THE NEW ZEALAND MEDICAL JOURNAL
Journal of the New Zealand Medical Association

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THE NEW ZEALAND MEDICAL JOURNAL
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This Issue in the Journal

Variation in the use of medicines by ethnicity during 2006/07 in New Zealand: a preliminary analysis
Scott Metcalfe, George Laking, Jason Arnold

Māori and Pacific people have a higher disease burden but haven't received sufficient medicines to treat it. That's what's suggested by a preliminary but novel overview of medicine use data, combined with population health needs data (beyond usual age), which shows historical differences in access (getting prescribed medicines in the first place) and persistence (continuing to receive medicines) between ethnic groups. While differences in prescribing rates are well-known, the study shows potentially greater and important variation in access and persistence across different medicines and ethnic groups. Even when prescribed medicines, Māori dispensing rates during 2006/07 were lower than non-Māori, where, when adjusted for disease burden, Māori overall had 19–37% lower dispensings than non-Māori. Although there are important limitations to this preliminary analysis, future analyses of prescribing patterns and medical care should better adjust for disease burden, including comparisons with this new baseline.

Ethnicity and rectal cancer management in New Zealand
Esther M Swart, Diana Sarfati, Ruth Cunningham, Elizabeth Dennett, Virginia Signal, Jason Gurney, James Stanley

The objectives of this paper were to investigate rectal cancer management and survival in a cohort of Māori and non-Māori patients with a newly diagnosed rectal cancer. The findings of this population-based cohort study suggest that there may be both similarities and differences in the presentation, treatment and outcomes from rectal cancer for Maori compared with non-Maori patients in New Zealand.

Māori nurses and smoking: what do we know?
Heather Gifford, Denise Wilson, Amohia Boulton, Leonie Walker, Wiki Shepherd-Sinclair

This paper presents the results from a national web-based survey of Maori nurses and student nurses. Major findings are smoking rates are down for nurses (20%) but still quite high for student nurses (32%). Nurses consider that smoking is a major health issue and those still smoking have a strong desire to quit as it conflicts with their identity as health professionals and impacts on their ability to provide effective cessation advice. Quit attempts in this occupation group could be better informed by evidence; a point that will be taken up by the research team when they design an intervention tailored for Maori nurses.

Increasing primary antibiotic resistance and ethnic differences in eradication rates of *Helicobacter pylori* infection in New Zealand—a new look at an old enemy

John Hsiang, Sri Selvaratnam, Susan Taylor, Joey Yeoh, Yu-Mwee Tan, Judy Huang, Alasdair Patrick

We aimed to determine the current prevalence, primary antibiotic resistance and eradication rate with standard triple therapy of a bacterial *Helicobacter pylori* (*H. pylori*) infection in South Auckland, New Zealand (NZ). The prevalence of *H. pylori* infection by ethnic group; European (7.7%), Māori (34.8%), Pacific People (31.3%) and Orientals (23.8%). Metronidazole resistance was found in 49.3% of isolates, clarithromycin resistance in 16.4%, and moxifloxacin resistance in 9.5%. No isolates were resistant to tetracycline. Clarithromycin resistance (≥15%) was prevalent among Māori, Pacific People and Orientals. Metronidazole resistance has increased significantly from 32.7% in 1999 to 49.3% in 2012, and clarithromycin resistance from 7% in 1999 to 16.4% in 2012. *H. pylori* infection is very common among certain ethnic groups living in South Auckland. Moreover, resistance to the antibiotics clarithromycin and metronidazole have increased significantly.

Timely delivery of hip fracture care: a Middlemore Hospital audit

C Ushan De Silva, Hla S Tha, Delwyn Armstrong, Kathy Walker

Hip fractures are a common reason for hospital admission in the elderly population. There are guidelines from the UK which outline key factors in hip fracture care. The aim of our paper was to audit hip fracture care at our institution against best practice guidelines. There have been significant improvements in the timely delivery of hip fracture care at Middlemore hospital. We advocate a centralised audit process for hip fracture care in hospitals in New Zealand to further improve the provision of care.

Retrospective analysis on timeframes of referral, diagnosis and treatment of patients with endometrial carcinomas in Dunedin Hospital, 2008–2011

Michael Yoon Kang, Peter Sykes, Peter Herbison, Simone Petrich

Endometrial cancer (cancer of the lining of the womb) is one of the most common cancers affecting New Zealanders each year. Ministry of Health has recently proposed a target time in which cancers should be diagnosed and treated. This research based in Dunedin Hospital showed that patients were waiting considerable amount of time from being referred to a specialist initially to receiving treatment, and also in waiting for initial specialist assessment of their suspected endometrial cancer after their GP made the referral when compared to the proposed target timeframes by Ministry of Health. These delays were also contributed by waiting for a procedure called hysteroscopy, which allows specialists to obtain cells from the lining of the womb to see if it is cancerous or not. Some ways to reduce the delays seen would be to increase training of GPs in Pipelle biopsy (another method of obtaining cells from womb lining), increased funding for diagnostic scans and surgery, and better education of New Zealand public in symptoms and signs of endometrial cancer so that they would seek medical attention promptly.

Pacific students undertaking the first year of health sciences at the University of Otago, and factors associated with academic performance

Faafetai Sopoaga, Tony Zaharic, Jesse Kokaua, Alec J Ekeroma, Greg Murray, Jacques van der Meer

Pacific students are under-represented in health sciences at the tertiary level and would benefit from better preparation from school. Pacific solutions are required to improve academic outcomes over and above mainstream policy solutions. Tertiary institutions need to engage prospective students earlier to ensure they are well informed of requirements, and are appropriately prepared for study at the tertiary level.

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Ethnicity and access to prescription medicines

Simon Horsburgh, Pauline Norris

Metcalfe et al's paper[1] in this issue tackles a key question in New Zealand healthcare: does the health system alleviate or exacerbate health disparities between Māori, Pacific and other New Zealanders?

Previous studies in New Zealand and elsewhere have shown differential outcomes from the health system for ethnic minorities.[2–4] Metcalfe et al look at prescription medicines, which are probably the most common treatment modality in healthcare. Previous research has found differences in access to prescription medicines. For example, we have found that Māori (particularly in rural areas) receive fewer antibiotic dispensings than non-Māori,[5] and other researchers have noted greater levels of suboptimal pharmaceutical asthma treatment in Māori compared to non-Māori.[6,7]

Metcalfe et al[1] conclude that rates of prescription medicine use amongst Māori, Pacific and other New Zealanders are roughly similar, until rates of illness in the different ethnic groups are taken into account.

Because Māori and Pacific people have greater rates of illness, they ought to have much higher rates of use of prescription medicines. However they do not, and the authors estimate that Māori missed out on 1 million prescriptions in the year studied. There are many complexities in adjusting for levels of illness, and the authors acknowledge the limitations of their approach, including the use of historical burden of disease data. Nonetheless the results are another indication that the health system may potentially be exacerbating disparities in health status between ethnic groups.

When we published our work on variations in medicines use by ethnicity[5,8,9] some GPs contacted us because they felt that we were accusing them of racism, i.e. treating Māori patients differently because of their ethnicity. But whether a person gets a prescription medicine or not is the result of complex chain of events in a process.

Firstly patients have to identify that something is wrong with their or their family member's health, or that something needs to be checked, and decide that this justifies a visit to a prescriber. Clearly social circumstances are going to affect the likelihood of identifying a bodily change as a symptom of illness, and of this being high enough up the list of concerns to warrant action. People who are struggling with paying the bills, feeding their families and dealing with other ill family members needing care and attention, are less likely to do this. High rates of poverty and poor health make this the reality for many Māori and Pacific families.

Secondly patients have to get to a prescriber. This is likely to be influenced by things like geographical location, ability to get time off work, financial circumstances, user charges, availability and cost of transport, availability and cost of care for dependents. While Māori are not more likely to report deferring a GP visit because of cost[10] other

issues like geographic distance and poor transport are likely to be a problem for rural Māori in particular.

Thirdly, the interaction with the prescriber has to result in a prescription. Cultures differ in what they define as normal bodily functioning, how they interpret symptoms, define illnesses, and how they think they should be treated. There are cultural differences in interaction style, and these may affect mutual understanding and rapport in clinical interactions.[11] This may result in different outcomes for different groups without implying racism.

Fourthly, the patient has to take the prescription to a pharmacy (or have it sent there), and they have to pick up the medicine. User charges are a significant barrier to picking up prescriptions, and previous research has shown that these are more likely to prevent Māori and Pacific people from obtaining their medicines.[12] These ethnic differences persist after adjusting for socioeconomic deprivation. Factors such as transport and time off work are also likely to affect whether people pick up prescriptions.

Attempts to ensure greater equity in prescription medicines use could be targeted at any of these stages. For example the Sore Throats Matter campaign (www.hpa.org.nz/what-we-do/rheumatic-fever/sore-throats-matter) targets the first stage, by communicating that sore throats can lead to rheumatic heart disease, and the second stage, by making appropriate care for sore throats simple to access.

Cultural competence training for healthcare practitioners focusses on reducing barriers at the third stage by increasing understanding of possible cultural differences in understandings of health and illness, how these are expressed, and how to respond to them. The fourth stage has become more problematic recently with the increase in prescription charges.

Metcalfe et al's work[1] provides a promising framework for monitoring ethnic disparities in access to prescription medicines specifically by explicitly adjusting for disease burden. The data collection used by Metcalfe et al, the Pharmaceutical Collection, collects information on subsidised medicines dispensed by community pharmacies. As such, it provides a useful window into which people are actually receiving what prescription medicines, rather than just which people are prescribed medicines. This is a more accurate metric of access to prescription medicines.

Adjusting for disease burden also gives a more accurate overall picture of how well the health system might be meeting the specific health needs of an ethnic group through prescription medicines, and which disease categories might need further investigation. In this sense, Metcalfe et al's work provides a refinement on the ways in which we might monitor the performance of the health system to evaluate how it is addressing health disparities.

While Metcalfe et al's approach is useful for giving an overall feel for how well the health system is addressing ethnic health disparities through access to prescription medicines, there are a number of caveats to be mindful of using their approach. The authors do a good job of raising these in their discussion of limitations and caveats. For example, many prescription medicines are used to treat a range of diseases, limiting the usefulness of one-to-one therapeutic group-disease code mappings at times. The authors note this as a potential limitation, using two anticonvulsants as an

example of how this problem might bias their findings. The point applies more broadly to other medicines, however.

The broad groupings used may also obscure potential disparities in important areas, such as antibiotic use and acute rheumatic fever in young Māori. Practitioner supply orders (PSOs) and the use of depots (where prescription medicines are delivered for collection by patients in rural areas, but often remain uncollected)[13] in rural areas also complicate interpretation. There may also be variation in the use of non-pharmaceutical treatment modalities for certain diseases.

Together, these highlight that the approach used by Metcalfe et al shows promise for monitoring the overall performance of the health system with regard to prescription medicines access, but is limited when a finer-grained picture is needed. It complements and adds to, rather than replaces, other research into disparities in prescription medicines access.

A potential weakness of using Pharmaceutical Collection data going forward is its vulnerability to changes in pharmaceutical policy, particularly co-payment charges. If the subsidy payable for a medicine is less than the co-payment, no claim for reimbursement is made by the dispensing pharmacy as the amount which would be claimed has already been covered by the co-payment. The Pharmaceutical Collection only records dispensings where a reimbursement claim has been made by the pharmacy, so dispensings where the subsidy is less than the co-payment will not be recorded.

With the recent increase in co-payments from $3 to $5, more medicines will not be recorded in the Pharmaceutical Collection. For example, common short-course antibiotics and a standard maintenance dose of some statins attract a subsidy which is less than the $5 co-payment. Examining trends and disparities in access to these medicines will be seriously hampered, since it is impossible to identify whether a shortfall is due to people not receiving prescription medicines or due to claims not being submitted to the Pharmaceutical Collection. This is not a limitation of Metcalfe et al's study alone; it is a potential problem for any research based upon the Pharmaceutical Collection and will continue to be so as long as there is no central repository for all prescription medicine dispensings, regardless of subsidisation.

The increase in co-payment from $3 to $5 raises more concerns than data capture issues. As noted above, Māori are more likely to defer collecting prescription medicines than Pākehā (New Zealanders of European descent) because of cost when the co-payment stood at $3. We cannot see increasing the co-payment to $5 being likely to do anything other than to make this worse.

The Pharmaceutical Subsidy Card scheme, where prescription medicines are essentially free after the first 20 items per calendar year, is not going to mitigate against this. It did not remove the disparity when co-payments were $3—it is hard to see why it would do so now. There is a certain irony in the fact that, by increasing the co-payment to $5, the Government is likely to be increasing disparities in access to prescription medicines whilst reducing the ability of the only national public prescription medicines data collection to detect them.

It is encouraging to see New Zealand's Pharmaceutical Management Agency (PHARMAC), as the organisation charged with 'achieving the best health outcomes

from the use of publicly-subsidised medicines within available funding', actively engaging in research to monitor the success of their activities. PHARMAC is in a unique position to undertake this research, and Metcalfe et al's paper is a promising step forward.

The authors' point regarding considering disease burden when interpreting pharmaceutical dispensing data is an important one for researchers and health data consumers alike. We look forward to an update of the research described in this paper with more contemporary data and, hopefully, extended into Pacific and other ethnic groups.

Competing interests: None identified.

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Pacific people's health in New Zealand

Kiki Maoate

Pacific health is the theme of this edition of the *Journal*; it sends a positive signal for the need to highlight the importance of research priorities, capacity and capabilities, and leadership in the Pacific populations in New Zealand.[1] It is also pleasing to see the research community showing their generous support. The Pacific people in New Zealand, however, continue to display relatively poor health outcomes despite these targeted programmes and focussed interventions.

The Pacific peoples in New Zealand (mostly comprising those of Samoan, Tongan, Niuean, or Cook Islands descent) is a diverse, complex community with multiple ethnicities, cultures and aspirations.[2] Unfortunately this ethnic complexity is seldom factored into the mixture of policy and funding initiatives designed to effect the desired outcomes. But in supporting Pacific research we will gain a better understanding of this priority population in order to facilitate the opportunities to improve their health outcomes and lead their communities out of the poverty indices.

Research and teaching institutions are allocated public resources to invest in the development of Pacific capabilities in research and education. Most institutions have implemented these strategies to varying degrees; unfortunately, however, the governing bodies remain ambivalent around the perceived risk in being seen to favour a priority population over others thus inconsistencies are seen with their fluctuating levels of investment.[3]

Increasingly, as the frustrations continue with current investment strategies, it might be time to consider supporting legislative measures so there is a consistent approach without the risk of the idiosyncrasies that impacts with the personnel changes of the governance and management structures at all levels. Indeed, the Crown and its agencies need to be consistent and avoid the cyclical dismantling and rebuilding of the Pacific teams in government which adds to the instability and inconsistency in supporting Pacific initiatives.

Organisations appear not to recognise that the lowest common denominator need the most help for the collective to have equal access to all the opportunities available.[3] We all agree that it is vitally important to support our best and brightest at the same time—it is also important to support the development, celebrate the achievements and innovation of the Pacific people to reduce their burden on society and prosper.

The more unequivocal statement, which leaves no doubt in the investment strategy for Pacific families, is the announcement by the Honourable Tariana Turia MP on the mechanism of a single Whanau Ora commissioning agency for all the Pacific families.[4] This will provide opportunities to enhance the research capacity and leadership, develop a monitoring and evaluation framework, be innovative, improve health outcomes and add value to the New Zealand economy.

Pacific people want to participate and contribute to the health and wellbeing agenda using research as one of the tools to add value. I commend the *NZMJ* Editorial Board for their leadership and investment in focussing this edition of the *Journal* on Pacific health research.

Competing interests: None identified.

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Variation in the use of medicines by ethnicity during 2006/07 in New Zealand: a preliminary analysis

Scott Metcalfe, George Laking, Jason Arnold

Abstract

Aim To describe variations in dispensing of specific medication groups by ethnicity in New Zealand, adjusting for health need.

