinal study design because the interRAI population in the year before lockdown was not identical to the population assessed post-lockdown, so it was not possible to "pair" measurements for analyses. Instead, we used all available data and treated the pre- and post-COVID interRAI populations as two separate samples. Other New Zealand studies have used similar study designs to compare COVID-19 data with 2019 data.[30,31] Third, this study used a single question of self-reported mood as an outcome. We could not use the Depression Rating Scale as it is not available in the interRAI-CA. A previous study found the interRAI-CA self-reported mood question was poorly correlated with the Depression Rating Scale.[32] Nevertheless, other single item depression questions have reasonable psychometric properties,[33,34] and one was used in a longitudinal study on the impact of COVID-19 on depression.[28] Fourth, unlike interRAI-HC, interRAI-CA does not routinely record physical comorbidities or generate an activities of daily living functional scale. Therefore, we could not adjust our analysis to these variables. Fifth, a higher proportion of interRAI-CA assessments were completed in the first post-lockdown quarter, because face-to-face assessments were limited during the lockdown. Since interRAI-CA is conducted over the telephone, it does not include clinical observations that could assist in detecting depressed mood and subjective poor health amongst the interRAI population. Finally, our analyses were limited by missing data in routinely collected health records.

Conclusion

Self-reported mood and self-rated health of the New Zealand interRAI population were not negatively affected in the first year of the COVID-19 pandemic. The oldest people (80+ years), women, Europeans, people who lived alone and people who lived in more deprived areas had improved self-reported mood and self-rated health in the first post-lockdown quarter relative to the comparative pre-lockdown period. A number of factors may explain these findings including resilience reserve, improved social and community cohesiveness, and community strategies put in place to “reach out” to people during the COVID-19 lockdown.

COMPETING INTERESTS

The authors declare that there is no conflict of interest.

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The need to nurture Aotearoa New Zealand's healthcare workforce

Elizabeth Fenton, Cervantée E K Wild, José G B Derraik, Cameron Grant, Yvonne Anderson

ABSTRACT

This commentary examines the ethical significance of recently published research demonstrating the extent to which healthcare workers experienced stress and increased challenges in the workplace due to inadequate access to personal protective equipment (PPE) during the first COVID-19 surge in Aotearoa New Zealand. The inadequate state of New Zealand's PPE stockpile and distribution system at the beginning of the pandemic was a critical signal, a "canary in the coalmine", of broader challenges facing the New Zealand healthcare system, particularly for healthcare worker safety and wellbeing.

As New Zealand reforms its health system with the aim of improving access to and equity of care, an opportunity exists to apply critical lessons learnt from the COVID-19 pandemic about the need to prioritise the wellbeing of the healthcare workers we are dependent upon to deliver that care. Failure to apply this new knowledge will see the system similarly unprepared for future public health emergencies, which are likely to be imminent, and potentially with healthcare workers less willing to accept the burdens placed on them.

The Nurture Framework, which has emerged from the voices of healthcare workers within this research, should be adopted as part of health reforms and ongoing emergency preparedness planning. Trust, transparency, respect and safety, the four values of the Framework, are fundamental for all workers who contribute their skills, knowledge and time to our healthcare organisations.

Like many countries, Aotearoa New Zealand is in the midst of a health workforce crisis.[1–4] Long-term staff shortages across health professions have been exacerbated by the COVID-19 pandemic, which has significantly increased stressors experienced by the workforce, both here and globally.[5–7] COVID-19 response strategies continue to evolve in response to new variants of the virus and to the shifting societal attitudes related to acceptability of restrictive public health interventions. The ongoing impact of the pandemic on the healthcare system and the health workforce should not be underestimated.

Recently published research shows the extent to which healthcare workers experienced anxiety and increased stress in the workplace due to inadequate access to personal protective equipment (PPE) during the first COVID-19 surge in New Zealand.[8,9] The inadequate state of New Zealand's PPE stockpile and distribution system at the beginning of the pandemic may be a far cry from our current situation, where masks are ubiquitous and supply chains restored. However, it remains a critical signal, a "canary in the coalmine", of broader ongoing challenges within the healthcare system—particularly related to healthcare worker wellbeing, stemming from persistent staffing shortages, high workloads, under-resourcing and burnout.[2–4]

The shortages of PPE during the first COVID-19 surge reflected inadequate stock, inequities in distribution and complacency in preparedness and planning, as well as other ethical and practical concerns.[10,11] A survey of over 1,400 healthcare workers, representative of a range of regions and specialties in New Zealand, showed that many healthcare workers were adversely affected by shortfalls in PPE provision, viewed as further demonstrating their perceived lack of value in the system and the extent to which their safety and wellbeing is compromised even when their skills are most needed. Unsurprisingly, respondents' comments showed links between feeling safe and protected in the workplace and feeling valued and respected as workers and as people. [8]

Public health emergencies force re-examination of moral commitments and obligations, both public and private. Like the SARS epidemic of 2003 and the HIV/AIDS epidemic before that, ethicists have used the COVID-19 pandemic as an opportunity to re-examine the nature of healthcare workers' duties to continue to work and care for patients in situations of increased personal risk. While most ethicists (and health professionals) accept some form of the "duty to treat", the inadequate supply of PPE during the first surges of COVID-19 clarified why that duty has limits. Some scholars have argued that the duty to treat is *contingent on* the provision of adequate PPE, and that where suboptimal PPE is a result of "avoidable allocation decisions," healthcare workers are justified in refusing to provide care.[12] Others have emphasised that insofar as healthcare workers have a duty to treat, healthcare institutions and governments have a *reciprocal obligation* to provide adequate PPE.[13,14] Crucially, other forms of affirmation for the contributions of healthcare workers during a public health emergency, while important for morale, are not substitutes for fulfilling this reciprocal obligation.[13]

Findings of the recent survey conducted with New Zealand healthcare workers show that just over one quarter did not receive adequate PPE from their organisation to enable them to do their jobs, and a similar proportion were told by their organisation not to wear PPE due to stock levels during surge one in 2020.[9] Reusing was also common, with just under half reporting they personally reused PPE.[15] These findings indicate the extent to which healthcare workers are expected to assume personal risks when their organisations are either unwilling or unable to meet their responsibility to mitigate those risks.

Failure on the part of healthcare organisations to meet this responsibility left many workers feeling expendable and under-valued. Past research has highlighted the interweaving of pre-existing tensions within the health system and the "extreme work" required during the pandemic response.[5] The "reality gap" between health management and frontline staff was amplified, with the tension of the moral aspects of frontline healthcare provision and adhering to changing workplace guidelines at times incompatible with staff wellbeing laid bare.[8]

Failures in the provision of PPE were not the only factors contributing to these feelings of a reality gap, as healthcare workers also experienced increased levels of stress and anxiety related to uncertainty. A lack of transparency and honesty about stock levels and the reasoning behind PPE allocation decisions were key indications for many healthcare workers that their organisations did not trust them to use either the information or PPE appropriately.

Alongside this negativity, positive experiences of communication were reported and recognised as critical to building trust and unity in a given organisation.[8] These findings are particularly relevant as Te Whatu Ora – Health New Zealand begins its leadership as the national organisation to deliver health services nationally.[16] One of the stated goals of this reform is to better support healthcare workers.[17] This is critical given the high rates of healthcare worker burnout reported in recent surveys across Australasia.[3–5]

The new knowledge gained from the PPE survey[8,9,15] allows us to draw robust conclusions about the impact on healthcare workers of the shortage of PPE, as well as the wider health system deficiencies that this shortage, and the organisational response to it, draws attention to. The reduction in "organisational slack" in public health services as a result of increased demand and the need for efficiency within austere funding environments already had the potential to negatively impact on healthcare worker health and wellbeing pre-pandemic.[5,18] The inability of healthcare workers to provide the care they perceive as needed—to patients for whom they have responsibilities—results in moral distress and ultimately burnout.[5,8] In a system in which unmet need has been normalised, healthcare workers were expected once again to carry on, assuming the risks of extreme staff shortages and unexpected workload surges, just as they have done with the risks of COVID-19, of pre-existing staff shortages and other long-standing challenges of under-resourcing.