Method Preliminary linkage of dispensings of prescription medicines in 2006/07 to age/disease burden proxies of health need for Māori, Pacific peoples (Pasifika)—who are mostly of Samoan, Tongan, Niuean, or Cook Islands descent—in New Zealand, and non-Māori/non-Pasifika. These disease burden proxies combine differences in prevalence, age, morbidity, and mortality. Variations were disaggregated by patients being first dispensed medicines ('access') versus subsequent dispensings ('persistence').

Results Initially, overall age-adjusted incidence of 'scripts' (prescriptions dispensed) to Māori was similar to that of non-Māori. There were differences in therapeutic coverage between Māori and Pasifika, for example greater use of asthma medicines in Māori.

However, further adjustments linking with disease burden showed marked variance for a number of diseases. Differences in dispensing included areas of high health need such as heart disease, infections, diabetes, mental health and respiratory disease. Māori had 19–37% lower dispensings overall than non-Māori, with a net difference of nearly 1 million scripts.

Māori were both less likely to access medicines, and then after first dispensing had fewer subsequent scripts. Patterns for Pasifika appeared similar, although needs-adjusted analysis is awaited for this population.

Conclusions Once adjusting for need, there was variable but sizeable differences in medicines dispensed to Māori compared with non-Māori, and likely differences for Pasifika populations. There are however important limitations to this preliminary analysis.

Crude and age-standardised metrics may be poor predictors of needs-adjusted gaps in medicines use. In this analysis, solely age-standardised rates tended to underestimate differences once adjusting for burden of disease; future analyses of prescribing patterns should consider better adjusting for disease burden.

The Pharmaceutical Management Agency (PHARMAC)'s statutory role in New Zealand is to achieve the best health outcomes from the use of publicly-subsidised medicines within available funding.[1] The health needs of Māori and Pacific people are an important part of PHARMAC's decision-making criteria, alongside the health needs of all New Zealanders.[2] Assessing health need and identifying medicines usage

patterns for populations can provide evidence of disparities and help inform funding decisions and public health activities.

Disparities between Māori and non-Māori health outcomes, and likewise for Pacific peoples (Pasifika) —who are mostly of Samoan, Tongan, Niuean, or Cook Islands descent— in New Zealand, are known to be both large and persistent over multiple issues.[3–12] However, data specific to medicines use in the community have been sparse. Despite good quality information on health disparities and usage patterns for some individual diseases, information has still been insufficient to rank potential health gains across medicines overall.

Analyses of medicines prescription dispensing rates cannot always address confounding from disease burden,[13] where higher needs would be associated with higher use, particularly aggregating for therapeutic groups overall. Such analyses usually require subanalyses comparing proxies for health need (e.g. mortality or hospitalisation) against individual medicines. This is a large task, given there are hundreds of disease entities and medicines, with large overlaps. Moreover, indicators such as hospitalisation, although more relevant for low-mortality / high prevalence diseases such as asthma, can be biased and confounded (see endnote *).[14]

There has been scope for limited analysis by mapping medicines usage against relevant internally-consistent comprehensive needs data. In New Zealand such data have for the past decade been available from the Ministry of Health's New Zealand Burden of Disease Study (NZBDS), first published in 2001,[15] which quantified years of life lost by the New Zealand population in 1996 from premature mortality and disability across a number of individual diseases. The NZBDS included some ethnic-specific data, using prioritised ethnicity

Similarly, information in New Zealand on national use of medicines subsidised in the community (listed in the New Zealand Pharmaceutical Schedule)[16] has been available, disaggregated by ethnic group, since about 2004, at that time being possible to readily link over 90% of prescriptions dispensed with anonymised age, gender and ethnicity data.

The following preliminary analysis therefore provides an overview of medicines dispensed by prescription volumes, category and population dispensing rates for the financial year 2006/07 in Māori, Pasifika and non-Māori/non-Pasifika populations.

The data take into account both (1) age differences within each ethnic group, (2) indicators of health need that combine historical morbidity and mortality, and (3) breakdowns by patient numbers vs. proxies for concordance/adherence. Results to date have helped inform PHARMAC's policy development for medicines funding and access.

Methods

Prescription data—This analysis used anonymised prescription medicines dispensing claims data for the financial year 1 July 2006 to 30 June 2007 contained in the PharmHouse (now Pharmaceuticals Collection) administrative claims database.[17] The PharmHouse/ Pharmaceuticals Collection database links patient-level dispensing of medicines listed on the New Zealand Pharmaceutical Schedule[16] with demographic data, including age and ethnicity, by encrypted National Health Index (NHI)[18] patient identifier numbers.

Encryption is one-way to ensure confidentiality. Endnotes ťand ‡ provide detail on prescription dispensings data collection, NHI numbers and Practitioner's Supply Orders (PSOs). The analysis excluded those medicines dispensed by health practitioners as PSOs and those prescriptions for individual patients otherwise not recording NHI numbers or where the NHI numbering was inconsistent.

During 2006/07 93% of prescriptions dispensed in New Zealand in community pharmacies had an NHI number recorded in PharmHouse; 31,935,268 prescriptions were dispensed, most being for individual patients (not PSOs) and containing NHI numbers. However 2,402,723 scripts were PSO, did not contain NHI numbers, or NHI-related information was unavailable for gender, ethnicity or valid age. To reflect true patient burden, we scaled the remaining 29,532,545 true scripts for individual patients containing NHI numbers and known gender, ethnicity and valid age, to account for those with missing information; this gave a synthesised total of 31,889,448 scaled scripts, used thereafter in this analysis.

Scaling is described in Appendices 1 and 2 – *see all Appendices at* http://journal.nzma.org.nz/journal/126-1384/5869/Appendices.pdf

Box 1. Method of calculation: total script count

Differences in age-standardised incidence rates (ASRs) allowed us to estimate the numerical gaps in prescription items dispensed to Māori people, given their population size, age structure and disease burden.

- For each indication-based group of medicines, we calculated crude rate ratios (RRs) for prescription items comparing crude scripts per 1000 population in M vs. nMnP, P vs. nMnP, M vs. P, and Māori vs. non-Māori ethnicity. We used age-standardised prescription rates (scripts dispensed per unit time) for Māori and non-Māori to calculate age-standardised rate-ratios (ASRRs) for Māori vs. non-Māori. ASRRs were expressed as the ratio of Māori and non-Māori script ASRs, where 'script $ASRR_{M:nM}$' = Māori script ASR ÷ non-Māori script ASR.
- We calculated disease burden ASRRs for Māori vs. non-Māori rates of DALY losses (DALYLs), 'DALYL $ASRR_{M:nM}$'.
- We then adjusted the M:nM script ASRRs for DALYLs. This gave a M:nM 'disease burden-adjusted $ASRR_{M:nM}$' for each indication-based medicines group, using the formula:

DALYL-adjusted prescription ASRR ($adjASRR_{M:nM}$)

= (unadjusted) prescription $ASRR_{M:nM}$ ÷ DALYL $ASRR_{M:nM}$

- We then estimated the difference in Māori medicines use compared with expected non-Māori usage, after accounting for differences in population size, age structure and disease burden. This involved the following:

  (1) calculating differences between Māori and non-Māori DALYL-adjusted prescription ASRs, as numerical shortfalls / excesses in prescriptions per 1000 population; then

  (2) re-expressing (1) as the proportional difference in adjusted Māori prescription ASRs; and then

  (3) multiplying (2) across the absolute counts of Māori prescriptions,

summarised algebraically as the formulae:

gap (DALYL-adjusted shortfall/excess in prescriptions in Māori)

= $(adjASRR_M - ASR_{nM}) \div ASR_M \times$ no. $prescriptions_M$

= $prescriptions_M \div ASR_M \times [ASR_{nM} \times (adjASRR_{M:nM} - 1)]$

where $ASR_{nM} \times (adjRR_{M:nM} - 1) = (adjASR_M - ASR_{nM})$, and

$adjASR_M = ASR_M \times adjASRR_{M:nM} \div ASRR_{M:nM}$

This preliminary analysis did not calculate confidence limits for ASRs and ASRRs.

We grouped medicines according to clinical indication (based on main usage), using therapeutic groupings in the New Zealand Pharmaceutical Schedule (see Appendix 1).

Scaled counts of scripts for these groups were combined with population data (using population estimates categorised by prioritised ethnicity for the 2006/07 year[19]) to derive ethnic-specific crude and age-standardised incidence rates of scaled prescriptions dispensed (counts of scripts, i.e. prescription items that were dispensed during the year, per 1000 population) for the three prioritised ethnic groups Māori (M), Pasifika (P), and non-Māori/non-Pasifika (nMnP). Similar rates were calculated for Māori and non-Māori ('nM', being P+nMnP).

Linking prescription with disease burden data—We then linked the indication-based medicines groups with relevant disease categories in published burden of disease data for 1996 in the NZBDS.[15] For this we calculated age-standardised rates (ASRs) for disability-adjusted life year (DALY) losses for Māori and non-Māori relevant to indication-based pharmaceutical data, using the year 1996 NZBDS-reported rates of DALYs lost by Māori and non-Māori prioritised ethnicity across its five age-groupings of 0–14, 15–24, 25–44, 45–64, and 65+ years.[15]

The grouper linking indication-based groups with Burden of Disease disease categories is provided in the Annexe to this paper (see http://journal.nzma.org.nz/journal/126-1384/5869/Annexe.pdf). Pharmaceuticals and DALYs were directly age-standardised to Segi's standard world population (as had occurred in the NZBDS), aggregating Segi's 18 5-year age groups into the 5 age group categories reported by the NZBDS.[15]

Gender could not be included in this analysis, as it was not part of the age/ethnic-specific NZBDS 1996 DALY data.

[***Note***: During the production of this paper (in August 2013), the Ministry of Health published the update of the NZBDS for disease burden occurring in 2006.[36,37]]

Differences in the above ASRs allowed us to estimate the numerical differences in scripts dispensed to Māori, given their population size, age structure and disease burden. We used age-standardised rate ratios (ASRRs) for Māori vs. non-Māori for scripts and DALY losses. From these we derived disease burden-adjusted M:nM script ASRRs for each indication-based medicines group.

We then calculated gaps in Māori medicines use compared with expected non-Māori usage. These gaps in effect accounted for differences in population size, age structure and disease burden (as DALYL-adjusted shortfall/excess no. scripts in Māori). Box 1 above details the calculations made.

Access vs. 'persistence'—We estimated the extents to which differential dispensing to Māori could be attributed to access versus 'persistence' (see endnote §). In the context of this analysis:

- *Access* related to differential dispensing to Māori of first prescriptions (index scripts). It was expressed as the variation in numbers of Māori (less or more patients) accessing medicines compared with access in non-Māori after adjusting for population size, age structure and disease burden. We expressed access as the rate ratio of DALYL-adjusted ASRs for 12-month patient period-prevalence ($\text{adjASRR}\mathbf{a}_{\text{M:nM}} = \text{adjASR}\mathbf{a}_{\text{M}} \div \text{adjASR}\mathbf{a}_{\text{nM}}$);
- *Persistence* was the subsequent residual variation in overall numbers of scripts dispensed due to variations in subsequent scripts per index patient, i.e. the individualised frequency of subsequent scripts dispensed to those Māori who had an initial script, expressed as ($\text{persistence}_{\text{M:nM}} = \text{scripts/patient}_{\text{Māori}} \div \text{scripts/patient}_{\text{non-Māori}}$).

Total scripts (prescriptions dispensed) were therefore the product of access (number of patients) and persistence (scripts/patient). This metric of access × persistence was the basis on which we could estimate gaps in dispensing.

The numerical data on prescriptions, patients, and ASRRs allowed us to differentiate between gaps in initial access to scripts and gaps in subsequent persistence with scripts. Gaps with persistence were simply the residual after subtracting gaps in access for total script gaps. Box 2 details these calculations.

Further details of calculation methods are available in Appendix 1, including worked examples.

Box 2. Method of calculation: 'access' and 'persistence'

Numerical gaps in initial access to scripts were calculated similar to gaps in total prescriptions, using the following steps:

1. for each indication-based medicines group, age-standardised incidence rates of index patients dispensed a prescription at any time during the year; notation $ASRa_{M}$, $ASRa_{nM}$, as the unadjusted age-standardised rates of initial dispensing to Māori and non-Māori;
2. then calculating the rate ratio as $ASRRa_{M:nM} = ASRa_{M} \div ASRa_{nM}$,
3. then adjusting for age-standardised DALY losses, as:

access $adjASRRa_{M:nM}$

= (unadjusted) $ASRRa_{M:nM} \div$ DALYL $ASRR_{M:nM}$

4. then using access $adjASRR_{M:nM}$, the age-standardised access rates $ASRa_{M}$ and $ASRa_{nM}$, and absolute counts of patients, to calculate numerical gaps in patients, as:

shortfall/excess $patients_{M}$

= (patient $adjASR_{M}$ – patient ASR_{nM}) ÷ patient ASR_{M} × no. $patients_{M}$

= no. $patients_{M}$ ÷ patient ASR_{M} × [patient ASR_{nM} × (access $adjASRR_{M:nM}$ – 1)]

This was the same as the gap in total numbers of scripts due to access differences (since the ratio of initial scripts to patients must be unity).

Further differences in number of scripts due to variation in subsequent scripts per each patient (persistence) were calculated as the residual, where:

shortfall/excess in subsequent scripts per index patient ($persistence_{M}$)

= overall shortfall/excess $scripts_{M}$ – shortfall/excess $patients_{M}$

Results

Near parity of script counts (prescriptions dispensed) when adjusted for age— During 2006/07 31,935,268 scripts were dispensed in New Zealand, 4,108,107 being PSO scripts and scripts for individuals either without NHI numbers or unknown or invalid age, gender or ethnicity information (comprising 12.9% of all scripts), with non-PSO NHI-containing scripts (including valid gender/ ethnicity/age) scaling to 31,889,448 for this analysis. 3.3 million (scaled) scripts were ascribable to Māori and 1.7 million to Pasifika (detailed in Appendix 2).

These script numbers related to 2.7 million patients with individual NHI numbers, which with scaling for missing NHIs became 2.92 million patients (383,000 Māori, 188,000 Pasifika).

Age-standardised scaled prescription dispensing (script) rates overall for Māori in 2006/07 were 97% of those for non-Māori/non-Pasifika, and for Pasifika were 123% of those for non-Māori/non-Pasifika (Māori 5919.8 scripts per 1000 age-standardised population, Pasifika 7535.8 per 1000, non-Māori/non-Pasifika 6102.1 per 1000). This contrasted with crude 64% scripts overall per capita in Māori compared with non-Māori/non-Pasifika, and 83% for Pasifika compared with non-Māori/non-Pasifika.

The higher usage after adjusting for age is largely explained by the relative youth of Māori and Pasifika; medicine use tends to increase with age and there are proportionately less older Māori and Pasifika (see Appendix 2).

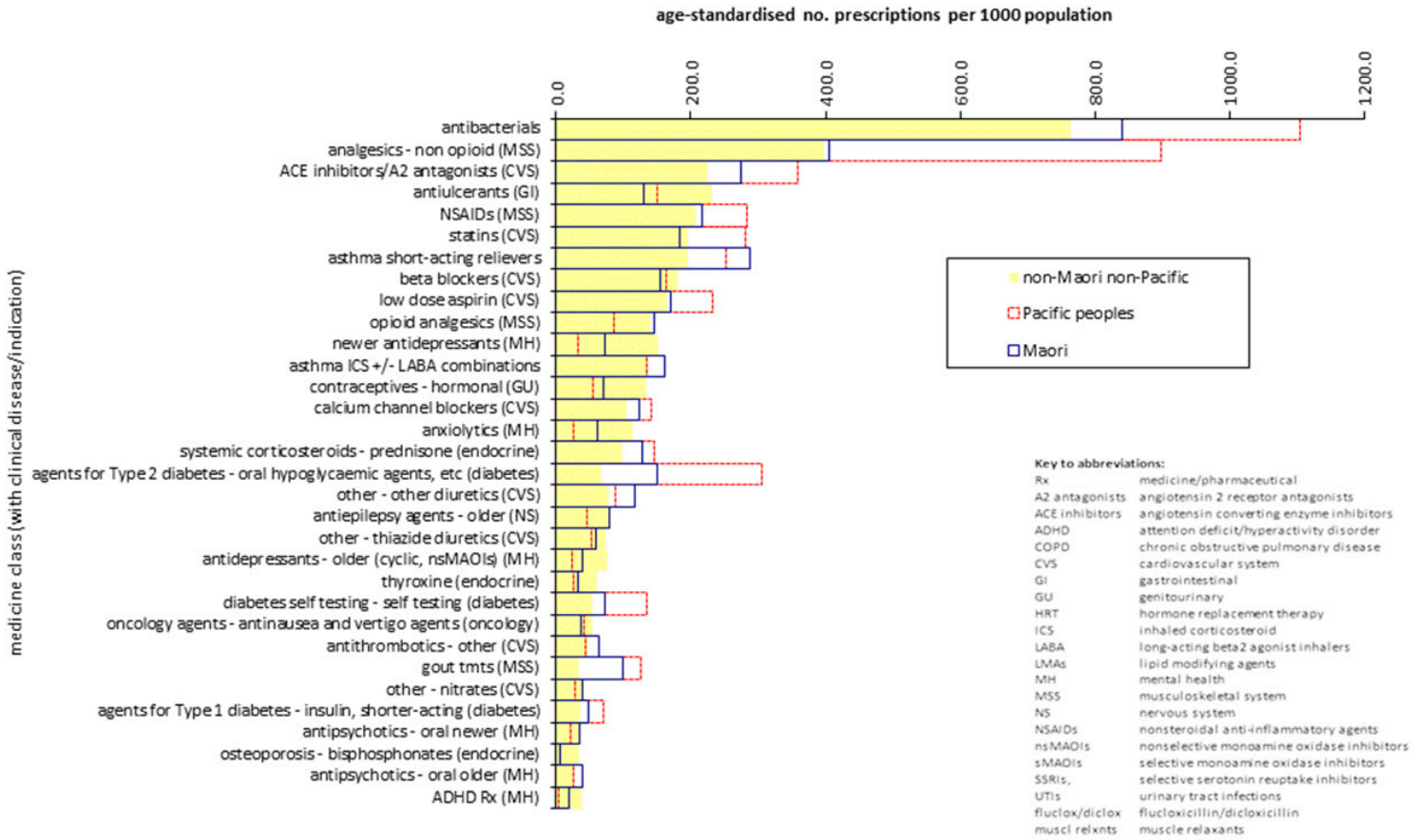
There was a large residual variability in scripts by medicine group after adjusting for age. This was often not obviously related to disease burden. For instance when compared with non-Māori/non-Pasifika, Māori and Pasifika showed lower age-standardised script rates for anti-depressants, contraceptives and inhaled corticosteroids, but higher rates for anti-hepatitis B antivirals, short-acting asthma inhalers, and older and depot injection antipsychotics.

The differences in therapeutic groups between Māori and Pasifika compared with non-Māori/non-Pasifika were not uniform, as can be seen in Figure A3-3 and Table A3-3 in Appendix 3. For instance, Pasifika were dispensed medicines for attention deficit disorder, Hepatitis C infections and older depot antipsychotics at one fifth the rate of Māori.

Asthma medicines and newer antidepressants were relatively under-dispensed in Pasifika compared with Māori. Conversely, Pasifika were dispensed oral hypoglycaemic medicines for type 2 diabetes and blood glucose test strips, older glaucoma medicines, scabies treatments, and hepatitis B medicines at twice the rate of Māori. Māori and Pasifika age-standardised rates were similar for antibiotics, statins, ACE inhibitors, low dose aspirin, and treatments for gout.

All of these features are detailed in Figure 1 below and in Appendix 3, including tables and further graphs.

Figure 1 Age-standardised prescription dispensing (script) rates 2006/07, by major ethnic group, for leading medicines groups (defined by prescription dispensing volumes)



Lower script counts for Māori when adjusted for health needs—Mapping the NZBDS disease categories to medicines listed on the New Zealand Pharmaceutical Schedule, in order to partly relate medicines use to disease impacts ('health need'), it was possible to link 85% of 2006/07 scripts (prescription dispensings) to relevant NZBDS disease groups. Accordingly, coincidentally 85% of DALY losses in 1996 appeared to be for diseases treatable or preventable by medicines on the Pharmaceutical Schedule.

Hence in 1996 perhaps some 480,000 disability-adjusted years of life (DALYs) were lost by the New Zealand population from diseases treatable by medicines on the Pharmaceutical Schedule (out of 563,000 DALYs lost overall for all diseases)—see Tables A4-1 and A4-2 in Appendix 4.

The generally higher use of medicines by Māori and Pasifika than non-Māori/non-Pasifika must therefore be seen in the context of these populations having general higher health needs. Details of these higher health needs for Māori can be found in Appendix 5.

For conditions treated or prevented by medicines on the Pharmaceutical Schedule, differences in burden of disease could be linked to differences between Māori and non-Māori dispensing rates (see endnote **). This mapping suggests that although total Māori script counts were comparable with non-Māori after adjusting for age, actual dispensing for Māori was much lower than needed to overcome their greater disease burden.

Hence, although Māori in 2006/07 had 97% age-adjusted script counts relative to non-Māori, after further adjusting for historical 45% higher relative DALY losses in Māori this ratio fell to 81% of what it would be for non-Māori.

Moreover, after excluding medicines not covered by the NZBDS diseases the ratio fell further to 63%. Māori had therefore 19–37% lower treatment rates compared with non-Māori (conversely, rates in non-Māori being higher).

The total scripts known to be dispensed to Māori in 2006/7 (excluding PSOs and those otherwise without NHIs, but scaled) was 3.3 million (as stated above), of which 2.7 million linked with NZBDS diseases.

The overall gap in scripts to Māori after standardising for age and adjusting for historical burden of disease amounted to 977,400 fewer scripts. Most medicines had shortfalls rather than excesses. Key shortfalls are summarised in Table 1.

Table 1. Shortfalls in Māori age/DALY-adjusted script counts

Medicine	Shortfall*	Comments
antibiotics	181,500	NZBDS categories of bacterial infections, of which 89,100 for amoxicillins
antiulcerants	60,500	principally 54,300 for proton pump inhibitors (PPIs); may reflect inappropriately high antiuclerant use in non-Māori
statins	53,100	cardiovascular risk (dyslipidaemia); principally simvastatin (45,400)
beta blockers	52,900	primarily for cardiovascular risk and disease
ACE inhibitors/A2 antagonists	48,800	cardiovascular risk and disease, including diabetes
newer antidepressants	46,300	principally selective serotonin reuptake inhibitors (SSRIs) (41,600); also venlafaxine, selective MAOIs
low-dose aspirin	40,100	cardiovascular risk
inhaled corticosteroids ± long-acting beta agonists	22,600	asthma
oral hypoglycaemics	21,300	primarily cardiovascular risk (type 2 diabetes)
diabetes self-testing	19,200	self-management of types 1 and 2 diabetes

*Shortfalls are the differences between actual script counts in Māori and numbers expected were Māori to have the same dispensing as non-Māori, after adjusting for population size, age, and disease burden.

'Access' and 'persistence' similarly less in Māori—Almost half of the above calculated 'need'-adjusted gap in prescriptions dispensed was due to fewer than expected Māori patients accessing medicines (443,900 absent initial dispensings). We estimated access in Māori to be 67% that of non-Māori. The biggest gap from reduced access was for amoxicillins.

The remainder of the gap was due to lower Māori persistence‡ with medicines (533,500 absent subsequent dispensings). Persistence in Māori was calculated as 58% of that in non-Māori. The biggest gaps from reduced persistence were for beta-blockers, PPIs, simvastatin, low-dose aspirin for cardiovascular risk, and SSRIs.

Conversely, the calculated overall difference in scripts for non-Māori (age and disease burden-adjusted) amounted to at least 12.2 million more scripts.

In summary, access and persistence contributed on a similar scale to apparent under-dispensing to Māori. Note however that there were appreciable differences between medicines in the mix of access and persistence. This included examples such as the newer antipsychotics, in which large proportionate shortfall in access was masked by proportionately lesser shortfalls in persistence.

These features are evident in the following graphs (Figures 2 to 5) and are detailed in Table A6.2 in Appendix 6.

To explain Figures 2–5:

- Figure 2 shows shortfalls and excesses in scripts for Māori compared with that expected for non-Māori. This reveals the therapeutic areas suggesting the largest gaps in dispensings.
- Figure 3 shows proportional shortfalls and excesses. This suggests the therapeutic areas with the most divergence in clinical practice from what would be expected in non-Māori, as Māori rates relative to non-Māori. (The data are on a logarithmic scale, so that shortfalls and excesses are distributed symmetrically about a relative rate of 1 (unity), which is the zero line; further explanation is in endnote ‡‡.)
- Figure 4 suggests numerical shortfalls and excesses broken down by access and persistence. This shows these two factors' variable contributions to differential dispensing.
- Figure 5 shows proportional shortfalls and excesses, broken down by access and persistence. As with figure 3, this suggests the therapeutic areas with the most divergence in clinical practice from what would be expected in non-Māori, as Māori rates relative to non-Māori, but then shows how much is due to differences in access versus differences in persistence. (Again as with figure 3, the data are on a logarithmic scale, see endnote ‡‡).

Figures 2 to 5 also include disaggregating of the category 'NSAIDS/gout/analgesics/ muscl relxnts' into component 'Rx for hyperuricaemia & gout' and 'NSAIDS + muscle relaxants' subcategories.

Figure 2. Numerical differences in script counts for Māori compared with non-Māori, adjusted for age and historical burden of disease

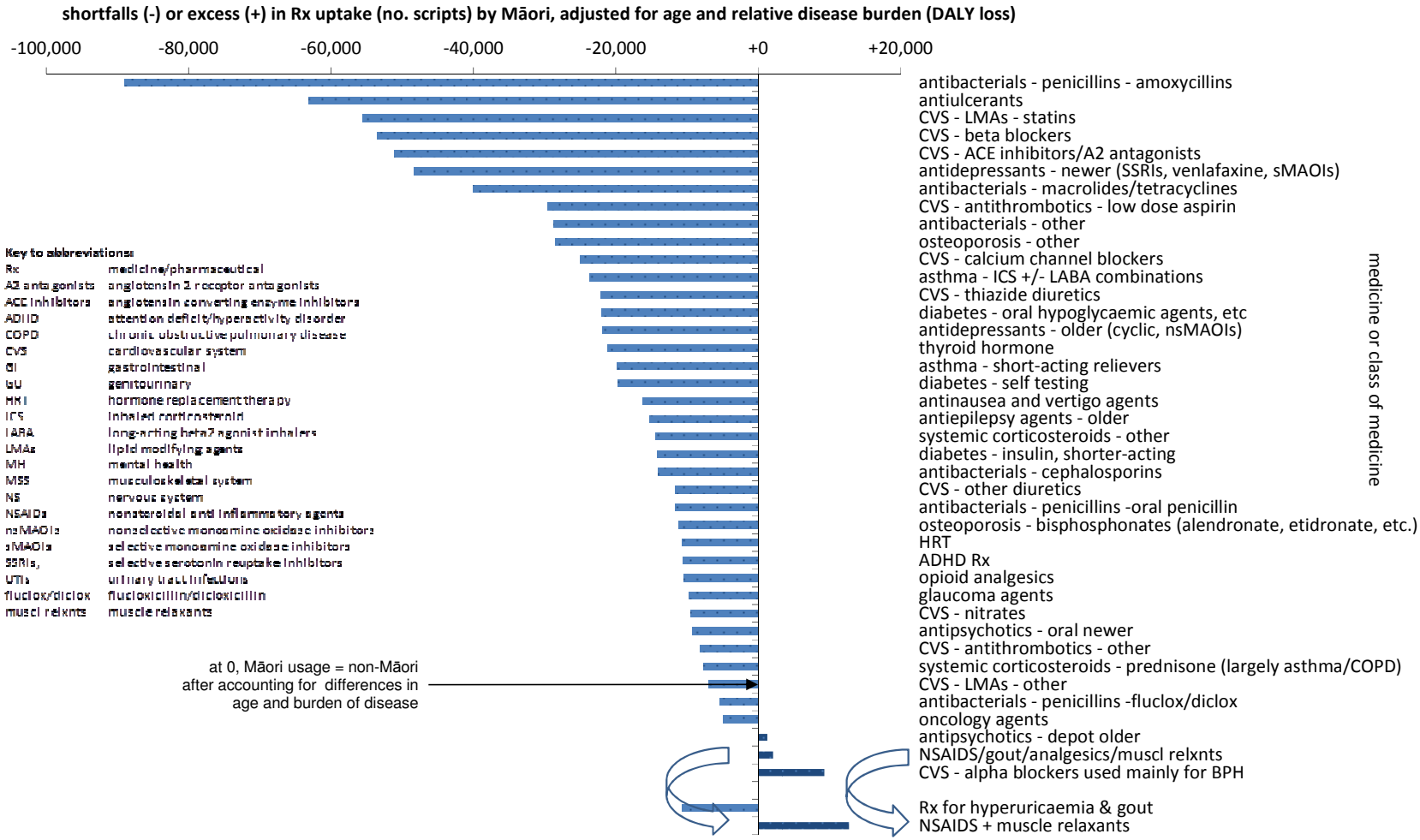


Figure 3. Proportional shortfalls and excesses in script counts for Māori compared with non-Māori (rate ratios), adjusted for age and historical disease burden

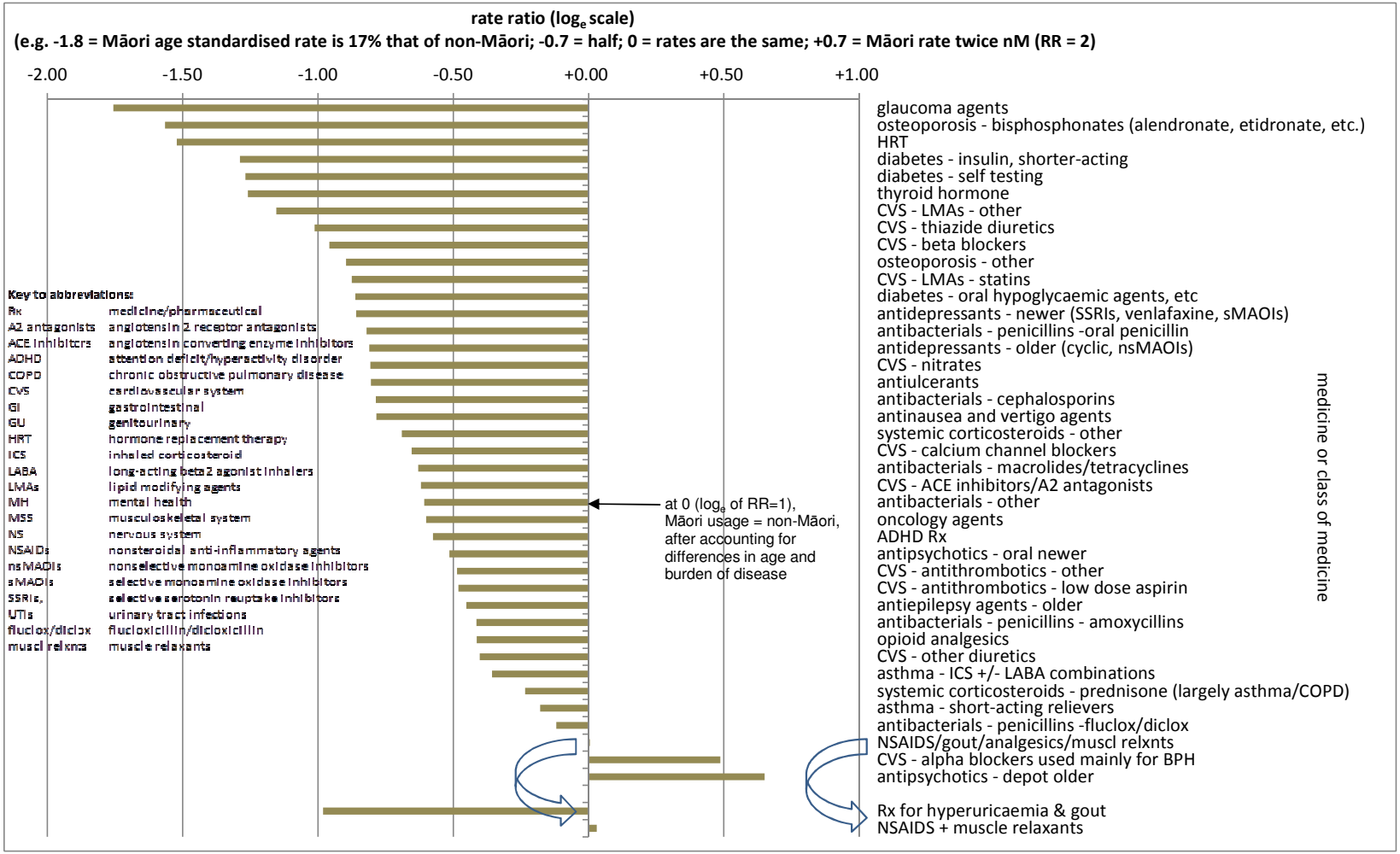


Figure 4. Numerical differences in script counts for Māori compared with non-Māori, adjusted for age and historical disease burden, disaggregated by access and persistence