The PPE survey allowed healthcare workers to express their recognition that such expectations are wrong, both morally and practically. We depend on the health workforce to continue contributing their skills during crises; those skills make them instrumentally valuable. But healthcare workers are also human beings, and this makes them *intrinsically* valuable; their welfare is as important as that of the patients for whom they care.[19] We cannot continue to depend on the contributions of healthcare workers unless we (the public, our institutions and our government) meet our obligations to ensure the health system provides a safe, supportive and well-resourced working environment. It is important to acknowledge that these issues are not confined to one country, with studies published internationally showing similar findings.[5,7]

As New Zealand reforms its health system with the aim to improve access to and equity of care for patients, an opportunity is available to prioritise the wellbeing of the healthcare workers we depend on to deliver that care. The analysis of survey responses from healthcare workers highlighted four critical values they hold: trust, transparency, respect and safety. These four values have been organised into the Nurture Framework, a set of recommendations for ensuring that healthcare institutions and organisations exhibit these values in their relationships with health professionals. The Nurture Framework clearly reaches beyond the pandemic.[8] Trust, transparency, respect and safety are fundamental for all workers who contribute their skills, knowledge and time to our healthcare organisations.

One key strength of the Nurture Framework is that its demands are straightforward and achievable—for example, inclusion of healthcare workers in decision making, honest communication, commitment to appropriate occupational health and safety standards, availability of wellbeing services and listening and responding to healthcare workers' concerns. A commitment to this Framework at all levels of healthcare delivery, management and governance would help ensure that the health system can deliver the best outcomes for our communities.

While healthcare has, rightly, become increasingly patient-focussed, a nurturing model encircles healthcare workers with support and care just as healthcare workers encircle patients. While the immediate crisis over PPE has passed, this important research highlights the need for a shift in mindset moving forward: from a top-down, linear model of healthcare delivery to a circular model, with patients supported by the healthcare workforce, the workforce supported and nurtured by the organisations within which they provide healthcare, and the patients actively contributing to improve the ways in which healthcare is delivered to them. Patient-centred care is not possible without a nurtured, engaged and valued healthcare workforce. Simply put, the health and wellbeing of New Zealanders depends on the health and wellbeing of healthcare workers. We should not wait for another health emergency to recognise their importance.

COMPETING INTERESTS
Nil.

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Empagliflozin and dulaglutide: community awareness project promotes improved access to newly funded medications for Pacific patients with type 2 diabetes

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ABSTRACT

AIM: The aims of our awareness campaign were to increase the number of inquiries by patients to doctors for two new diabetes drugs funded by Pharmac on 1 February 2021 and 1 September 2021 respectively, to increase the number of applications for special authority, and to trial a "grass roots" community dissemination of information that appeals to explicit individual benefit from the new medicines. The campaign used an approach tailored primarily to the Pasifika community.

METHODS: The campaign ran from April 2021 to July 2021 and targeted Counties Manukau communities using a talanoa approach by primarily sharing key messages informally through social networks face-to-face by word-of-mouth. The key messages about the new medicines were shared orally with local organisations, family, friends, influential community leaders and colleagues such as justices of peace, kapa haka leaders, committee representatives from local schools, sports, cultural and hobby clubs. A printed pamphlet translated in Māori, Samoan, Tongan and English with the key messages was also distributed widely. The campaign notified 102 primary care practices, used Pacific equity teams to disseminate the information, promoted the message on Māori and Pasifika radio stations, and engaged a public relations company who contacted the South Auckland Community Trust, councillors, community boards and local churches. This approach was intended to spread the message through the community to reach people with type 2 diabetes and/or their families to prompt them to contact their doctor and see if they are eligible. To gauge how effective the campaign was, we gathered data from Pharmac that quantified new prescriptions for the new medicines by location and ethnicity.

RESULTS: An estimated 45,000 people were exposed to our campaign materials or were told about the new medicines by people they knew. These estimations were conservatively based on the known membership, listenership, and reach of the various delivery arms by which this campaign was delivered. These data show Pacific patients, the focus of about 64% of our project work, were 40% more likely to apply and receive a prescription for empagliflozin in Counties Manukau than anywhere else in the country.

CONCLUSION: Direct-to-consumer marketing is an effective way of increasing health awareness and uptake of newly funded diabetes medicine amongst Pacific patients with type 2 diabetes.

Ministry of Health figures estimate there are 286,693 patients with diabetes in Aotearoa New Zealand, 49,140 of whom reside in South Auckland (Counties Manukau District Health Board [DHB]).[1] Counties Manukau DHB patients have predominantly type 2 diabetes and they are predominantly Māori 6,497 (11.9%), Pacific 17,959 (32.5%) and South Asian 7,167 (12.6%), compared with NZ European patients 17,517 (35.6%). Poorer health outcomes have persisted among Māori and Pacific people with type 2 diabetes for more than 20 years.[2] In response to this, more effective and equitable management of type 2 diabetes in New Zealand has been urged by health professionals and health academics.[3,4]

In September 2020, Pharmac announced the funding of two diabetes drugs, empagliflozin and dulaglutide, for the treatment of all type 2 diabetes.[5] These drugs were representative of two new classes of medications, SGLT2 inhibitors and GLP1 receptor agonists that have rapidly become the mainstay of type 2 diabetes management around the world. They are the first diabetes drugs that are shown to modify disease outcomes such as cardiovascular death and progression to end-stage renal failure.[6–8] Compared with traditional treatments (metformin, sulphonylurea & insulin), they are easier to administer, more convenient to take, and they have a more acceptable adverse event profile. They cause weight loss rather than weight gain and they do not cause hypoglycaemia.

Pharmac initially proposed that the new medications should be subject to special authority (SA) application based on cardiovascular risk and risk of diabetes complications. SA is an application process in which a prescriber requests government subsidy on a community pharmaceutical for a particular person. Many groups lobbied Pharmac to extend eligibility to all Māori and Pacific patients irrespective of complication status and comorbidities and this was agreed by Pharmac.[9] However, we were concerned that Pharmac's SA system could still be a barrier-to-care for Māori, Pasifika peoples and people living in high deprivation with inequitable access for prescribing clinicians. Whether or not SA is a barrier-to-care also depends on primary care access to the electronic SA approval mechanism.

The Diabetes Foundation Aotearoa is a community charitable trust established in 1994, whose mission is to reduce the impact of diabetes and its complications in the South Auckland community. The Diabetes Foundation Aotearoa decided to fund and undertake a campaign to ensure as many eligible patients as possible applied for these new medicines or asked their doctor about whether the treatment was suitable for them.

Methods

The campaign targeted communities within the Counties Manukau DHB Region using a talanoa, word-of-mouth approach using a succinct combination of facts, data and language that highlights the *personal* life-enhancing benefits of the medicines. Information on the medicines was spread through the community by influential community leaders and peer-to-peer at its grassroots. Influential community leaders comprised: justices of the peace; kapa haka leaders; chairs/treasurers of cultural and hobby clubs; chairs/secretary of sports clubs; school principals and teachers; health promotion agencies; doctors/nurses; and church ministers.[10] The key components of the message included the following four points:

- if you or one of your family members has diabetes, they may be able to receive 2 new medicines;
- these medicines can significantly improve your health and can delay diabetes-related deaths and need for dialysis by 10–15 years;
- the new medicines have fewer side effects and are much easier to take than existing diabetes medicines;
- please ask your doctor if you qualify for these.

This message about the new medicines and how they can be accessed was passed through local organisations, family, friends, influential community leaders and colleagues. This was intended to spread through the community to reach people with type 2 diabetes their families and ask them to contact their doctor and see if they are eligible.