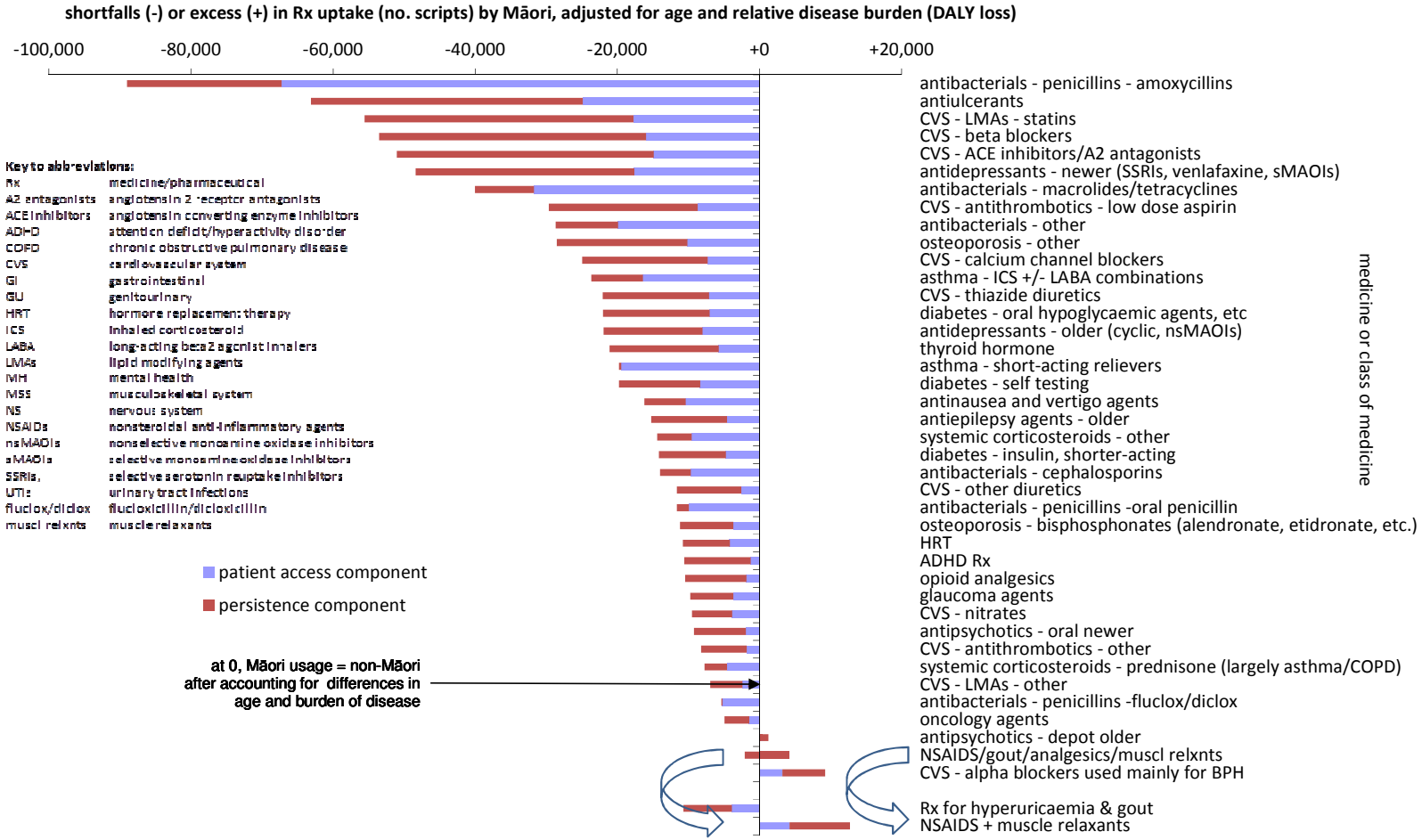
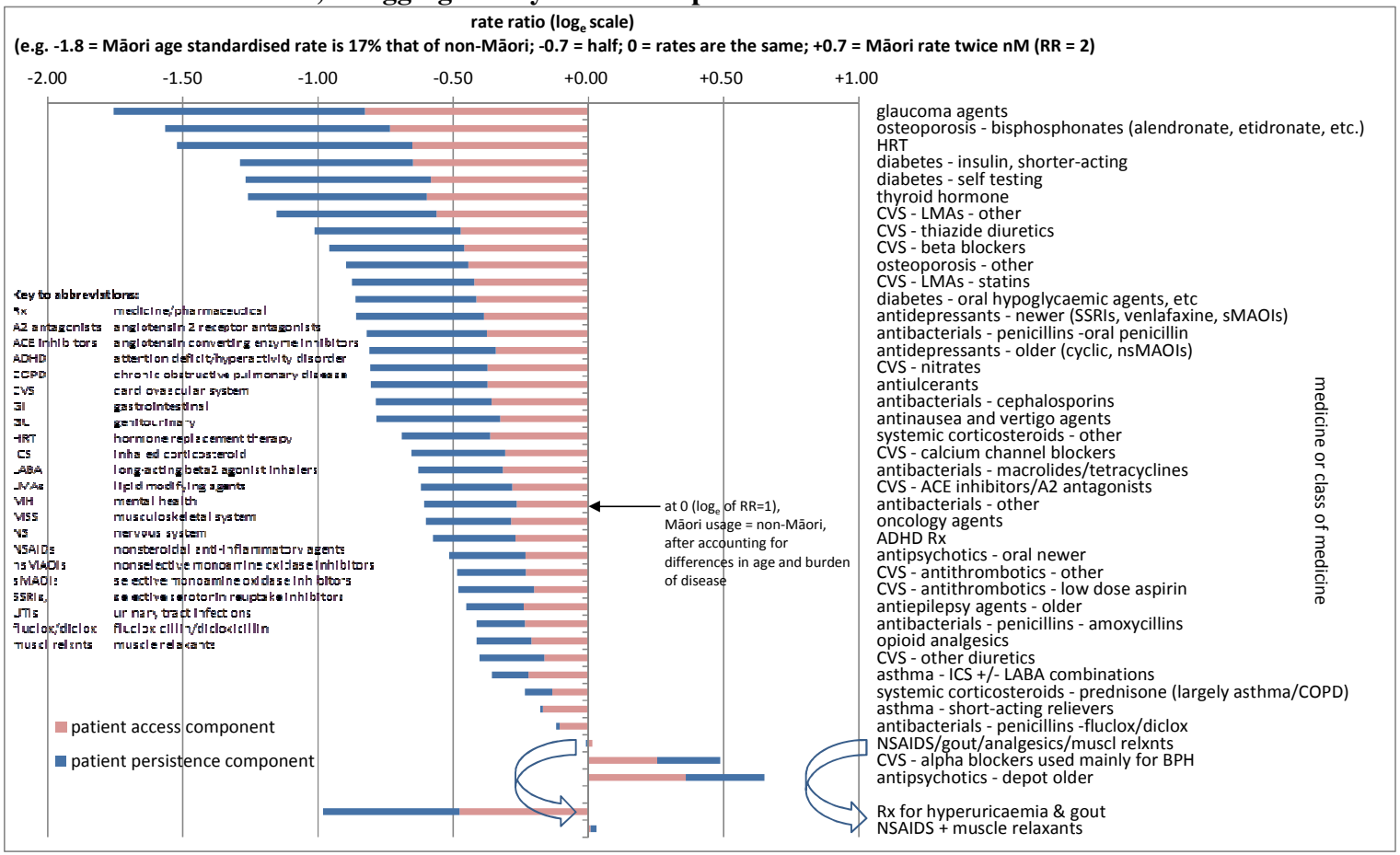


Figure 5. Proportional shortfalls and excesses in script counts for Māori compared with non-Māori (rate ratios), adjusted for age and historical disease burden, disaggregated by access and persistence



Discussion

This analysis links patient-level script count data with population-based estimates of health need. This method can give at best broad indications of trends, for what are complex issues. Interpretation of the results may change after more detailed analysis of individual issues. The ability of access to counteract persistence (as seen with some antipsychotics) is an example of more complex effects that may be lost in population-based data.

Even so, this work reveals a potentially significant issue with likely differences between ethnic groups, and hence potential for health gain or reduced wastage once shortfalls and excesses are addressed. This is apparent in a majority of disease and disability states, and begs the question of suboptimal or excess treatment elsewhere.

Limitations and caveats—There are however important limitations and caveats with the analysis:

- Scripts dispensed are not the same as medicines prescribed. There is evidence that many prescriptions are either not presented or not collected at pharmacies. Reasons for this may include time, cost and transportation. Such factors can affect populations differentially.

  Māori are more likely to have uncollected prescriptions, their non-collection rate being 45% higher than that of non-Māori aged over 15[20,21] (where this statistic stems from 2006/07, when minimum co-payments for the first 20 items were $3 per item; this has since risen to $5). It is not possible to tell from this analysis the extent that failure to dispense represents a systematic failure to prescribe or a systematic failure to ensure that prescriptions are filled. However, this feature may appreciably understate true gaps.

- Dispensing data are restricted to those prescriptions and patient groups that gain subsidies for publicly-funded community dispensed medicines. The data therefore exclude prescriptions that were not subsidised, or items that fell below the $3–$15 prescription co-payments at that time, where pharmacies would have no need to claim (and hence would not be captured in the PharmHouse claims database data). Non-capture of unclaimed medicines use might undercount appreciably overall medicines use and potentially understate gaps in in populations with poorer access to medicines.

- Script counts are an imprecise measure of coverage (days) that medicines are actually provided, being confounded by dispensings/script rates and duration (days' coverage) of dispensings. With scripts versus dispensings, people living in rural areas tend to get longer dispensings (e.g. 3 months, where 1 month would be standard in non-rural setting). Hence, to the extent that Māori are overrepresented in rural populations, the gaps may be overstated to an uncertain extent.

- Some PSOs may be used for targeting populations with poor access to medicines. PSOs are more commonly used in rural areas, where the nearest pharmacy may be some distance, and for certain types of medicines, such as antibiotics. PSOs understate true numbers of people receiving medicines, which may mean gaps are overstated to some extent.

- Gaps in script counts do not necessarily equate with gaps in disease burden and capacity to benefit from effective medicines treatment. Population health gains (expressed for example as quality-adjusted life years (QALYs) gained) reflect not only numbers of patients and script frequencies per patient, but also the effectiveness of medicines in relation to patients' health needs. Hence gaps in health outcomes from patients receiving less medicine are not necessarily the same as gaps in script counts.
- Linking between script counts and diseases can be imprecise where medicines have multiple clinical indications or disease burden covers a broad range of diseases. Problems linking medicines to single disease groups may have important effects on the analysis' results.

  If these factors were to cause bias that is non-differential, such imprecisions from linking could tend to understate true differences in disease burden-adjusted prescriptions. However, this is not a given; it is possible that differential bias could occur, for instance understating of shortfalls in for one disease category meaning falsely ascribing shortfalls in another disease category, which could overstate net true differences.

  An example of probable non-differential bias within a disease category (understating true differences) is that of gout and other musculoskeletal conditions. Medicines for gout (e.g. allopurinol) are bundled into wider NSAIDS etc., because the 1996 NZBDS data combined a number of musculoskeletal conditions, meaning the high excess disease burden for Māori for gout (e.g. their age-standardised hospitalisation rates in 2006/07 being 6–7 times that of non-Māori)[22] was diluted by other musculoskeletal diseases and hence relative disparities were muted. Overall, Māori had a small observed shortfall of DALYL-adjusted scripts for musculoskeletal diseases (-2,000), but this may well have been due to a large shortfall for allopurinol etc. for gout (-10,700 scripts) masking a similarly-sized excess for NSAIDs (+12,700).

  Conversely, an example of the potential for differential bias across disease categories (potentially overstating net true differences) is that of carbamazepine and sodium valproate, which are anti-epilepsy medicines. In the analysis, these were matched to the NZBDS Epilepsy category, and there was a shortfall of 5,900 scripts for Māori (out of 208,900 total scripts). However, carbamazepine and sodium valproate are also commonly used for the control of bipolar disorder, inter alia.

  The lifetime prevalence of bipolar disorder in Māori is double that of the overall population,[23] so it is possible that the shortfall for Māori in the Epilepsy category was understated, and the shortfall for Māori in the NZBDS Mental Health category was overstated, to a greater extent than non-Māori. Such possibilities highlight the impact of mismatching of medicine dispensings and disease categories.

  More specifically, the broad scope of this preliminary analysis does not allow more detailed review of antibiotic use for discrete issues, e.g. the high incidence of acute rheumatic fever in Māori children,[11] which relates specifically to childhood penicillin and amoxicillin use in the treatment of

acute pharyngotonsillitis (sore throat)—where these medicines also treat many other childhood infections.

- Age-standardised rates and rate ratios are aggregates that can obscure wide variation across age groups. This become particularly important where data are missing (e.g. from prescriptions that lack NHI numbers including PSOs), with the potential to mis-state true gaps.

  For example, with the amoxicillins (amoxicillin, amoxicillin clavulanate) there was a shortfall of 89,100 scripts for Māori. Much of that shortfall occurred in children aged 0–14 years, whose relative rates were substantially lower than for older age groups. However, 13% of scripts for amoxicillins did not have NHIs and could in theory all have been on PSO (being double the average 7.5% for scripts overall on PSO).

  If, radically, the many amoxicillin scripts without NHIs were for all Māori children and these in turn had the same relative rates as for older patients, then the shortfall for amoxicillins for Māori children would halve and the overall gap (all ages) would be only 1/5th lower than non-Māori (53,200 script gap). Details including component calculations can be found in endnote ŧŧŧ.

  Amoxicillins accounted for 11% of all non-NHI scripts (204,762 scripts without NHIs numbers, out of 1.6 million amoxicillin etc. scripts and 2.4 million scripts without NHIs), so these medicines are an important part of this information gap.

- Analysis is unavailable for Pasifika. The available Ministry age-specific analysis by ethnic group was confined to comparing Māori with non-Māori, and other relevant disease burden analysis (Ministry of Health 2001b[3]) provided insufficient detail to enable age-specific and age-standardised disease burden estimates for Pasifika, Māori and non-Māori/non-Pasifika. Pasifika people have needs and underuse at least equal to Māori (see Appendix 3), with two consequences:

  Important gaps need to be identified and quantified for Pasifika too;

  Māori vs. non-Māori comparisons if anything may understate the extent of Māori underuse once adjusted for need, as by including Pasifika in the non-Māori group this may dilute the relative effects for Māori.

  Such deficiencies should be addressable in the Ministry's forthcoming updates of the NZBDS.

  [***Note***: The August 2013 published update of the NZBDS[36,37] has not included separate results for Pasifika, only comparing Māori with non-Māori.]

- The use of disease burden estimates based on mortality/morbidity data from 1996 to compare with prescription volumes a decade later may overstate absolute health need, as mortality and morbidity would be expected to have improved overall over that decade (as was certainly the case for life expectancy at birth[24]) but affecting some diseases more than others.

  Such improvement[24] may be due in part to increased access to some medicines since the mid-1990s (e.g. statins), or some medicine classes or medicines or

formulations (e.g. low dose aspirin) subsidised in 2006/07 not so during the mid-1990s, aside from other causes.

In broad terms, this overstating of need a decade later may be substantial, by a factor of 1/10th to 1/3rd overall (see endnote §§), and the extent that individual diseases' burdens had improved is not known. This bias, mismatching medicines use with variably changing needs, would be best addressed by concurrent prescription volume data and burden of disease estimates.[36]

- Analyses that relate medicines utilisation with health outcomes, e.g. using separate hospitalisation and pharmaceutical utilisation databases, are cross-sectional and ecological. Although these can suggest relationships, they cannot adequately resolve causal association. Longitudinal analytical methods, e.g. using linked datasets, can better resolve causation. However, they also are prone to errors such as confounding and selection bias.
- Results can be difficult to interpret without wider contextual information and deeper analysis. Adjusted differences between ethnic groups' medicines use are descriptive only; they can reflect shortfalls in use of needed treatments in one group, excess use of inappropriate treatments in the comparator group, or combinations of these. For instance, for some medicines, low DALYL-adjusted relative dispensings may suggest suboptimal access by Māori, but could equally be due to excess use in non-Māori compared with recommended ideal usage levels, or patient characteristics aside from broad age and disease burden; a number of similar ambiguities are possible.
- Observed associations between dispensings and those disease burden (DALY) measures that incorporate hospitalisation outcomes will probably be subject to confounding from other factors. There are multiple factors leading to hospital admissions, for reasons beyond the simple availability of medicines (endnote *). Relevant factors occupy several different domains, including socio-economic, cultural, and behavioural. This may however not substantially affect the results.
- The NZBDS DALYL estimates for 1996[15] discounted annually at 3%, consistent with the methodology used by the original Global Burden of Disease Study.[25] More recent convention (including with the updated NZBDS)[36] is to not discount future DALYL; PHARMAC's own assessments of health need[26] do not discount future years lost (as distinct from discounting future life years gained in cost-effectiveness analyses, consistent with conventional health economic assessments[27]).

  The discounting of the 1996 DALYLs has two effects:

  1. Patterns of relative absolute disease burdens (total DALYL) across diseases will be distorted by understating disease burden for those diseases with higher proportions of DALY losses occurring later, which especially occurs where premature mortality (high years of life lost, YLLs) dominates DALYL;
  2. Consequent DALYL $ASRRs_{M:nM}$, affecting gap analysis (script differences) and thus consequent rankings, will be distorted for those

disease states where DALYL in Māori occur at quite different times than for non-Māori, especially understating where YLL is particularly high in Māori (where discounting mutes these greater YLL differences).

These disparate effects are best addressed by not discounting DALYL estimates. However this feature is not thought to substantially affect the results of the analysis.

- To prevent numerator-denominator mismatching, ethnicity in all three settings (Pharmhouse prescription data, NZBDS DALYL and population denominators[15]) used ethnicity coded by the 'prioritised output' system adopted by Statistics New Zealand (see endnote ***). Problems with prioritised ethnicity, which Statistics New Zealand no longer supports (recommending since 2004 against its use) nor provides publicly, have been well summarised in the *Journal*.[28] Effects on the analysis' results are difficult to gauge.
- Scaling produces small distortions in absolute script numbers (overall 13% increase), although underlying patterns are unlikely to be affected appreciably.
- Segi's standard world population was used as reference population for age-standardisation, not alternatives such as the World Health Organization (WHO) world population or New Zealand census populations. Used by the original NZBDS[15,3] (and hence a requirement for this analysis), Segi's standard population is younger and hence closer to the Māori population structure, whereas the WHO world population is older and closer to the non-Māori population.[29] This however is unlikely to appreciably affect the results.

  [***Note***: The NZBDS 2013 update[36,37] uses the WHO world population as its reference population for direct age standardisation.[37]]
- Medicines persistence is a systems measure comprising many components, including disease severity, differences in numbers of dispensings per script and/or days' coverage, access to affordable comprehensive ongoing medical and pharmacy care in order to gain and collect subsequent dispensings, and revealed preference (patients electing not to collect further dispensings, beyond issues of pharmacy availability and cost). Again, it is not possible from this preliminary work to ascertain whether and why a patient is not prescribed further dispensings, stops having a medicine dispensed, or later does not use it all once dispensed (concordance/adherence).
- Persistence may be distorted for age/disease/ethnicity groups with marked absolute excess premature death (YLL) in a 12 month period, as early mortality (e.g. Māori) will understate persistence. This however is unlikely to appreciably affect the results.
- This analysis has not included an estimate of uncertainty. In principle, confidence limits could be calculated for ASRs and ASRRs (using the log-transformation method), which would allow standard hypothesis-testing to help filter those gaps explainable by chance. This can be considered for future analysis that uses updated prescription and burden of disease data, provided such analysis was valid (endnote ‡‡‡).

These limitations and caveats will be of varying importance; it is difficult to gauge their overall net impact on the results of the analysis.

The NZBDS update (August 2013) contains more detailed and numerous disease categories, non-prioritised ethnicity (in the form of single and combination ethnic response groups) and does not discount.[36,37]

Interpretation—Despite these limitations, the data still suggest important and potentially remediable differences that need to be addressed.

In this analysis, age-standardised rates (without further adjustments for disease burden etc) tended to understate true gaps in needs-adjusted access. Confining analysis to crude and age-standardised script rate ratios may equate poorly with needs-adjusted gaps in access to medicines; the reporting of prescription volumes should consider the effects of burden of disease.

Needs-adjusted Māori and non-Māori dispensings during 2006/07 were about equal in a small number of areas—for example, substance use disorders, hepatitis B/C treatments, and anti-rheumatoid agents. But there were major differences in some areas of key importance to Māori health.

For example, in 2006/07 around 286,000 fewer prescriptions for cardiovascular medicines were dispensed than would have been expected for a comparable non-Māori population (and thereby more than expected scripts in non-Māori). Other key areas of large underuse in Māori (and/or overuse in non-Māori) included antibiotics for infections (which will include preventing rheumatic fever), newer antidepressants, oral hypoglycaemic agents for type 2 diabetes, and inhaled corticosteroids and/or long acting beta agonists for asthma.

Conversely, the small surplus in Māori for non-steroidal anti-inflammatory drugs (NSAIDs)/gout medicines /analgesics/muscle relaxants included 12,700 excess prescriptions dispensed to Māori for NSAIDs. NSAIDs pose significant cardiovascular, renal and gastrointestinal hazards. The relatively high NSAID usage by Māori may reflect underdispensing of other treatments such as allopurinol for gout (10,700 script shortfall), a disease where Māori and Pasifika suffer disproportionately.[30]

More detailed analysis required—Ambiguities could in part be addressed by estimating concurrent ideal needs-adjusted usage for populations across the range of medicines within specific disease categories, and then comparing access and persistence by demographic characteristics across those medicines across time. This might also improve measurement of progress within ethnic groups over time (intra-ethnic group comparison).[31]

Examples of such groupings of different medicines include treating schizophrenia and related psychoses with newer and older oral and depot antipsychotic medicines; treating asthma with short-acting relievers, inhaled corticosteroids (ICSs) and long-acting beta-agonists (LABAs) in various combinations; or glycaemic control in diabetes with rapid vs. long-acting insulins, sulphonylureas, other oral hypoglycaemics, diet alone, blood glucose monitoring test strip to manage diabetes.

For instance, in 2006/07 excess script counts (similar to NSAIDS etc. above) occurred for Māori with antipsychotic medicines overall. However, within that overall pattern

there were important areas of relative excess for Māori, in particular older depot agents (twice the rate in Māori than non-Māori), but with shortfalls for oral antipsychotics, especially newer oral agents, when compared with non-Māori. These patterns are seen in Table 2 below.

This means, for instance, that Māori had three times the usage of long-acting injection (depot) older antipsychotics than would be expected after adjusting for historic disease burden, age, population and lower usage of oral newer (atypical) antipsychotics. The high disease burden and documented disparities in Māori from schizophrenia etc.[32] would make it valuable to know the trends in ratios over time.

Table 3. Proportional disparities in script counts for prescriptions of antipsychotic medicines dispensed to Māori, adjusted for age and burden of disease*, by type (older/newer) and formulation (depot, oral, orodispersible)

scripts,M/nM RR

	depot	oral	orodispersible	total	**oral/depot**
older antipsychotics	1.92	0.72		0.85	0.37
newer antipsychotics	1.47	0.60	1.14	0.62	0.41
total	1.81	0.64	1.14	0.70	0.35
newer/older	0.77	0.83		0.74	

ratio of depot older antipsychotics to oral newer antipsychotics = 3.2 (1.92 / 0.60)

* DALYL-adjusted age-standardised M:nM rate ratios for prescription dispensings (scripts)

Updated analysis should include new medicines and new groups of medicines listed on the Pharmaceutical Schedule since 2006/07, including vaccines for some childhood infectious diseases.

Policy implications—These data, spanning many medicines and diseases, simply reveal differences between what was dispensed to Māori and non-Māori, after adjusting for differing populations and need. However, they raise again the possibilities of structural discrimination[33] with systemic inequity[4-12] in New Zealand's prescribing practice at the time.

Any inequity and/or wastage, if ongoing, can only undermine key public policy objectives of securing access to medicines for all eligible New Zealanders.[1] If confirmed, their redress could provide opportunities for substantial population health gains and expenditure savings—by reducing shortfalls in needed medicines use, with fewer costly hospitalisations, fewer premature deaths and improved quality of life and patient satisfaction, and/or reducing inappropriate medicines excesses. This however requires further analysis.

The data relate to the 2006/07 year, now seven years ago, and given changes to Health Sector since then they cannot necessarily be considered to still be representative. This will require updating including concurrent burden of disease data and matching indications. However, to our knowledge this preliminary work is the sole such gap analysis available to date that compares across all community medicines.

Conclusion

Population-based linkage studies of this kind can be an important tool to inform equitable policies and funding decisions. These preliminary data suggest important variation in medication access and persistence across different medicines and ethnic groups. Both lower accessibility and 'persistence' appear important, but their relative influence varies across therapeutic settings; this can inform the priorities set for health sector efforts to improve access to medicines and public health activities for their optimal use.

The limitations to this preliminary analysis mean that more research will help better understand reasons for differential dispensing. An early update is required, to account for change in NZBDS disease categories, non-prioritised ethnicity, new estimates of DALY losses,[36] and different medicines and indications funded in the years since 2006/07. Such work could include age/disease burden-adjusted gap estimates for Pasifika and non-Māori/non-Pasifika using non-prioritised ethnicity, gaps for other sociodemographic variables (e.g. location, deprivation), and tracking change in shortfalls/excess of medicines over time,[31] using a treatment-year metric.

Meantime, age-standardised ethnic rates of medicine use that do not adjust for need may carry a high risk of understating true gaps in needs-adjusted access. Analyses of prescription data by ethnicity should consider whether to more extensively adjust for health need and methods to separate access from persistence.

Appendices and annexe

Appendices

1. Methods
2. Crude rates of prescription dispensings by ethnic group, and effects of age structures and thus age standardisation on prescription dispensing patterns for ethnic groups
3. Detail of variability in prescription dispensing rates for Māori and Pasifika compared with non-Māori/non-Pasifika
4. Medicines use related to New Zealand Burden of Disease Study disease needs
5. Excess disease burden in Māori and non-Māori
6. Gaps in Māori use of medicines, adjusted for age and disease burden (need)

Annexe

Grouper linking pharmaceuticals 2006/07 with DALYs 1996

Endnotes:

* Thresholds to hospital admission are determined only in part by the severity of disease or similar need ('demand'). Many factors can lead to hospital admissions, for reasons beyond the simple availability of medicines. These include variation in bed supply; diagnostic shift and miscoding in hospitalisation data; and the differential effects of double counting of readmissions and of inter-hospital transfers as 'new' admissions. Supply factors include bed availability, which can vary by time and place; alternative service provision (outpatient services, assessment wards in Emergency Departments); clinical protocols; and competing illnesses (e.g. the winter surge in cardiorespiratory admissions).

ťIn New Zealand, patient-level data is collected from dispensing pharmacies when they claim for dispensing fees. Although the original prescription does carry patient details, the only detail recorded into the database is a patient identifier called a National Health Identification (NHI) code, which is encrypted to ensure confidentiality. This unique NHI number is issued to any patient using any public hospital or enrolled in any Primary Healthcare Organisation (PHO) in New Zealand. Virtually every primary care clinician in New Zealand has computerised patient records, and prescriptions have the NHI number automatically printed on them. Similarly, the majority of hospital out-patient prescriptions are likely to be issued with an adhesive label giving the patient identification and the NHI number. (The one confounding factor in the information chain is likely to be private specialists who have no incentive to write the NHI number on their scripts. This is only a small proportion of prescriptions however, and there is no particular reason to think that the trend in private practice would work against what is recorded in public.)

In addition to the NHI number attached to hospital records, the NHI register contains the individual's date of birth, ethnicity, deprivation index (based on socioeconomic variables in national household census data relating to domicile), and other demographic data.

In PharmHouse/the Pharmaceuticals Collection, 'scripts' (i.e. prescription items dispensed) count initial dispensings alone, authorised by a doctor's etc. prescription, without including repeat dispensings, while 'dispensings' combine initial dispensings with any repeats (authorised by the same prescription). A script is flagged in the database the first time a patient is dispensed a medicine on a given prescription. Therefore the count of scripts (prescription items) a person has for a given medicine is the count of initial dispensings they receive over a given period of time.

This analysis relates to dispensing data for any of those medicines listed on the New Zealand Pharmaceutical Schedule[16] between 1 July 2006 and 30 June 2007.

Analysis includes only dispensing claims for prescriptions written individual patients, and excludes Practitioner's Supply Orders (PSOs). PSOs help prescribers obtain subsidised medicines for emergency use, and teaching and demonstration purposes (a PSO being a written order made by a prescribing Practitioner (doctor, dentist, dietician, midwife, nurse prescriber, optometrist, pharmacist) for the supply of community pharmaceuticals to the practitioner, which the practitioner requires *inter alia* for emergency use and providing to patients where individual prescriptions are impractical).

‡ This was an observational study (being an audit observing outcomes without controlling study variables or having an intervention) with the secondary use of data for quality assurance/outcome analysis/resource review undertaken by people employed by the service provider holding the information and where participants remain anonymous. It did not meet criteria for requiring ethics committee review.[34]

§ In the context of this analysis, 'persistence' is the frequency of subsequent prescriptions dispensed for each individual index patient dispensed a first prescription of a medicine during the year. This is distinct from rates of dispensings across a population (which combine both access rates (index patients dispensed any amount of a medicine) and persistence (subsequent prescriptions dispensed/patient). Persistence is predicated on, *ceteris paribus* (all other things being equal), there being no particular reason why some groups would have lower subsequent prescription dispensing frequencies than other groups needing the medicine.

Medicines persistence is a systems measure comprising many components, including disease severity, differences in numbers of dispensings per script and/or days' coverage, access to affordable comprehensive ongoing medical and pharmacy care in order to gain and collect subsequent dispensings, and revealed preference (patients electing not to collect further dispensings, beyond issues of pharmacy availability and cost). Any choice not to collect further dispensings (*ceteris paribus*) may

have similar underlying causes of incomplete concordance once a medicine is collected. Concordance /adherence by patients is merely a subset of persistence.

** Unfortunately the available Ministry analysis by ethnic group was confined to comparing Māori with non-Māori (Ministry of Health 2001a[15]); other relevant disease burden in 1996 analysis (Ministry of Health 2001b[3]) did not provide sufficient detail to enable age-specific and age-standardised disease burden estimates for Pasifika, Māori and non-Māori/non-Pasifika. Māori vs. non-Māori comparison if anything understates the extent of Māori underuse once adjusted for need, as the non-Māori group includes Pasifika who have needs and underuse at least equal to Māori—hence diluting the relative effects for Māori. The Ministry analysis was also outdated, using data from 1996, for which some conditions the Māori:non-Māori differences will have changed (but at the time of writing we could not efficiently determine for which and the extent). The Ministry has now updated and enhanced the 2001 published work.[36]

ϯϯ (% Māori access cf non-Māori) × (% Māori persistence cf non-Māori) = % Māori overall prescription volumes cf non-Māori, where scripts = access× persistence.