Twenty-five thousand double-sided "personal impact" leaflets were printed (see Figure 1). The design focussed on everyday life enhancements the medicines could have for individuals and asked those with type 2 diabetes to "call your doctor right now to see if you are eligible". The pamphlets offered translations in Samoan, Tongan, and Māori. Pamphlets were sent out with an explanation kit detailing the Diabetes Foundation Aotearoa efforts and how they can help through spreading the word and the pamphlets. A page on the Diabetes Foundation Aotearoa website was curated which detailed the campaign and presented information about the two new medicines empagliflozin and dulaglutide. It was hoped the webpage would heighten trust and authenticity, alongside giving clarity on the SA process.

Six tertiary health students at AUT University who grew up and lived in Counties Manukau were employed as part of the program. Five students identified as Pacific and one as Asian (Malaysian). They contacted significant and well-known influential community leaders to ask that they pass on the new medicine information to people that they knew. They kept in contact with these influential community leaders to ensure the information was passed on and gave them pamphlets to those who were interested in distributing them in person. The students were very effective. They were keen and proud to disseminate the information to their community. They reported a positive reception from each contact and recorded at least one confirmed subsequent transmission from that contact to another person in their network.

One hundred and two primary care practice clinics in the Counties Manukau Region were identified and notified of the campaign and the new medicines. All Alliance Health Plus Primary Health Organisation clinics received leaflets to spread through their networks and to the Pasifika community via their Pacific Equity team. An email system was developed that allowed patients to easily request an appointment with their general practitioners to determine if they were eligible for the new diabetes medicines. By scanning a QR code printed on the leaflets and graphics on social media using a smartphone, the user was sent to a webpage to select their local health clinic and general practitioner to phone, or to send an appointment request. If they wanted to email, a Google form took their name and phone number and automatically emailed their selected clinic to request an appointment.

Finally, Diabetes Foundation Aotearoa, retained a public relations company (Blackland PR) to assist with the campaign. Blackland PR had previous experience in performing community outreach having successfully promoted two separate vaccine products for pharmaceutical companies. Blackland PR contacted South Auckland community trusts, councillors, and community boards, local churches, sports clubs, and marae for distribution among members and affiliates asking for their help with the awareness project. They also enlisted the help of local radio stations Ake 1179, the official radio station of Ngāti Whātua, and Tama-Ohi Radio, a Tongan community radio station based in Panmure, Manukau.

Results

An estimated 45,000 people received communications about the new medicines by way of this campaign (see Figure 2). A survey was administered by each student employee with at least three influencers (18 in total). The number of people subsequently contacted by the influential community leaders varied greatly. For example, well respected people each reached around five to six people, and church ministers reached over 100 people. From that, we estimate a minimum contact ratio from this approach of at least 1:5 (i.e., for every influential community leader contacted, another five people get the information). We estimate the student outreach passed the information to over 5,000 people of whom 98% were Pasifika. The "natural limit" of influential community leaders is unknown; however, the students felt comfortable that each influencer reached a minimum of 80 contacts.

Public Relations Company Blackland PR reached out to approximately 500 trusts, clubs, community groups, small businesses and individual influencers. They were each sent emails, leaflet packs and phone calls were made to groups. Approximately 15,000 of the leaflets were distributed through these groups of whom 68% were Pasifika based on the ethnic makeup of the area from the 2018 Census. Follow-ups indicated that all leaflets were distributed. The more formalised, sizable, or established an organisation, the more reluctant they were to assist due to COVID-19. They expressed concerns about community engagement with the new medicines due to a focus on the virus or were themselves busy with community matters concerning COVID-19. However, informal community groups did not share the same concerns and were more supportive of this campaign.

Table 1: New prescriptions for empagliflozin for CMDHB compared with all other DHBs. Prescription data are from Pharmac and diabetes information is from the Virtual Diabetes Register.[1]

	CMDHB			All DHBs		
	Māori	**Pacific**	**Other**	**Māori**	**Pacific**	**other**
February 2021	52	121	119	696	374	1,573
March 2021	143	318	259	1,430	790	2,715
April 2021	180	432	286	1,266	713	2,560
May 2021	202	489	337	1,343	754	2,741
June 2021	173	510	293	1,203	678	2,550
July 2021	165	546	325	1,149	663	2,560
Total (%)	915 (18.5)	2,416 (48.8)	1,619 (32.7)	7,087 (27.5)	3,972 (15.4)	14,699 (57.1)
Diabetic population[1]	49,140			286,693		
% of diabetic population	12	32.8	55.2	16.4	13.8	69.8

Figure 1: Personal impact leaflet.

Diabetes Foundation Aotearoa

Important change to diabetes medicines

Two new diabetes medicines have been fully funded that replace some Type-2 Diabetes treatments.

Call your doctor right now to see if you are eligible.

If you are eligible, these new medications will reduce your risk of needing insulin and reduce your risk of dying from heart attack or kidney failure:

Jardiance *(Empagliflozin)*	**Trulicity** *(Dulaglutide)*
One tablet a day Better blood sugar results Lose weight	One injection a week Better blood sugar results Lose weight

Call your doctor now, or **scan here** to book a doctors appointment:

Your usual doctor fee may apply.

For more information visit: www.diabetesfoundationaotearoa.nz

Figure 2: Impact of different modes of information dissemination.

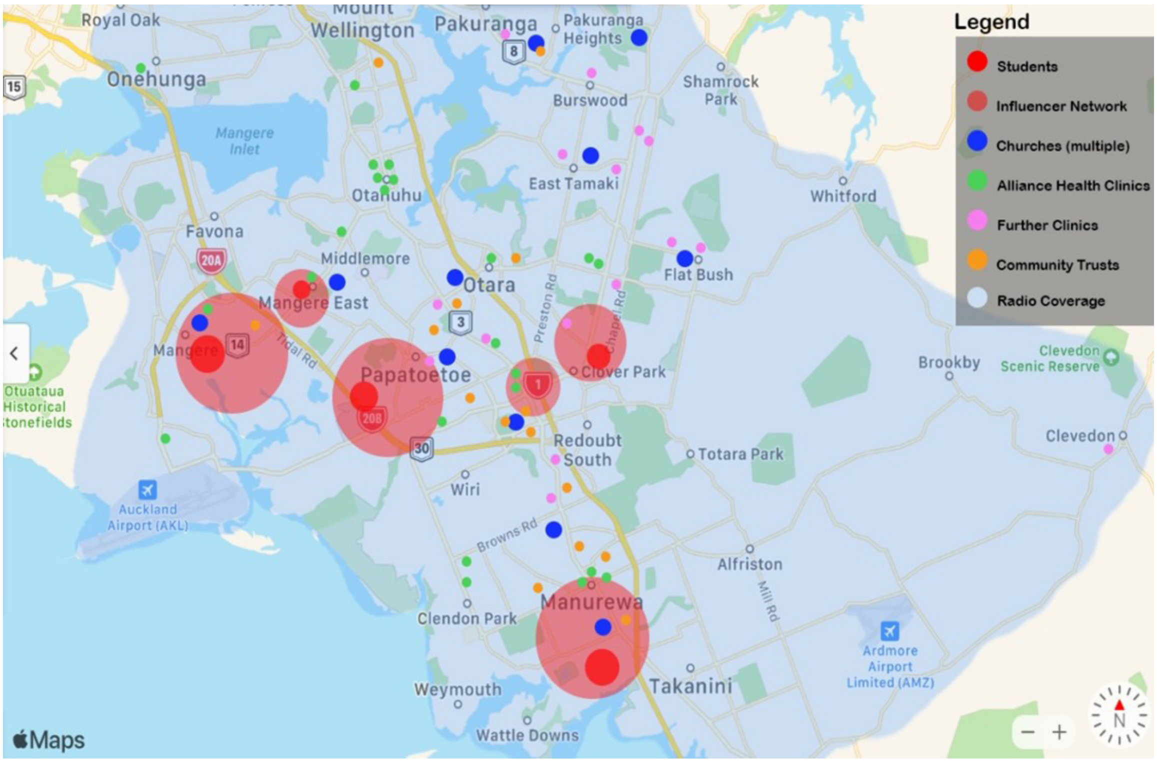


Figure 3: New prescriptions for empagliflozin in Counties Manukau compared with all other DHBs. Results are corrected for prevalence of diabetes and proportion of each ethnic group.