‡‡ To help interpret Figures 3 and 5, note that, because the scale is logarithmic, it is the zero line where Māori usage is equal to non-Māori after accounting for differences in population size, age and burden of disease (i.e. 0, where when Māori usage rates equate to non-Māori the ratio of the rates is 1, and then the natural logarithm ($\log_e$) of 1 is 0). Values are spread out when Māori usage was less than non-Māori, and clumped when Māori usage was relatively higher, so for example at -1.7 the Māori age standardised rate was 18% that of non-Māori; -0.7 was half that of non-Māori; 0 means rates were the same; 0.7 means the Māori rate was twice that of non-Māori.

§§ The ethnic gap in life expectancy at birth (Māori versus non-Māori) in 1996 was 9.7 and 9.8 years for males and females, declining in 2006 to ~7.6 and 7.0 years, respectively;[24] this was an approximate 25% relative decrease in the gap improvement [(average of (9.7 −7.6, 9.8 −7.0)) −1]. Recent life expectancy updates[35] suggest recent further narrowing, with the gap between Māori and non-Māori life expectancy at birth being 7.3 years (based on death rates in 2010-12), compared with gaps of 9.1 years for 1995-97, 8.5 years for 2000-02, and 8.2 years for 2005-07; this gave a 10% relative reduction in the gap over the decade 1995-97 to 2005-07:

Differences between non-Māori and Māori life expectancy at birth (years)

Tobias et al 2009	1996	2006	difference	%2006/1996	relative change	gap overstated*
male	9.7	7.6	2.1	78%	-22%	28%
female	9.8	7.0	2.8	71%	-29%	40%
all	9.8	7.3	2.5	75%	-25%	34%

StatsNZ life tables	1995-97	2005-07	difference	%2006/1996	relative change	gap overstated*
all	9.1	8.2	0.9	90%	-10%	11%

*= the extent that the gap in life expectancy (LE) in 1996 overstates the gap in LE in 2006

Hence the 1996 NZBDS data may overstate Māori versus non-Māori health gaps for the 2006/07 population by perhaps 11 to 34%, for death at least.

This however is a crude comparison that is broadly indicative only, where some diseases will be affected more than others. In addition, the absolute gap in life expectancy at birth remains large: Māori life expectancy in 2006 was similar to that achieved by non-Māori 30 years previously (1976) for females and 20 years previously (1986) for males.

Analysis of the NZBDS update, for disease burden during 2006,[36] would address these concerns.

*** With the 'prioritised output' system adopted by Statistics New Zealand, each person is identified as belong to just one ethnic group, prioritised by Māori first, etc. (i.e. all individuals identifying as Māori (including those also identifying with other ethnic groups) are coded as Māori; all those identifying as Pasifika, other than those also identifying as Māori, are coded as Pasifika; etc.) Analysing ethnic variation using total response would mean that one person could be represented in multiple ethnic groups. While ethnic prioritisation provides a true denominator, where each person equals one count, total response would allow richer information around ethnic data, particularly for people who identify as both Māori and Pasifika, and increased accuracy around non-Māori and non-Pasifika comparisons. The advantage of using prioritised ethnic analyses is to continue previous time trend comparisons using a consistent methodology.

Initial summary material has been available on PHARMAC's Te Whaioranga website (http://www.tewhaioranga.co.nz/Health-professionals/Research-and-articles/Analysis) since 2009, and was provided in bpac$_{nz}$'s Best Practice Journal in 2012.[38] These initial data however understated overall disparities by one third, due to numerator-denominator bias evident on preparing detailed data for formal publication.

ŧŧŧ With the amoxicillins (amoxicillin, amoxicillin clavulanate), there was a shortfall of 89,100 scripts for Māori, being 1/3rd less than expected after adjusting for population, age and disease burden (disease burden-adjusted AS RR of 0.66). 73% of that shortfall occurred in children aged 0-14 years, whose adjusted rate ratio of 0.55 was substantially less than the average 0.81 RR for older age groups.

However, 13% of scripts for amoxicillins did not have NHIs and could in theory all have been on PSO; this is double the average 7.5% for scripts overall. Amoxicillins accounted for 11% of all non-NHI scripts (204,762 scripts without NHIs, out of 1.6 million amoxicillin etc scripts and 2.4 million scripts without NHIs).

If, radically, the 204,762 amoxicillin scripts without NHIs were for all Māori children and these in turn were to have the same script M:nM adjusted RRs as for older patients, then the shortfall for amoxicillins for Māori children would halve and the overall shortfall in Māori would decrease by 40% to become 53,200—see the following table.

agegroup		0-14	15-24	25-44	45-64	65+	total
no. scripts	Māori	150,699	30,233	45,790	42,229	18,190	287,141
(excl PSO)	non-Māori	503,297	121,455	174,982	273,396	241,609	1,314,739
	total	653,996	151,688	220,772	315,625	259,799	1,601,880
ASR	M	696.8	257.3	270.6	425.1	691.8	459.3
	nM	749.4	246.9	173.4	300.0	489.8	410.7
	RR, scripts	0.93	1.04	1.56	1.42	1.41	1.12
RR, DALYL		1.7	1.7	1.7	1.7	1.7	1.7
adj RR scripts		0.55	0.62	0.92	0.84	0.83	0.66
difference rates M - nM		-52.6	10.5	97.3	125.1	201.9	48.7
shortfall (scripts)		-65,115	-11,135	-3,407	-6,585	-2,887	-89,130
% age/all for shortfall		73%	12%	4%	7%	3%	100%
% shortfall/all Maori for age		-43%	-37%	-7%	-16%	-16%	-31%
% shortfall/all pts for age		-10%	-7%	-2%	-2%	-1%	-6%
if scripts without NHIs were for Maori children with same M:nM script RR as for older patients							
(no. scripts, Māori)		150,699	30,233	45,790	42,229	18,190	287,141
RR, scripts		1.36	1.04	1.56	1.42	1.41	1.36
adj RR scripts		0.81	0.62	0.92	0.84	0.83	0.81
shortfall (scripts)		-29,205	-11,135	-3,407	-6,585	-2,887	-53,220
% change in shortfall*		55%	0%	0%	0%	0%	40%

*if scripts without NHIs were for Maori children with same M:nM script RR as for older patients

‡‡‡ The use of confidence limits in this setting may confuse precision with validity, when this was a preliminary pilot exercise whose validity required due peer scrutiny.

Competing interests: The authors are PHARMAC staff or advisors.

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Acknowledgments: We thank Rico Schoeler (Manager Assessment) and Marama Parore (Manager Access & Optimal Use and Māori Health) of PHARMAC, Wellington; Martin Tobias (Principal Adviser, Public Health Intelligence) of the Ministry of Health, Wellington; and PTAC members in 2008 who both provided advice on earlier analysis and reviewed (1) indication-based medicines groupings and (2) consequent groupings of indication-based medicines with disease categories. The Journal's anonymous peer reviewers provided helpful commentary.

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THE NEW ZEALAND MEDICAL JOURNAL
Journal of the New Zealand Medical Association

Ethnicity and rectal cancer management in New Zealand

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Abstract

Aim Research shows survival disparities between Māori and non-Māori colon cancer patients, with comorbidity and cancer care being major contributing factors. We studied rectal cancer management and survival in a cohort of Māori and non-Māori patients with a newly diagnosed rectal cancer.

Methods 194 Maori and non-Maori patients diagnosed with rectal cancer between 2006 and 2008 were identified from the New Zealand Cancer Registry. Medical records were reviewed and patients compared on presentation, patient and tumour characteristics, and receipt and timing of treatment. Cox regression models were fitted to compare cancer-specific survival.

Results Compared to non-Māori patients, Māori patients were younger (mean age at diagnosis 63.5 and 69.2 for Māori and Non-Māori respectively; $p<0.001$) and had higher prevalence of comorbidity. Stage, grade and tumour size distributions were similar. Almost all stage I–III patients (97%) underwent definitive surgery, with no difference between Māori and non-Māori. Māori patients waited longer for referral to medical oncologists (40 days vs. 33 days; $p=0.03$). Results suggested Māori patients with stage IV disease may be less likely than non-Māori to be referred to palliative care (13% vs. 40%; $p=0.07$). The hazard ratio for cancer-specific death for Maori compared with non-Māori patients was 1.24 (95% CI 0.65–2.35).

Conclusion The findings suggest both similarities and some differences in treatment and outcomes between Māori and non-Māori rectal cancer patients, but firm conclusions are limited by small sample size.

Cancer incidence and mortality rates are known to vary between different ethnic groups in New Zealand.[1,2] Rectal cancer is one of the few cancers for which Māori have historically lower incidence rates than non-Māori.[3] However Māori are more likely to be diagnosed at a more advanced stage of disease or have unknown stage,[4,5] and are more likely to die from rectal cancer once diagnosed.[4-6]

A recent study on survival disparities between Māori and non-Māori colon cancer patients in New Zealand showed that Māori had poorer survival than non-Māori patients, and that patient comorbidity and poorer access and quality of cancer care accounted for most of the excess mortality risk in Māori.[7,8] This study involved a detailed review of notes, and included all Māori patients diagnosed in a 8-year period (1996–2003).

A second study which included patients over the same period concluded that there was no evidence of disparties in survival between Māori and non-Māori colon cancer patients. This second study was based on routine and administrative data, and included patients in their survival analysis only if they had full TNM or Dukes staging

data recorded on the New Zealand Cancer Registry (<40% of patients) and was therefore likely to provide a biased estimate.[9] However the situation with rectal cancer is unknown.

Treatment for rectal cancer is more complex than that of colon cancer, generally.[10] Partly for this reason, guidelines suggest that all patients should be discussed at a multidisciplinary team meeting.[10,11] Surgery is the mainstay of treatment for rectal cancer stage I–III patients.

Preoperative radiotherapy and both pre and postoperative chemotherapy are often recommended for stage III patients. The use of adjuvant therapies is also recommended for some Stage II patients, but controversy remains. Radiotherapy can be short or long course, with the decision often made in the context of multidisciplinary team meetings.

Colorectal cancer is one of the most commonly diagnosed cancers and one of the most common causes of death from cancer in New Zealand. In 2009, colorectal cancer accounted for more than 2800 newly diagnosed cases registered with the New Zealand Cancer Registry (NZCR), and 1200 cases of cancer deaths in New Zealand alone.[2] New Zealand and Australia have the highest incidence rates of colorectal cancer worldwide.[12]

Given the demonstrated ethnic inequalities in colon cancer management for Māori and non-Māori patients in New Zealand,[7,13] it is of interest for New Zealand cancer practice to consider whether inequalities in cancer care services and/or outcomes also exist between Māori and non-Māori patients with rectal cancer.

As part of a larger study, we studied the management of cancer in a cohort of Māori and non-Māori New Zealanders with a newly diagnosed rectal cancer. We collected data directly from hospitals and cancer centers over the entire North Island, allowing a comprehensive comparison of cancer care offered to Māori and non-Māori patients with rectal cancer.

Methods

Incident cases of rectal cancer diagnosed between 1 Jan 2006 and 31 Dec 2008 were identified from the NZ Cancer Register, and confirmed on the basis of histological report. Any rectal cancer was eligible for inclusion, but rectosigmoid cancers were excluded. Patients aged 25 years or over at diagnosis, who had no previous diagnosis of rectal cancer, were resident in the North Island and were diagnosed prior to death or post-mortem were eligible for study inclusion. Only 10% of Māori cases occur in the South Island so these were excluded for practical (and resource) reasons.

All eligible Māori patients along with a randomly sampled equal number of non-Māori patients were included. Ethnicity was classified on the basis of NZ Cancer Registry data which uses an ever-Māori approach where patients are classified as Māori if they have been identified as Māori on any previous health record, all others are classified as non-Māori.

Clinical data were abstracted by a trained oncology nurse (VS) from patients' medical records from public hospitals and, where possible, from medical records held by physicians practicing in private. Data were recorded on a standardised study pro-forma, and double-entered into an electronic database. Data were also collected from cancer centers and routine administrative hospital records (National Minimum Dataset), and the national mortality collection. Validation checks were carried out and any discrepancies were resolved by reviewing all relevant data, and reaching consensus.

Data included date of diagnosis (defined according to first positive biopsy in histology reports or as recorded by treating clinician), details of patients' presentation (including a specified list of comorbid conditions present at the time of diagnosis), tumour characteristics (including tumour grade, tumour

size (longest length in mm) and stage at diagnosis (pre-treatment as estimated by the treating clinician or based on clinical data with input from a colorectal surgeon), receipt and timing of treatment (including surgery, chemotherapy, radiotherapy and palliative care), and details of surgical treatment including type of operation [lower anterior resection (LAR), abdominoperineal resection (APR), local excision, palliative], type of surgeon performing operation (general or colorectal surgeon; self-defined in clinic letters or District Health Board records), and postoperative complications (within 30 days). Cancer stage was classified according to the TNM classification system.[14]

For the purposes of describing the place where definitive surgery was performed, hospitals were categorised into those that were in main centres, smaller centres or those that were private hospitals. Main centre hospitals included North Shore, Auckland, Middlemore, Manukau Super Clinic, Waikato, Palmerston North, Wellington and Christchurch; smaller centre hospitals included Whangarei, Tauranga, Thames, Rotorua, Whakatane, Gisborne, Hawke's Bay, Hutt, New Plymouth, Taranaki, Whanganui and Masterton; while private hospitals included Kensington, MercyAscot, Braemar, and Southern Cross.

Although only patients residing in the North Island were included in the study, in one case a patient received treatment in Christchurch, which is therefore included here. For the purposes of describing timing to chemo or radiotherapy, we used first referral, and first receipt for chemo or radiotherapy for each patient.

Crude and age-standardised proportions of patients were calculated for each variable for Māori and non-Māori cohorts. Direct standardisation using the total New Zealand cancer population was used to calculate age standardised proportions to adjust for differences in the age structure between the Māori and non-Māori population.

P values were calculated from Mantel-Haenszel Chi-squared tests stratified by age group, or by t-test in the case of mean age at diagnosis. Median times between key steps in the cancer care pathway were calculated for the total population and for Māori and non-Māori cohorts. P values for these treatment time variables were calculated from the log-rank test stratified by age group.

For analysing receipt and timing of definitive treatment procedures, stage IV patients were excluded. First treatment was defined as earliest of radiotherapy, chemotherapy, definitive surgery, or where colonoscopy with polyp removal was treatment rather than diagnostic. Survey methods were used to produce population estimates for all those with rectal cancer in New Zealand over the time frame of the study. The final Māori and non-Māori samples were therefore weighted to the proportion of the target eligible Māori and non-Māori New Zealand rectal cancer population to produce total group estimates.

Cox proportional hazard regression model adjusted for age (continuous variable), stage (categories: I to IV) and tumour grade (categories: well-, moderately- and poorly-differentiated) was used to compare mortality hazard ratios (HR). The proportional hazard assumption was not violated, as graphically evaluated.

Follow-up time started at date of diagnosis and ended at date of death from colorectal cancer. Patients who died from other causes were censored at that date, and those who did not die were censored at 31 Dec 2009 (the final date covered by the mortality dataset).

All analyses were performed using SAS version 9.2 software. Approval for this study was obtained from the Multi-Regional Ethics Committee (ref. # MEC 10/042/EXP).

Results

We identified a total of 106 Māori patients diagnosed with rectal cancer who met the eligibility criteria based on NZ Cancer Registry data. All eligible Māori were included along with a randomly selected equal number of eligible non-Māori patients, resulting in an initial sample of 212 patients.

After reviewing their medical records we found 8% of patients to be ineligible (patients either had left New Zealand for treatment; were found to have a diagnosis date outside of the study period; or were found to have non-rectal cancer as their primary tumour). This resulted in a final sample of 194 patients (97 Māori and 97 non-Māori), of whom all except three had adenocarcinoma of the rectum.