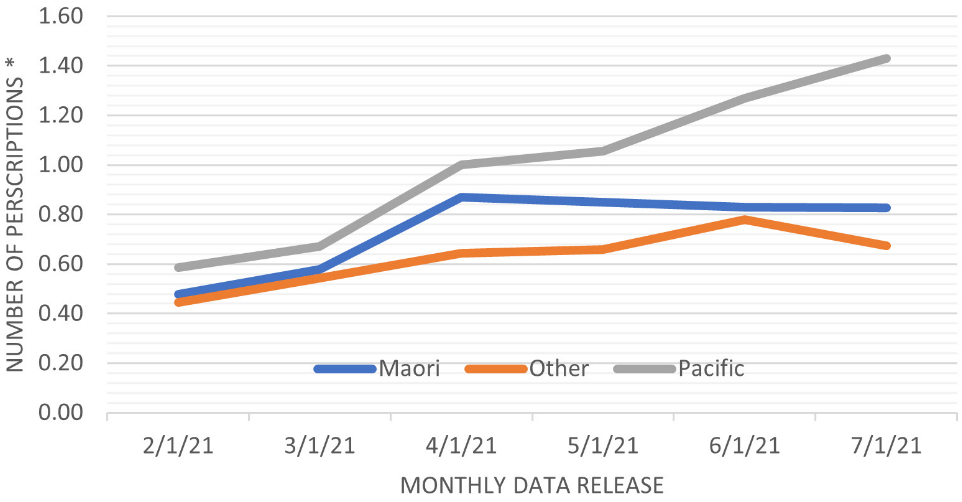
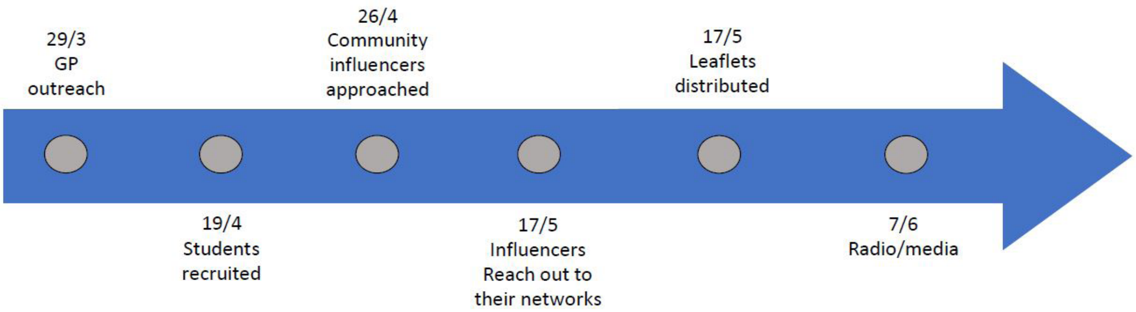


Figure 4: Timeline of community interventions.



An estimated 5,000 people were reached via health clinics of whom 98% were Pasifika and an estimated 20,000 people on listenership (50% Pasifika) were reached via radio networks. Community radio stations broadcast the voice of one of the students delivering a 40 second recording promoting the new medicines. The advertisement called on people with type 2 diabetes to contact their doctor about the new medicines and asked others to spread the word. The message was recorded and played in English, Tongan and Samoan. Each broadcast spanned the Counties Manukau Region.

Diabetes Foundation Aotearoa board members were also interviewed by Pasifika radio stations specifically about the campaign. In contrast to the community-level media interest, mainstream media assistance proved difficult to engage due to New Zealand entering a COVID-19 lockdown during the crucial contacting period of the campaign.

To determine the effectiveness of the campaign we originally planned to monitor SA applications from Counties Manukau suburbs within days of activity compared with the entire country. However, after lengthy negotiations with Pharmac, we were only able to access month-by-month prescription data for the Counties Manukau DHB Region instead. Data were collected from when empagliflozin was first made available on 1 February 2021 to 31 July 2021 for the Counties Manukau DHB Region compared with all other DHBs (see Table 1). Dulaglutide was not available until 1 September 2021, after the study had completed.

After standardising for ethnicity and population numbers, data showed reduced prescriptions for the new medicines for Counties Manukau DHB Region compared with all other DHBs for the first 2 months. Thereafter, there was a relative 40% increase in prescriptions in Pacific patients in Counties Manukau DHB with relatively static numbers in other ethnic groups (see Figure 3).

Discussion

This was a pilot campaign that tested the effectiveness of dissemination of information targeted to the Pasifika community as close as possible at the grass roots, and tested the effectiveness of messages that were clear and explicit about the health benefits to an individual that new medicines offered. Contacts generally perceived the request made to them was to contact people with diabetes that they knew rather than to pass on the information to everyone they knew. These influential community leaders had to be culturally connected to them. Community knowledge, comfort and interest were the important traits.

The data show Pacific patients, the focus of about 64% of the delivery of campaign messages, were 40% more likely to apply and get a prescription in Counties Manukau than anywhere else in the country (Figure 3). The large impact in Pacific patients was higher than anticipated. The Pasifika community in South Auckland have high levels of social connectedness; more so over lockdown when Pasifika radio stations became more prominent as listeners were trying to keep abreast of the latest COVID-19 updates.[11] Word-of-mouth communication is more effective in Pasifika communities as they tend to have more extensive social circles that include large extended family, church, village, sports club and friend networks. The nature of our campaign was informed by “The Fonofale model of health” in that it was holistic, community based, incorporated aspects of culture and family.[12] Key delivery methods of our campaign are also strongly aligned to the Pasifika concept of “talanoa”, which acknowledges the importance of oral communication in communicating important messages to community.[13]

Previous research by Faletau et al.[14] found that Tongan individuals diagnosed with pre-diabetes were poorly cared for by the New Zealand health system. Messages regarding pre-diabetes were not clearly communicated to these individuals meaning that they were not aware that they were diagnosed with pre-diabetes. This caused feelings of disbelief and fear once the diagnoses were clearly explained and understood in the study. Further, there was also no understanding of what pre-diabetes meant and that pre-diabetes was reversible.[14] We are reassured that in contrast, our campaign, clearly communicated its key messages about the availability of these new diabetes medicines to our Pasifika communities—indicated by the higher uptake of these medicines following the campaign. However, suggest that future research should measure how Pacific patients with diabetes understand the effects of the newly funded medications, and education around it and the management of diabetes using the new medications.

We are unaware of any other direct-to-consumer style campaigns that have promoted newly funded medicine for treatment of diabetes in New Zealand. However, there have been many mainstream campaigns that have targeted Pasifika and Māori communities for health issues such as the COVID-19 and meningitis B vaccinations, and diabetes prevention, rheumatic heart disease prevention.[15–18] These programmes were generally successful however in some instances unintentionally victimised Pasifika communities.[19] In considering and designing our campaign we were careful to ensure that it would not harm any communities by indirectly assigning blame in any way.

Empagliflozin and dulaglutide are the first new diabetes medicines funded by Pharmac in more than a decade. This generated a high level of interest in the diabetes community and prompted several organisations to run awareness campaigns at the same time as this pilot program. Pharmac mounted a national social media campaign through Whare PR. Pharmac's campaign recruited four well-known and respected Māori personalities who either live with type 2 diabetes or have whānau members living with the disease. The campaign consisted of a multi-channel three-month campaign, delivered through Māori television, national newspapers, posters, digital ads, public relations and social media. Bay of Plenty based kaumātua Phil Merritt; rugby league star, Adam Blair; founder of "Kura Kai", Makaia Carr; and playwright, journalist and film-maker, Aroha Awarau, encouraged whānau to visit their doctor to enquire about the new diabetes medicines. The New Zealand Society for the Study of Diabetes disseminated an information package and PowerPoint presentation to primary care; and the Goodfellow Unit (The University of Auckland) and primary health organisations also ran education sessions for primary care. We controlled for the impact of these national programs on our data by relating new prescriptions in Counties Manukau controlled for ethnic breakdown to national prescription data over the same period see Figure 3).

There were a number of limitations to this project. We were unable to employ a Māori student, which may have contributed to the lower response for Māori. This campaign also occurred at a time where primary care in South Auckland was already overloaded and distracted by the COVID-19 pandemic and Auckland regional lockdowns would have adversely affected patient access to primary care in Counties Manukau compared to the rest of the country. Finally, dulaglutide was not available until 1 September 2021 after the study had completed, so our assessment of impact was restricted to empagliflozin.

Direct-to-consumer advertising is currently allowed only in the USA and New Zealand.[20] It is associated with increased prescription of advertised products and there is substantial impact on patient's request for specific drugs and physician's confidence in prescribing.[21]

Health literacy amongst Māori and Pasifika peoples may be another contributory factor to the slow uptake of new medicines, although it is as much a barrier and the responsibility of the health provider, organisation, and system as the consumer.[22] Advertisements are a legitimate form of patient's information, and the benefits are targeted directly at patients and the public. Our findings suggest that a direct-to-consumer approach increases health awareness, improves doctor-patient communication, and improves concordance leading to an increase in prescriptions of new medicines for Pacific patients. We hope this will translate to improved health outcomes for our community in the long-term.

COMPETING INTERESTS

Nil.

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Radiological cardiac compression secondary to retrosternal haematoma in blunt trauma

Sohil Pothiawala, Li Hsee

A 26-year-old female presented to the emergency department (ED) after a high-speed motorbike crash. Her vital signs were stable, and she had a left anterior chest wall bruise and an abrasion over her left abdomen. Chest X-ray did not show haemopneumothorax or wide mediastinum. Extended focussed assessment with sonography in trauma (eFAST) that was done by the ED specialist was negative. The patient's electrocardiogram (ECG) showed normal sinus rhythm and troponin was normal. A computed tomography (CT) scan was done, and the image is shown in Figure 1. What is the diagnosis?

Answer: A 10mm displaced mid-sternal fracture associated with a large retrosternal haematoma causing mass effect on the heart with compression in the antero-posterior plane.

Figure 1: Coronal (A) and sagittal (B) views of computed tomography (CT) scan of the thorax showing mid-body sternal fracture (thick arrow), along with retrosternal haematoma creating a mass effect on the heart (thin arrow)

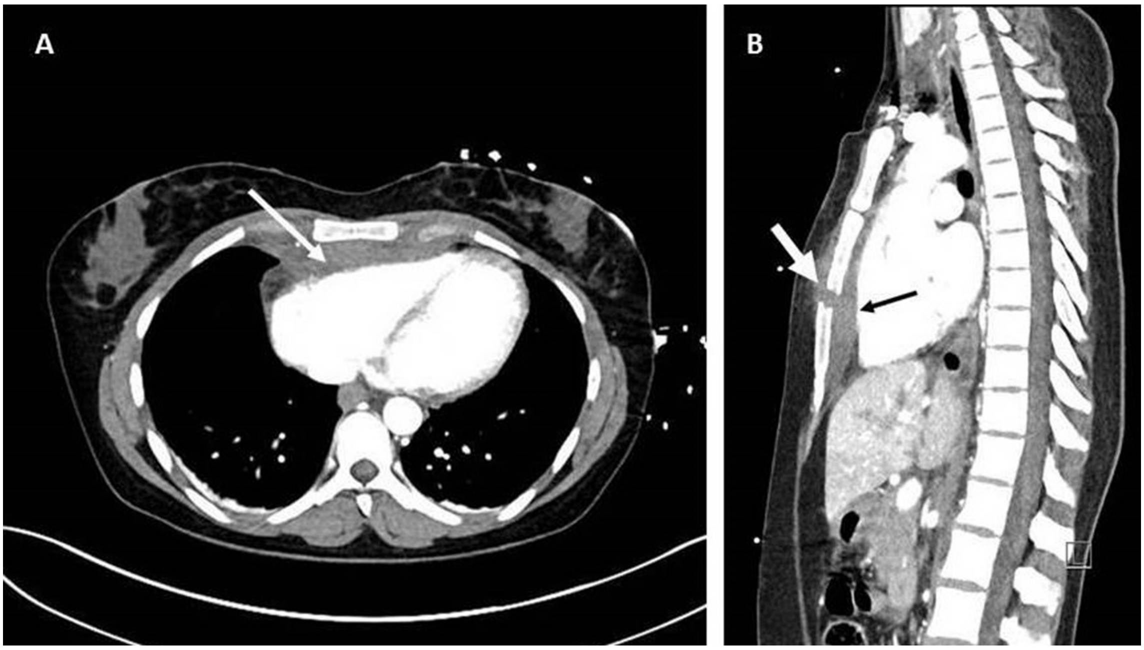
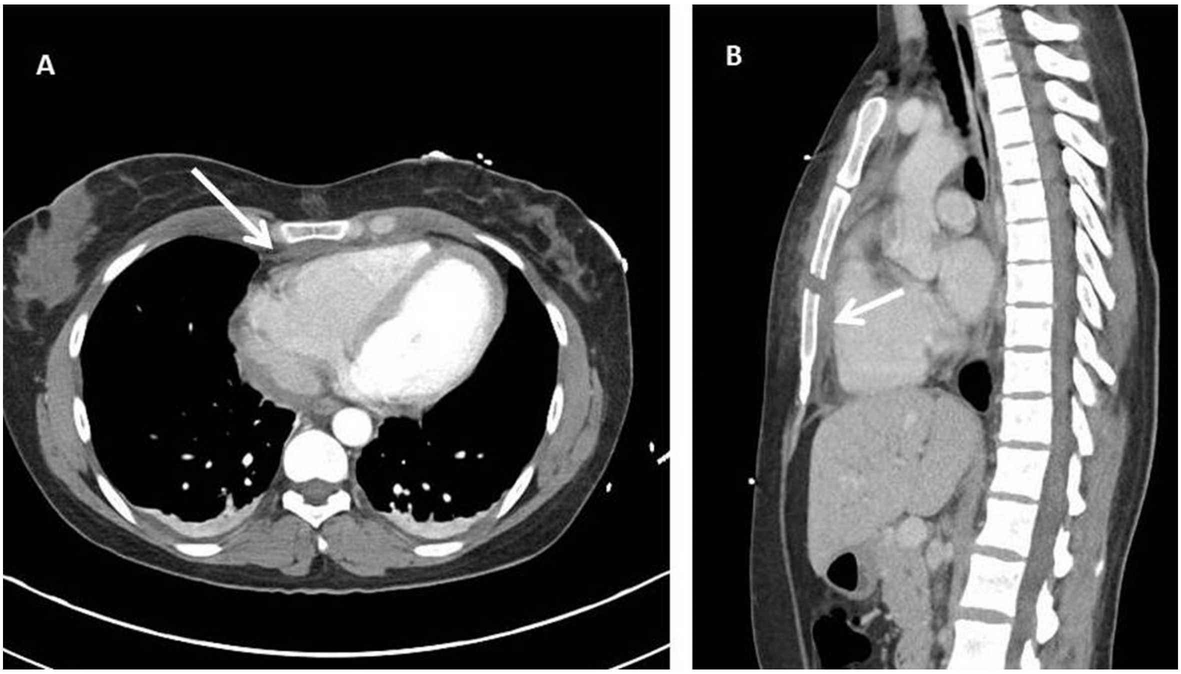


Figure 2: Coronal (A) and sagittal (B) views on repeat CT scan showing spontaneous reduction in size of retrosternal haematoma (thin arrow) with no mass effect on the heart.