Around two-thirds of Māori and non-Māori rectal cancer patients were male (Table 1). Compared to non-Māori, Māori patients were younger (mean age 63.5 years for Māori vs. 69.2 for non-Māori; p<0.001). There were no significant differences in the overall distributions of tumour grade, size or stage between Māori and non-Māori patients (Table 1), although for both grade and tumour size, more data were missing for Māori patients. Compared with non-Māori patients, Māori were more likely to have comorbid conditions, particularly cardiac arrhythmias (age standardised prevalence 17% for Māori vs. 6% for non-Māori; p=0.02), congestive heart failure (age standardised prevalence 12% for Māori vs. 5% for non-Māori; p=0.05), and chronic pulmonary disease (age standardised prevalence 19% for Māori vs. 7% for non-Māori; p=0.01) (Table 1).

Table 1. Characteristics of all study-eligible rectal cancer patients

Variables	Total (n=194)		Māori (n=97)			Non-Māori (n=97)			P value
	n	%[a]	n	Crude %[b]	Adj %[c]	n	Crude %[b]	Adj %[c]	
Sex									
Male	128	66%	64	66%	67%	64	66%	66%	0.83
Female	66	34%	33	34%	33%	33	34%	34%	
Age (years)									
25–49	20	9%	12	12%	–	8	8%	–	
50–64	56	25%	33	34%	–	23	24%	–	
65–74	67	31%	38	39%	–	29	30%	–	
> 75	51	36%	14	14%	–	37	38%	–	–
Tumour grade									
Well differentiated	32	20%	12	12%	11%	20	21%	23%	
Moderately differentiated	110	57%	55	57%	56%	55	57%	52%	
Poorly differentiated	21	10%	12	12%	10%	9	9%	13%	
Missing data	31	14%	12	19%	23%	8	13%	12%	0.20
Tumour size (mm)									
<20	14	9%	5	5%	4%	9	9%	9%	
20–39	38	22%	16	16%	18%	22	23%	25%	
40–59	28	16%	12	12%	14%	16	16%	16%	
>59	17	7%	10	10%	9%	7	7%	7%	
Missing data	97	45%	34	56%	55%	34	44%	43%	0.37
Stage									
Stage I	42	21%	22	23%	25%	20	21%	21%	
Stage II	36	18%	19	20%	16%	17	18%	15%	
Stage III	70	40%	31	32%	35%	39	40%	41%	
Stage IV	43	20%	24	25%	22%	19	20%	20%	
Missing data	3	2%	1	1%	2%	2	2%	2%	0.77
Comorbid conditions									
Angina	23	11%	13	13%	16%	10	10%	9%	0.2
Hypertension	78	41%	38	39%	38%	40	41%	35%	0.44
Myocardial infarction	13	7%	6	6%	7%	7	7%	6%	0.96
Arrhythmia	24	9%	16	16%	17%	8	8%	6%	0.02
Valvular disease	10	6%	4	4%	7%	6	6%	6%	0.98
Congestive heart failure	20	8%	13	13%	12%	7	7%	5%	0.05
Peripheral vascular disease	7	5%	2	2%	2%	5	5%	4%	0.36
Chronic pulmonary disease	28	10%	19	20%	19%	9	9%	7%	0.01
Diabetes	38	17%	22	23%	22%	16	16%	14%	0.24
Other primary cancer	18	9%	9	9%	10%	9	9%	8%	0.79
Renal disease	13	6%	7	7%	9%	6	6%	5%	0.32

Abbreviations: n, number; mm, millimeter; PVD, peripheral vascular disease.

Notes: a) Population estimates; b) Crude estimates; based on the actual study sample; c) Age-standardised estimates.

Most patients with stage I–III disease, both Māori (97%) and non-Māori (98%), underwent definitive surgery (Table 2). Although there were some apparent differences in the types of surgery received among Māori and non-Māori patients, this difference was not statistically significant (p=0.07) (Table 3).

The specific procedures included low anterior resection (LAR) (age adjusted proportions 51% Māori vs. 64% non-Māori), and local excision (17% Maori vs. 4% non-Maori). All patients who underwent local resection had stage I disease.

Nearly two-thirds of definitive operations were performed by specialist colorectal surgeons for both Māori and non-Māori patients. The proportion of patients recorded as having postoperative complications was similar for Māori and non-Māori although the differences in reoperation rates were close to statistically significant (p=0.13) (Table 3).

Most patients (age-standardised 52% of Māori and 57% of non-Māori) underwent their first surgery in hospitals in main centres, while 43% of Māori and 28% of non-Māori had surgery in smaller regional hospitals. In addition, 5% of Māori and 16% of Non-Māori had their first surgery in a private hospital (p=0.04; Table 2).

Table 2. Receipt of treatment for stage I–III patients

Variables	Total (n=148)		Māori (n=72)			Non-Māori (n=76)			P value
	n	%[a)]	n	Crude %[b)]	Adj %[c)]	n	Crude %[b)]	Adj %[c)]	
Definitive surgery	144	97%	70	97%	97%	74	97%	98%	0.72
Place of surgery:									
Main centre	79	55%	38	54%	52%	41	55%	57%	0.87
Smaller centre	51	32%	28	40 %	43%	23	31%	28%	0.15
Private	14	13%	4	6%	5%	10	14%	16%	0.04
Chemotherapy[d)]									
Preoperative	41	23%	25	36%	36%	16	22%	25%	0.24
Postoperative	44	25%	26	37%	37%	18	24%	29%	0.33
Radiotherapy[d)]									
Preoperative	54	34%	29	41%	44%	25	34%	35%	0.44
Postoperative	14	10%	7	10%	7%	7	9%	11%	0.83

Abbreviation: n, number.

Notes:

a) Population estimates.

b) Crude estimates; based on the actual study sample.

c) Age standardised estimates.

d) Limited to those who received definitive surgery.

Table 3. Characteristics of definitive surgery for stage I–III patients

Variables	Total (n=144)[a]		Māori (n=70)			Non-Māori (n=74)			P value
	n	%[b]	n	Crude %[c]	Adj %[d]	n	Crude %[c]	Adj %[d]	
Type of surgery[e]									
LAR	81	62%	37	55%	51%	44	63%	64%	
APR	36	27%	17	25%	30%	19	27%	28%	
Local excision	13	5%	10	15%	17%	3	4%	4%	
Palliative	7	6%	3	4%	3%	4	6%	4%	0.07
Type of surgeon									
General surgeon	57	40%	28	41%	42%	29	40%	34%	
Specialist colorectal surgeon	84	60%	40	59%	58%	44	60%	66%	0.52
Postoperative complications									
Reoperation[f]	16	7%	11	16%	18%	5	7%	6%	0.13
Organ failure[g]	7	5%	3	4%	6%	4	5%	4%	0.72
Pneumonia	7	4%	4	6%	7%	3	4%	4%	0.33
Sepsis	18	14%	7	10%	10%	11	15%	13%	0.5

Abbreviations: number; LAR, low anterior resection; APR, abdominoperineal resection

Notes
a) Limited to those who received definitive surgery (n=144)
b) Population estimates
c) Crude estimates; based on the actual study sample
d) Age standardised estimates
e) Type of surgery information was available for 137/144 (67 Māori and 70 non-Māori) patients
f) Reasons for reoperation included anastamotic leakage, bleeding, and intra-abdominal abscess
g) Includes cardiac, respiratory and renal failure

Among patients with stage I–III disease, there were no statistically significant differences in the likelihood of being recorded as receiving chemotherapy or radiotherapy (pre or postoperative) for Māori and non-Māori patients (p=0.24-0.83; Table 2). For chemotherapy, this was also true when we limited the patients to those with stage III disease receiving postoperative chemotherapy. Around half of all stage IV patients (49%; 21/43) received chemotherapy. Overall, waiting time from date of diagnosis till first treatment was 37 days, and was similar for Māori and non-Māori patients (Table 4).

Once diagnosed, Māori patients in this cohort tended to wait longer before referral for adjuvant therapies particularly chemotherapy compared to non-Māori patients (medical oncology: median 40 days for Māori vs. 33 days for non-Māori patients, p=0.03; radiation oncology: median 27 days for Māori vs. 19 days for non-Māori, p=0.26). However, once in the oncology treatment pathway, waiting times were similar for Māori and non-Māori patients (Table 4). Also reassuringly, the overall time from diagnosis to receipt of treatment was similar for Māori and non-Māori patients.

Māori patients with stage IV disease were less likely to be referred to palliative care than non-Māori patients (13% and 40% respectively), although this difference was not statistically significant (p=0.07).

Table 4. Timing of treatment for all stage I–III patients with treatment dates available

Variables	Total (n=148) Median[a)]	Māori (n=72) Median[b)]	Non-Māori (n=76) Median[b)]	P value
Waiting time (days)				
Time diagnosis till first treatment	37	42	37	0.14
Waiting time chemotherapy (days)[c)]				
Diagnosis–Referred to Med Onc	33	40	33	0.03
Referred Med Onc–Reviewed by Med Onc	23	18	23	0.54
Reviewed Med Onc–Received chemo	15	15	16	0.31
Waiting time radiotherapy (days)[d)]				
Diagnosis–Referred to Rad Onc	19	27	19	0.26
Referred Rad Onc–Reviewed by Rad Onc	16	17	16	0.47
Reviewed Rad Onc–Received radiation	12	16	13	0.88

Abbreviations: n, number; Med Onc, medical oncologist; Rad Onc, radiation oncologist
Notes:
a) Population estimates
b) Crude estimates; based on the actual study sample
c) Limited to those who received chemotherapy (n=62)
d) Limited to those who received radiotherapy (n=69)

There was considerable imprecision around our estimate of survival for Māori compared with non-Māori patients with rectal cancer. After adjusting for age, stage and tumour grade Māori had 24% higher mortality but the confidence intervals around this estimate were wide with plausible estimates ranging from Māori having 35% lower mortality to 235% higher mortality than non-Māori patients (HR 1.24; 95% CI 0.65–2.35).

Discussion

The findings of this population-based cohort study suggest that there may be both similarities and differences in the presentation, treatment and outcomes from rectal cancer for Maori compared with non-Maori patients in New Zealand. Stage and tumour size were similar for Māori and non-Māori, although Maori patients were younger at diagnosis, and have higher levels of comorbidity. There was also a suggestion of some differences in surgery type, with more Māori patients receiving local treatment and fewer anterior resections, but the differences were not statistically significant.

There was no difference between Māori and non-Māori in the duration between diagnosis to first treatment. Māori patients waited longer for referral to medical oncology, but once in the system waiting times were similar. In addition, stage IV

Māori patients may have been less likely to be referred to palliative care, although again, differences were not statistically significant.

Hill and colleagues 13 examined colon cancer management in New Zealand between 1996 and 2003 using a similar notes review method and found poorer survival amongst Māori colon cancer patients, contributed to by differences in comorbidities, health care access and treatment. In particular, Māori colon cancer patients were less likely to receive adjuvant chemotherapy and those who did receive it were more likely to experience a significant delay before starting.

Type of surgery however did not differ between Māori and non-Māori colon cancer patients in their study, nor did reoperation rates. In contrast, our study found some possible differences in type of surgery, but also similar or even higher rates of chemotherapy receipt among Māori compared with non-Māori patients, although these differences were not statistically significant. There are several possible explanations for these findings.

First, the difference found in type of surgery for rectal cancer might reflect higher rates of comorbid conditions among Māori necessitating more local excision.

Second, any differences in surgical approach may reflect regional differences. We found that Māori were slightly more likely to receive procedures in smaller centre hospitals and less likely to do so in private hospitals. However, both Māori and non-Māori were equally likely to have been cared for by specialist colorectal surgeons.

Third, the difference in surgical type may be a chance finding. Hill's study was conducted over 1996–2003, while this study covers the period 2006–2008, a decade after the first part of the Hill study. The similarities in chemotherapy receipt in this study, in contrast to the Hill study, may reflect changes in practice over that time.

In terms of timing of care, Māori tended to wait longer between diagnosis and referral to medical or radiation oncology. However, reassuringly, overall waiting times, and waiting times for each step in the process thereafter were very similar for Māori and non-Māori patients.

We found that, within our cohort, a lower percentage of stage IV Māori patients were being referred to palliative care compared with stage IV non-Māori patients. Assuming this difference is real (the difference was not statistically significant), it is possible that geographical variation in palliative care availability may be contributing.

A recent report on access to cancer services for Māori showed that disparities in access to palliative care services have been reported previously, including geographical disparities and differential distribution of resources.[15]

The New Zealand Palliative Care Strategy reported that the proportions of Māori patients who died at home (53.2%) was higher than the proportion of non-Māori non-Pacific (30.8%), and that 29.4% of non-Māori non-Pacific patients died in private hospital or other institutions such as hospices and rest homes.[16] This might reflect an increased access to end of life services for non-Māori; or different preferences for end of life services between ethnic groups.

While both of these reports cover periods before our study, our findings do suggest that some ethnic inequalities in access to palliative care services for rectal cancer may possibly exist.

The key limitation of our study is the small sample size. Many of the findings presented here should be considered indicative. Despite a thorough notes review, there was missing data particularly in relation to tumour characteristics (grade and size in particular). In addition, three patients with tumours that were not adenocarcinomas were included, and patients aged under 25 years were excluded although these issues are unlikely to have had a meaningful impact on the results.

Because of its retrospective nature there were some clinical details which were difficult to ascertain. However, the study has several important strengths; it is a population-based study and we were able to collect data for all eligible patients. The in-depth review of medical notes allowed us to make a comprehensive comparison of care offered to Māori and non-Māori patients at multiple points along the whole cancer treatment pathway and to collect detailed data on tumour characteristics and comorbid conditions.

A substantially larger study on colorectal cancer based on review of medical notes is currently underway (PIPER study). Results from that study should be available in 2015, and will help to clarify whether the patterns seen here are consistent in a larger population group.

Colorectal cancer screening is currently being piloted in New Zealand with a view to wider implementation.[16] The introduction of a colorectal cancer screening programme provides an opportunity to reduce inequalities in CRC outcomes between Māori and non-Māori as long there is a clear focus on inequalities in the programme implementation.[17,18]

In conclusion, in this population based study we found similarities and some indication of differences in terms of treatment and outcomes between Māori and non-Māori patients with rectal cancer. Whilst these findings are based on relatively small numbers they are consistent with other research showing disparities in care and outcomes for Māori with cancer.[7,13,19–21]

Competing interests: None identified.

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Acknowledgements: C3 (Cancer Care and Comorbidity) is funded by the Health Research Council of New Zealand. The authors acknowledge the contribution of the C3 study team and advisory groups.

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THE NEW ZEALAND MEDICAL JOURNAL
Journal of the New Zealand Medical Association

Māori nurses and smoking: what do we know?

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Abstract

Aim A research partnership between NZNO, Whakauae Research, and Taupua Waiora aimed to determine Māori registered and student nurses' smoking behaviours and attitudes to smoking cessation.

Methods We analysed a national web-based survey that explored the behaviours and views of 410 NZNO Māori nurses, student nurses and other health workers using descriptive statistical analysis.

Results Findings confirm a smoking prevalence rate of 21.5% for all respondents—32% for Māori nursing students and 20% for Māori nurses. Of smokers, 75% of nurses smoke fewer than 10 cigarettes per day, 84% smoked outside their homes, and almost 20% indicated they were considering quitting within the next month. Most nurses who had attempted to, or had, quit did not use the range of smoking cessation interventions available.

Māori nurses see the value in smoking cessation for improving their own and other's health, although many did not necessarily see themselves as effective in supporting Māori with smoking prevention and cessation.

Conclusion Prevalence rates for smoking among Māori registered nurses was lower than previous research and many of those still smoking indicate a strong intention to quit. Quit attempts in this occupation group could be better informed by evidence. Increasing the number of Māori nurses who are smokefree will have the added benefit of increasing the efficacy of cessation interventions with patients and whānau (extended families).

As healthcare practitioners, Māori nurses (and community health workers) are strongly positioned to influence wider whānau (extended families) and Māori communities about smoking cessation. Each interaction with a patient provides Māori nurses with the opportunity to offer a smoking intervention. Currently 3487 registered nurses identify as Māori[1], of whom, almost 3000 belong to the New Zealand Nursing Organisation (NZNO).