Discussion

A retrosternal haematoma is defined as a haematoma deep to the sternum without a fat plane between the haematoma and the sternum. It is seen in about 70% of patients with sternal fracture, and especially in those with a displaced, mid-body sternal fracture. In patients with blunt chest trauma, it develops secondary to bleeding from the sternal fracture, soft tissue contusion or injury to surrounding vascular structures.[1] It may enlarge in size, secondary to associated active bleeding from damage to an internal thoracic artery, intercostal artery or a mediastinal vessel.[2,3] Considering the thickness of the adjacent sternum, retrosternal haematomas can be classified as Grade 1 (retrosternal haematoma less than half the thickness of the sternum), Grade 2 (retrosternal haematoma more than half the thickness of the sternum), and Grade 3 (retrosternal haematoma measuring the full thickness of the sternum).

Although rarely reported, it can compress the chambers of the heart, leading to extra-pericardial tamponade and haemodynamic compromise. The onset of cardiac tamponade from extra-pericardial retrosternal haematoma is usually more insidious compared to pericardial tamponade secondary to cardiac rupture. The patient remained haemodynamically stable in the intensive care unit (ICU), and transthoracic echocardiography did not show signs of cardiac tamponade or any regional wall motion abnormality from a potential associated cardiac contusion. After a few days, a repeat CT revealed spontaneous reduction in the size of retrosternal haematoma with no mass effect (see Figure 2).

As sternal fractures are associated with some degree of retrosternal haematoma, repeat imaging is not indicated in all patients to assess for haematoma resolution or fracture union. Repeat imaging with transthoracic echocardiography or CT scan is only indicated if there is deterioration of the patient's condition, and the expanding retrosternal haematoma leads to physiological signs of cardiac tamponade (tachycardia, narrow pulse pressure, hypotension, pulsus paradoxus, jugular venous distention, muffled heart sounds). Prompt surgical management with sternotomy for haematoma evacuation and/or ligation or angio-embolisation of the bleeding vessel is required. As seen in our patient with retrosternal haematoma pressing on the cardiac chambers during radiological evaluation, a high level of clinical suspicion and close haemodynamic monitoring is required for early identification of physiological signs of impending cardiac tamponade.

COMPETING INTERESTS

Nil.

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Consent for teaching—response to Rennie et al.

Ben Gray

I agree with Rennie et al.;[1] patient autonomy is important. Central to this debate is the tension between the ideal, what is happening and what is possible. I have no problem at all with the Consensus Statement[2] as a statement of an ideal … for the people involved in developing the statement. However, there are other priorities that need to be considered at the same time. The Consensus Statement is an attempt to interpret the provisions of the law across a range of contexts to the students and practitioners affected by it. My paper is another attempt.

Their major objection to my paper was that they felt that I did not acknowledge that the Code of Health and Disability Services Consumers' Rights (HDC Code)[3] is the law in Aotearoa New Zealand. They continued by a partial citing of the HDC Code listing rights 6 and 7 but did not include Section 3, which qualifies the Code by saying that a provider is not in breach of the Code if they have taken reasonable actions considering clinical circumstances and resource constraints.

The Consensus Statement states that "*the need to gain consent cannot be set aside on the grounds of inadequate time or resource*". This appears to be a contradiction of Section 3. The question is what constitutes "reasonable actions" in relation to this aspect of practice.

Indeed, many provisions of the HDC Code hinge on the concept of "reasonable" (Right 4, "*reasonable care and skill*"; Right 5, "*where necessary and reasonably practicable, this includes the right to a competent interpreter*"; Right 6, "*reasonable consumer*"; and Section 3, "*reasonable actions*"). This is difficult for the HDC because every complainant believes that their rights have been breached and that there is something "unreasonable" about this. A key aspect of my argument is that any attempt at defining reasonable is culture bound, as discussed in my paper in relation to what level of introductions are "reasonable" on a ward round.[4] There is no objective standard of what is reasonable. In any area of practice, notions of what is reasonable will be structured by a set of values, purposes, expectations and ways of thinking—in short, by the culture, and we are a culturally diverse country. We agree that cultural competence/safety is of considerable importance.

Another key part of my argument is that the Quadruple Aim[5] should apply to medical practice, and that this has implications for how consent to student involvement in care is gathered. For each of those aims an ideal could be described. Focussing on one aim can lead to unintended consequences affecting another aim.

A good example of this is the effect of the COVID-19 pandemic. During most of the lockdowns, public health was prioritised over patient choice and autonomy and teaching, and this had considerable impact on clinician wellbeing. Our students had significantly less clinical contact during this time. At the height of a pandemic there is significant justification for prioritising public health, but it will be at the expense of the other aims; in this case less clinical teaching and less patient autonomy, clinician wellbeing and provision of routine care.

Consent for teaching is one important priority and in aiming for this ideal, judgements need to be made while also aiming for the other ideals of clinical care, wise use of resources, clinician wellbeing and public health.

I agree with much of the content of the Consensus Statement. There is a good description of the changing nature of consent from junior to more senior students. Difficulties with consent for patients who lack capacity are acknowledged. I agree that the process by which consent is obtained can and should be proportional to the involvement of the medical student and the nature of the interaction and consequent risk or inconvenience to the patient. I agree it is also an important aspect of building rapport with patients, and of maintaining the trust and goodwill that exists between patients and the health professionals who care for them—including medical students.

If gaining consent for teaching involves extra time (introducing all the staff present on every ward round to every patient, including the medical student, with detail on their level of training) and resources (for example, printing of signs, filing of signed consent forms) and there are constraints on time and resources, then a judgement needs to be made. What the right level of consent is will vary from patient to patient depending on their clinical presentation, cultural background and expectations, again requiring a judgement to be made. These judgements are more difficult in the resource-constrained environment that we are currently in.

COMPETING INTERESTS
Nil.

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Prevalence of anaemia in acutely unwell infants

Ji Young Park, Cameron C Grant

Historically anaemia and iron deficiency (ID) have been prevalent among children in New Zealand. Iron deficiency and iron deficiency anaemia (IDA) prevalence were estimated in a community sample of 324 6–23-month-old children living in Auckland in 1999–2002.[1] ID was present in 14% and IDA in 6%.[1] In a study of 391 children aged 9–23 months hospitalised with acute illnesses in Auckland from 1997–1999, IDA was estimated to be present in 29% of children.[2]

This study aimed to estimate the prevalence of anaemia in children hospitalised with an acute illness and determine demographic and illness factors associated with anaemia.

Methods

This was a retrospective audit of acute admissions to the General Paediatric service at Starship Children's Hospital from 1 January 2019 to 31 December 2019 of children aged 0–13 months.

Hospital event data were sourced via the Auckland District Health Board (now Te Whatu Ora – Health New Zealand Te Toka Tumai Auckland) Child Health Data and Analytics service. Only children with domiciles within this district health board region were included. Among these children, only those with acute infective or inflammatory conditions as defined by ICD-10 discharge diagnosis codes were included.

For children with multiple admissions during the study period, only data from the first admission was used, and for children for whom multiple full blood counts (FBC) were performed, only data from the first FBC was used.

Anaemia was defined as a Hb <105g/L for ages 0–5,[3,4] and <110g/L for ages 6–13 months.[5] Whether the need for follow-up of anaemia was documented in the hospital discharge letter was determined.

Child ethnicity was as defined by the caregiver on hospital admission. Household deprivation was measured using NZDep2018.[6]

Data analysis was performed using SAS version 9.4 (SAS Institute, Cary, NC). Associations were described using unadjusted odds ratios (OR) and 95% confidence intervals (CI).

Results

There were 854 acute admissions of children aged 0–13 months to the general paediatric service during the study period. During 475 (56%) of these events in 424 children a full blood count (FBC) was measured. Of these 424 children, 302 lived in the study region. Excluding those admitted with non-infective or non-inflammatory conditions, 235 acute admission events were analysed.

The mean (sd) serum haemoglobin concentration was 118(22)g/L, with a range of 80–208g/L. Anaemia was present in 71/235 (31%) children. Serum ferritin was measured in seven children.

Compared with children aged 0–2 months, the odds of anaemia were increased in children aged 6–9 months (OR=2.50; 95% CI 1.22–5.14). Compared with children of NZ European or Other ethnic groups, the odds of anaemia were increased for children of Pacific ethnic groups (OR=2.23; 95% CI 1.11–4.58). Compared with children born in summer, the odds of anaemia were increased for children born in winter (OR=3.05; 95% CI 1.12–9.82). In comparison with children admitted to hospital during summer, the odds of anaemia were increased for children admitted to hospital during winter (OR=3.05; 95% CI 1.12–9.82).

Of the presenting illnesses 43 (18%) were lower respiratory infections; 15 (6%) upper respiratory infections; 10 (4%) gastroenteritis; 18 (8%) sepsis/meningitis; 17 (7%) staphylococcal/streptococcal infections; 30 (13%) urinary tract/*Escherichia coli* infections; 27 (12%) measles/cytomegalovirus (CMV)/adenovirus infections; and 75 (32%) other infections or other acute illnesses.

In comparison with children admitted to hospital with other infections and other acute illnesses, the odds of anaemia were increased for children admitted to hospital with urinary tract/*E. coli* infections (OR=2.99; 95% CI 1.21–7.41) or with measles/CMV/adenovirus infection (OR=2.73; 95% CI 1.07–6.99).

Specific inpatient anaemia management (transfusion) was documented for two children. For 5/71 (7%) children with anaemia, anaemia was identified as a problem in the hospital discharge summary.

Table 1: Associations of demographic factors with presence of anaemia.

Variable	**n (%)**	**Anaemia present n (row %)**		**Odds ratio (95% confidence intervals)**
		Yes **71 (31)**	**No** **164 (69)**	
Age in months, n (%)				P=0.07
0–2	135 (58)	36 (27)	99 (73)	1.00
3–5	41 (17)	11 (27)	30 (73)	1.01 (0.44–2.18)
6–9	42 (18)	20 (48)	22 (52)	2.50 (1.22–5.14)
10–13	17 (7)	4 (24)	13 (76)	0.85 (0.23–2.57)
Sex, n (%)				P=0.35
Male	130 (55)	36 (28)	94 (72)	1.00
Female	105 (45)	35 (33)	70 (67)	1.31 (0.75–2.29)
Ethnic group, n (%)				P=0.04
NZ European or Other	76 (32)	19 (25)	57 (75)	1.00
Māori	30 (13)	10 (33)	20 (67)	1.50 (0.59–3.73)
Pacific	68 (29)	29 (43)	39 (57)	2.23 (1.11–4.58)
Asian	61 (26)	13 (21)	48 (79)	0.81 (0.36–1.80)
Area level deprivation†, n (%)				P=0.417
Deciles 1–3 (Least deprived)	56 (24)	18 (32)	38 (68)	1.00
Deciles 4–7	93 (39)	23 (25)	70 (75)	0.69 (0.33–1.45)
Deciles 8–10 (Most deprived)	86 (37)	30 (35)	56 (65)	1.13 (0.56–2.34)
Season of birth				P=0.007
Summer (December–February)	57 (24)	5 (19)	22 (81)	1.00
Autumn (March–May)	69 (30)	7 (14)	43 (86)	0.72 (0.21–2.66)
Winter (June–August)	45 (19)	34 (41)	49 (59)	3.05 (1.12–9.82)
Spring (September–November)	64 (27)	25 (33)	50 (67)	2.20 (0.79–7.18)
Season of admission, n (%)				**P=0.005**
Summer	27 (12)	5 (19)	22 (81)	1.00
Autumn	50 (21)	7 (14)	43 (86)	0.72 (0.21–2.66)
Winter	83 (35)	34 (41)	49 (59)	3.05 (1.12–9.82)
Spring	75 (32)	25 (33)	50 (67)	2.20 (0.79–7.18)

* Based upon NZDep2018.6

Discussion

In this sample of children 0–13 months old, admitted with an acute illness to a metropolitan general paediatric inpatient service in New Zealand, anaemia was present in 31%. The odds of anaemia were increased in children aged 7–9 vs 0–2 months, for children of Pacific ethnic groups and for children hospitalised during winter. The odds of anaemia varied with infection type. For only a small proportion of the children who were anaemic was anaemia an identified problem in the hospital discharge plan. The study findings do indicate that anaemia remains a prevalent issue in this population.

The two most frequent causes of anaemia in the age group are ID and acute infection.[7,8] The small proportion of children (3%) in whom iron status was measured prevents an estimation of the contribution of ID to anaemia in this sample. A 2020 publication by the World Health Organization (WHO), of guidelines for the use of serum ferritin concentration to assess iron status, increases the utility of serum ferritin as a marker of iron status in this at-risk population.[9] The WHO guideline states that, in children 0–23 months old, ID can be diagnosed using a serum ferritin concentration <12µg/L in children without infection or inflammation, and <30µg/L in children with infection or inflammation.[9]

The 7–9 months age group is vulnerable as this is the age range when weaning from breastfeeding frequently occurs. During this weaning phase iron intake can be insufficient to meet the iron demands present during infancy.[10]

This association of anaemia with Pacific ethnicity is consistent with previously community- and hospital-based studies.[1,2] An increased prevalence among Pacific children of dietary risk for ID, as well as the increased incidence of *Helicobacter pylori* in Pacific children, are potential explanations.[2,11]

Acute respiratory infections occur more frequently during winter, with anaemia being associated with more severe or more frequent infections.[12] The associations between specific infective agents and anaemia reflect differences in illness severity caused by different pathogens, for example measles and gram-negative bacilli causing more severe illnesses.

Our findings imply the need for better surveillance for anaemia among young children hospitalised with acute illnesses. The potential now exists for non-invasive measurement of haemoglobin concentration using spectrophotometric measurement.[13] Thus, such surveillance does not necessarily require blood sampling, and hence more systemic screening for anaemia is possible as a component of care provided to young children hospitalised with acute illnesses.

COMPETING INTERESTS

Nil

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The Relation of Doctor to Patient

NZMJ, 1923

An excerpt from the *Presidential Address, British Medical Association, New Zealand Branch*, 1923, by F. G. Gibson, M.D.

Ladies and gentlemen:—Some time ago, and in another part of the world, I happened to be one of an audience similar to that which I have the honour to address.

The President of that Conference had spent much time and thought on a paper to which I could have listened with much interest and some edification in a company of medical colleagues, with perhaps a leavening of laymen of the more serious sort. I say I *could* have enjoyed the address, but my peace of mind was disturbed by the restless behaviour of the lady seated at my side.

She was young, and fair, an ornament to her sex, and to, what I may term, the supernumerary rank of our profession. She was, in fact, the wife of a doctor, not my own I hasten to state; but, poor dear young thing, she was very bored, bored to the verge of tears, and her *malaise* affected me so strongly that I lost the thread of the speaker's discourse, and when at last, with about a third of his speech still unread, he paused in turning over a page, an agonised whisper with a sort of sobbing catch in it gasped in my ear, "Does he really *have* to read all that stuff?" I registered a solemn vow then and there, that if I ever found myself in the honourable, but uncomfortable, position which I am endeavouring to fill, I should attempt a lighter theme, and, if I could not achieve wit, I should strive after brevity, and above all, try to select a subject which should have some interest, not only for the members of the profession, no matter what their special branch may be, but also for those in other walks of life, and, above all, for their womankind.

There are, in the life of every man, only three dates that really matter, those of his birth, marriage and death; of woman I should add a fourth—the birthday of her first-born child. Now in all these dates the doctor is deeply interested; intimately associated with your birth, it is his privilege to welcome and comfort you when you come wailing into a world of terrific sounds, harsh contacts, and most horrible frigidity. In your marriage, too, he is no less interested, although I have found that his advice, though often sought, is seldom followed in that matter. When it comes to the birthday of a mother's first-born child, she never has greater need of a wise, patient counsellor and friend; while, though we cannot always postpone the day when you will have to balance your account with Death, the universal creditor, we can, perhaps, support you as you approach the portals of that grim countinghouse, and add our sign-manual to the quittance.

All doctors then are interested in their patients, and all patients should be interested in their doctors, so I have chosen as my subject, "The Relation of Doctor to Patient," for you must either be one or the other at some time of your life, no matter if in the intervals you may be tempted to sample the wares which are now-always displayed with such enticement of advertisement, and such subtlety of false logic, beyond the pale of our profession.

The origins of the three learned professions are to be sought for in the remote ages of antiquity, but I claim, without fear of cavil, that our own is the oldest of all, for the art of healing must be regarded as contemporary with the dawn of life, since medicine arose out of the primeval sympathy of man for man; one member of the first family must, for good or ill, have constituted himself as the physician, before there was any thought or need of the priest, or the lawmaker. During the War you all became more or less versed in the science of enblematology, and many of you could, perhaps, without much difficulty, distinguish a brigadier-general from a machine-gunner by the badges on his collar. The ladies were especially interested in the details and histories of regimental badges, but I doubt if any of you learned the true origin of that of the Army Medical Corps—a serpent entwined round a staff, and surrounded by wreaths of bay. I heard the matter once discussed by some convalescent "diggers." One reckoned that it was a tapeworm on a horribly magnified surgeon's probe; a second saw in it the fiery serpent set upon a pole by Moses, as an antidote to those ills with which an angry God had been scourging His murmuring people. A third, proud of his superior knowledge, identified it with the badge of Æsculapius, the Greek father of medicine. They were all more or less correct; but Æsculapius himself recognised the serpent and staff as the sign which had been blazoned on the doors of the physicians' houses in the cities of Atlantis and Lemuria during that golden age of which the Greeks regarded the days of their prime as but a decadent sun setting. May we not trace the serpent and pole back to the days of creation, and see its origin in the allegorical serpent entwined about the tree which was in the midst of the Garden, whose fruit gave to the eater a knowledge of good and evil? I am aware that the serpent's reputation has not been free from a sinister taint, but in the Babylonian clay tablets of about 2100 B.C., which have been excavated from the ruins of the library of Nippur, his character has been shown in a different light. These tablets, which are in the Sumerian language, contain an account of the fall of man similar to that in the Book of Genesis in many particulars. According to the best authorities the Hebrew account of the Garden of Eden was written at some later date than 1000 B.C., and the ancient Babylonian story was apparently overtaken by the Hebrews and adjusted to fit their monotheistic system. Now from the Sumerian standpoint the serpent was the honest friend and counsellor of man, so that I have no longer any diffidence in claiming that most subtle beast of the field as the prototype of our profession. The whole evolution of man has tended towards the development of thought, but in the dawn of civilisation this capacity was only in preparation, and in those Atlantean golden days the general mass of mankind must have been instructed by leaders who towered high above them in intellectual ability. The wisdom possessed by these leaders, and the powers of which they were masters, could not have been obtained by any earthly education, but were imparted to them by entities of a higher rank, and not pertaining directly to the earth. I like to believe that the fundamental truths of the science of medicine were imparted to man by these divine messengers, for how else could the germs of truths which we are to-day so painfully proving by laborious experiment have been given to the men of the first phases of civilisation?

The earliest traditions, the earliest records, the earliest monuments show man writhing with the fiend of malarial fever. Herakles fighting the Hydra, Apollo slaying the Python betoken the struggle of Phœnician and early Greek colonists on African, Asiatic, and Mediterranean shores. It is only of recent years that the researches of *Laveran*, *Ross* and *Manson* have finally proved the association between malaria and that peril that flieth by night, the mosquito. In the Ninth Edition of the *Encyclopedia Britannica* one reads—"The most prevalent hypothesis of malaria is that it is a specific fever generated in the soil. Perhaps not every soil is capable, under circumstances, of causing malaria, but it is difficult to assign limits to its potential presence," and so the article goes on through columns of learned verbiage suggesting, among other hypotheses, that the fever is a "telluric intoxication" generated by vegetative power of the soil, when that power is not duly exhausted by plant growth; or, again, that it is caused by the excessive and sudden extraction of heat from the body under the influence of cold and damp. Never a word about mosquitoes from beginning to end. By patient research, *Laveran* identified the flagellate form of the malarial parasite, and *Manson* proved, and in so doing sacrificed upon the altar of science the life of his own son, my one-time familiar friend, that the flagellate parasite, was transferred to the blood of man from the body of an infected mosquito. The ancients, however, had known all about the matter. A Babylonian clay tablet, baked over three thousand years ago, now in the British Museum, bears in cuneiform signs the name of the "fever fly." What else but *Laveran's* flagellate parasite with its four or five long, whip-like processes, furiously lashing upon the field of the microscope was that hydra of the Greek engravers who used the symbol to represent the Lernean scourge of malaria vanquished by Jupiter's son—the draining and sun purification at the hands of Apollo of the mosquito breeding marshes? Again, the proof of the carriage of plague by means of the rat flea is recent enough; but the trespass offering of five golden mice—they would, no doubt, have been in the larger form of rats, but for the expense of the precious metal required—and of five golden emerods, these were the buboes characteristic of the plague, presented by the stricken Philistines in returning the ravished Ark of the Covenant to the Israelites are evidence enough of the antiquity of the knowledge which connects the rat with the plague. The ancients, too, knew how to deal with plagues. They carefully protected, and, when possible, domesticated the natural enemies of the rat, and even deified some of the more useful ones—as the cat, the kestrel and the cobra—and they made special use of the rat-eating species of snakes. They kept great numbers of these harmless reptiles in specially constructed pits in their medical temples, and sent them to be liberated wherever the disease had broken out. The ancients did not only pit the rat-eating snake against the plague-carrying rat, but they also protected the scarab, or dungchafer, because it destroyed the heltu worm, that caused laziness, dirt-eating, and intense anæmia, and the ibis because, its usual food being fresh-water snails, it stood on the margins of the Egyptian irrigation canals, and kept at bay the "winged snakes." two formidable snail-fostered parasites of man, now-a-days labelled schistosoma hæmatobium, which gives rise to endemic hæmaturia, and schistosoma mansoni which causes a form of dysentery. Three thousand years before *Jenner*, *Susruta* fought the smallpox in India by inoculating lymph from the pustules of the zebu calf—and so we go on, rediscovering age-old truths, and by patient research, corroborating the medical lore imparted to man by those Divine messengers I have suggested. What secrets there may be still to be discovered in the writings on those clay tablets which, unlike the libraries of Alexandria, Peking, and Louvain, have been inscribed on a material durable enough to withstand the insensate fury of the ravaging Hun of their particular eras. Perhaps in some archæological pigeon-hole is hidden away the germ of a theory which will lighten our darkness as regards the cause of cancer. We want some clearing-house of research where scientists can exchange the fruits of discovery, the artificer of war to help the man of peace, the delver in the past to give rich inspiration to the pioneer of science.