Despite Māori nurses' potential to be influential in smoking prevention and cessation, those who smoke are disadvantaged personally and professionally—they are at risk of poorer health, suffer disapproval and misunderstanding of non-smoking colleagues,[2] and have difficulty giving smoking prevention and cessation information.[3–5] Earlier research has shown that nurses who smoked believe they were inadequate role models, and that their smoking affected their ability to effectively work with patients who also smoke.[4,6]

The high prevalence of smoking among Māori generally (41%),[7] Māori women (44%),[7] and nurses (30%)[2] calls for targeted smoking cessation support[8] and mechanisms that are sensitive to the difficulties they encounter, as healthcare practitioners, when quitting.[9,10] Unsuccessful smoking cessation programmes for Māori have been attributed to their individual focus[11] and their lack of relevance.[12,13] Therefore, to optimise Māori nurses as role models and increase the impact of cessation advice, they need support to become and stay smokefree.

The overarching goal of the research is for Māori nurses to be in a stronger position to realise their potential in the prevention of smoking uptake and healthcare promotion more widely. This survey is the first stage of research that will inform the design of a supportive smoking cessation intervention for Māori nurses who smoke.

Method

A national web-based survey collected demographic and baseline data, and determined the smoking behaviours and attitudes among Māori nurses who are members of NZNO. The 111-item survey was iteratively designed with a team of Māori, nursing and tobacco control researchers using elements from validated smoking surveys (e.g. New Zealand Tobacco Use Survey), and informed by the Māori, literature about smoking and quitting behaviours.

Questions were selected based on their relevance to the study's aim and for comparability. Demographic questions included nursing scope, field, and employment, and were replicated from previous NZNO surveys. The survey collected information about smoking behaviours and activities; motivation to quit; lapse/relapse triggers during previous attempts; and the impact of environmental and social triggers for quitting. Ethical approval was gained from the AUT Ethics Committee (12/190).

NZNO, with the endorsement of Te Rūnanga o Aotearoa, distributed the survey to Māori registered and student nurse members with e-mail addresses (N=1796). Whilst responses were received from 24 community health workers and midwives, the main focus was on nurses. The survey was advertised in Kai Tiaki Nursing New Zealand and on the NZNO web site. Reminder emails were sent 2 weeks after the initial invitation. Descriptive statistical analysis was performed using EXCEL. Non-Māori and non-nurse/nursing student responses received were excluded from the analyses.

Results

Demographics—We received 386 responses from nurses and nursing students, and 24 responses from midwives and other community/healthcare assistants who identified as Māori. The 23% response rate was consistent with other NZNO member surveys (25-35%), and represents approximately 12% of the Māori nursing workforce. Most respondents (96%) were female, similar to the total nursing population (92.6%).[1] Registered nurses comprised 63% of the respondents, while 25.5% were student nurses—the remainder included enrolled nurses and other community health workers. Table 1 shows most nurses were employed by DHBs in inpatient (n=108) or community settings (n=43), with 61 employed by Māori and Iwi health providers. Most nurses worked in mental health and addictions (n=43) and primary health or practice nursing (n=38) areas (Table 1). Table 1 shows the majority of respondents' (77.1%) total annual income was more than $41,000 per year, and that 60.8% had children and/or adults dependents. The respondents were a younger age profile than the total nursing population—58% were less than 45 years of age, compared to 43.7%.[1] The majority (73.2%) were currently employed, while 20.5% (some students were currently employed) indicated they were student nurses. The geographical distribution (Table 1), determined by District Health Board (DHB), represented the NZNO geographical spread.

Table 1. Respondents' demographics

Demographic		Percentage (%)	Number (n)	Demographic	Percentage[1] (%)	Number (n)
AGE PROFILE (n=410)				**TOTAL INCOME PER YEAR (n=407)**		
Age Range (years)	16–25 yrs	10%	41	<$10.000	3.7%	15
	26–35 yrs	20%	83	$11,000–$40, 000	19.2%	78
	36–45 yrs	28%	116	$41,000–$70,000	34.2%	139
	46–55 yrs	27%	112	$71,000–$100,000	19.4%	79
	56–65 yrs	13%	53	>$100,000	13.8%	56
	>66 yrs	0.5%	2	Prefer not to say	9.7%	40
	No response	0.7%	3			
GEOGRAPHIC DISTRIBUTION (n=324)				**FINANCIAL DEPENDENTS (n=407)**		
Greater Auckland		25%	81	Dependent children only	45.4%	186
Central		13.9%	45	Dependent children & older adults	10%	41
Greater Wellington		13%	42	Dependent older adults	2.7%	11
Hawkes Bay		12.7%	41	Other	2.7%	11
Te Tai Tokerau		10.2%	33	No responsibilities	38.4%	158
Bay of Plenty		10.2%	32			
Midlands		9.6%	31	**SCOPE OF PRACTICE (n=410)**		
Canterbury		9.6%	31	Registered Nurse (incl. Nurse Practitioners)	62.9%	258
South		7.1%	23	Student Nurses	25.6%	105
Lakes		6.5%	21	Enrolled Nurses	5.6%	23
Top of South Island		1.4%	5	Community Health Workers	2.9%	12
West Coast		0.3%	1	Others (incl. Midwives, Kaiawhina)	2.9%	12
MAIN PLACE OF EMPLOYMENT (n=391)				**MAIN FIELDS OF PRACTICE (n=312)**		
DHB – Inpatient		27.5%	108	Mental health/addictions		43
Other*[3]		14.2%	56	Primary health/practice nursing		38
Māori and Iwi health provider		11.4%	45	Aged care		27
DHB – Community		10.5%	43	Community nursing		26
Education institution		7.7%	30	Medical incl. educating patients		22
Aged care provider		5.9%	23	Child health/neonatology		16
NGO		4.6%	18	Education incl. clinical		16
Māori and Iwi based community health		4.1%	16	Emergency & trauma		12
PHO provider		3.6%	14	Non-practising		12
General practice		3.1%	12	Other[3]		100
Other[4]		6.5%	26			

Note: [1]Percentages have been rounded to one decimal place. [2]Includes student nurses who may affect the income distribution. [3]Other includes accident and medical centre (n=2); community hospital (rural) (n=4); government agency (MOH, ACC, prisons, etc) (n=6); nursing agency (n=5); Pacific health provider (n=1); private surgical hospital (n=3); self-employed (n=5). [4]Other includes assessment & rehabilitation (n=8); cancer nursing (n=2); district nursing (n=7); family planning/sexual health (n=3); infection control (n=2); intellectually disabled (n=3); intensive or coronary care/high dependency unit (n=6); nursing administration/management (n=9); nursing professional advice (n=3); obstetrics/maternity (n=4); occupational health (n=2); other – nursing (n=11); palliative care (n=3); perioperative care/theatre (n=8); prison nursing (n=2); public health (n=10); school nursing (n=8); surgical (n=9).

Smoking behaviours—We found 21.5% of respondents currently smoked, with 16.6% smoking at least once a day (Figure 1). Figure 2 shows 75% of respondents smoked ≤10 cigarettes a day.

The majority of registered nurses (52.6%) no longer smoked, although 20% currently smoked and 12.8% smoke at least once a day. However, just over a third of the student nurse group smoked, with 36.2% aged between 26 to 35 years.

Figure 1. Frequency of respondents' smoking

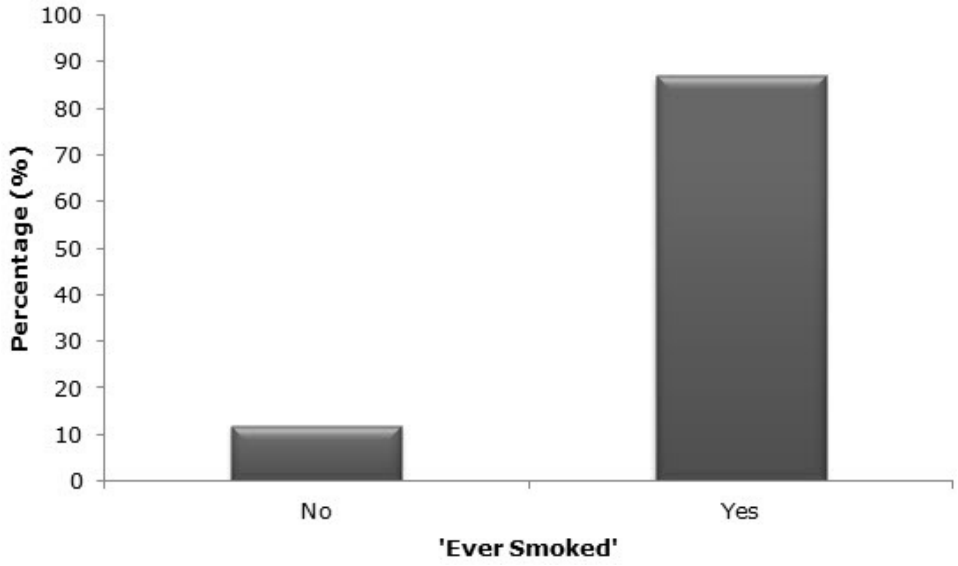


Figure 2. Number of cigarettes smoked per day

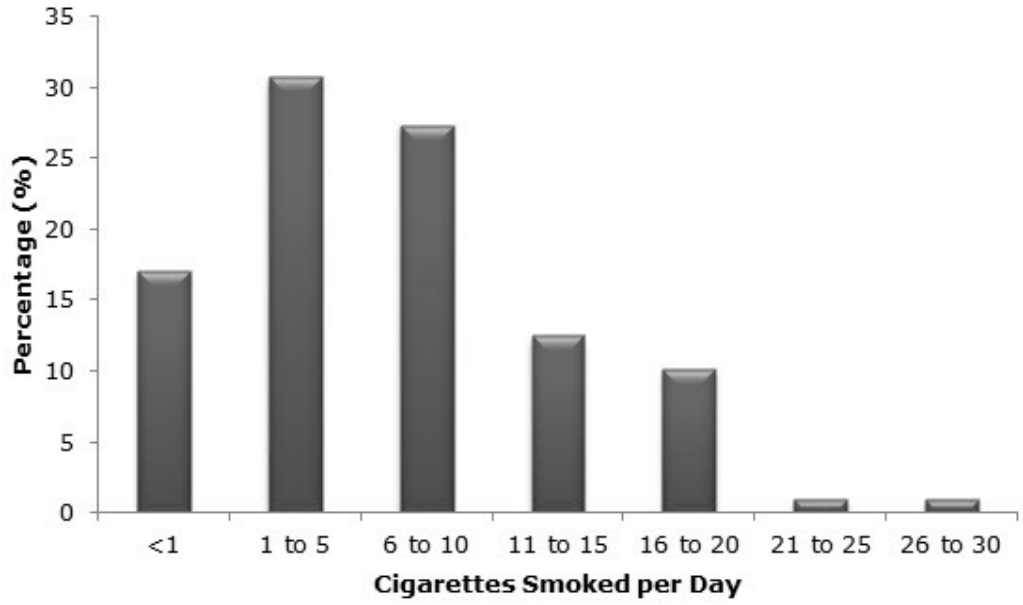


Figure 3 shows 87% (n=356) declared they had ‘ever smoked’. Of these, 65.8% had smoked more than 100 cigarettes—of those, 68.5% did not currently smoke and 5% smoked at least, or less often than, once a month. Tailor-made cigarettes were preferred by most respondents (59.1%) (Figure 4). While only 16% (n=8) of respondents smoked inside their house, 40% (n=23) smoked in the car and 16% (n=14) did this frequently.

Figure 3. Ever smoked status

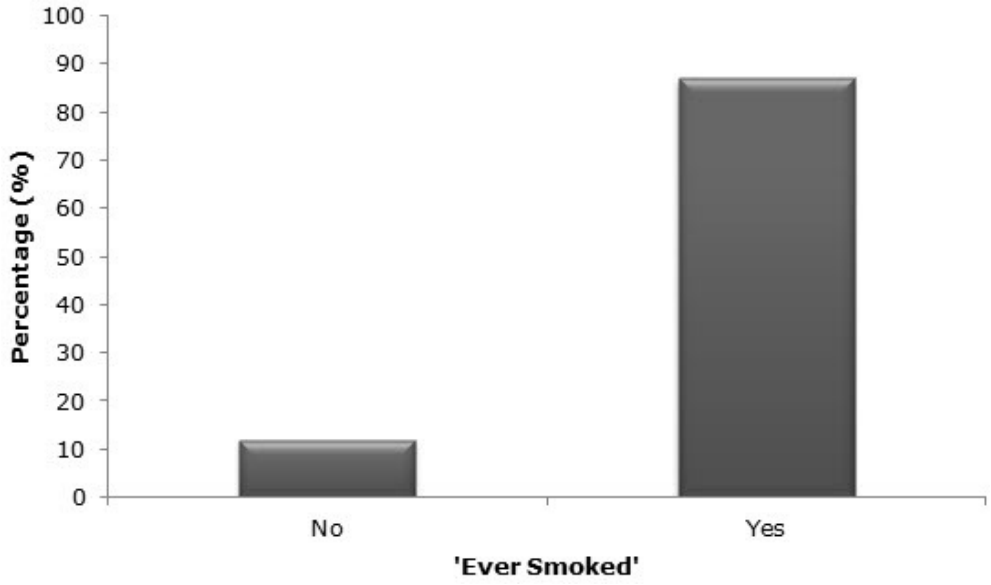
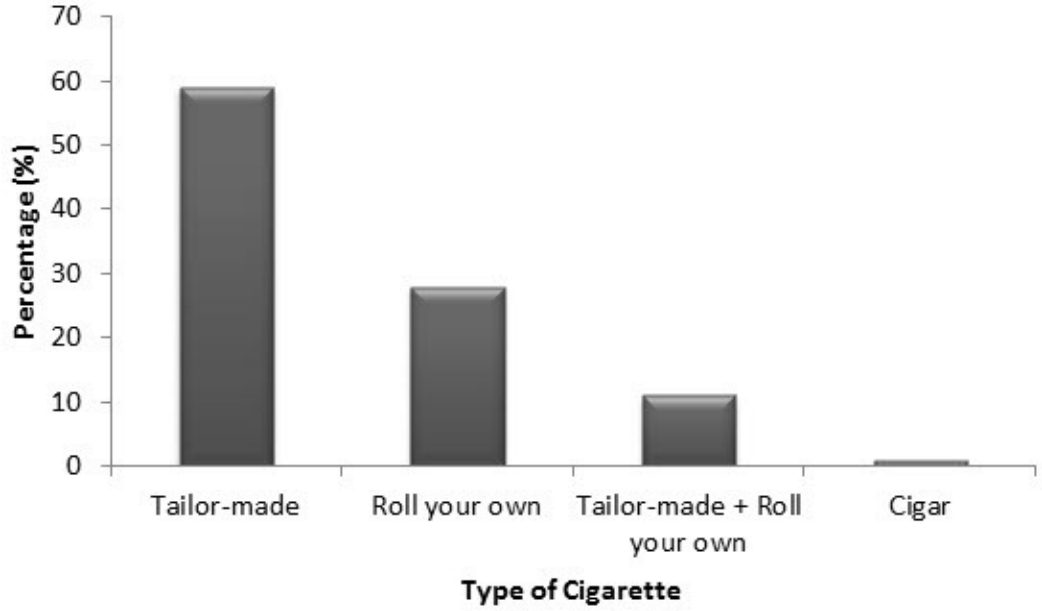


Figure 4. Type of cigarette smoked



Quitting—Just over 50% indicated they were thinking of quitting, and nearly 18% were thinking of quitting within the next 30 days. Figure 5 indicates the most common reasons for quitting was personal health (78%).

Of the respondents who had previously attempted or successfully quit (n=279), few had used cessation interventions, such as Aukati Kai Paipa (14%, n=20), Quitline (25%, n=42), or nicotine replacement therapy (15%, n=129) [calculated on the total of 6-items that related to the various forms of nicotine replacement therapies]. Most respondents (an average of 82%) did not use any interventions. Figure 6 shows 64 had made multiple quit attempts.

Figure 5. Main reasons for trying to quit

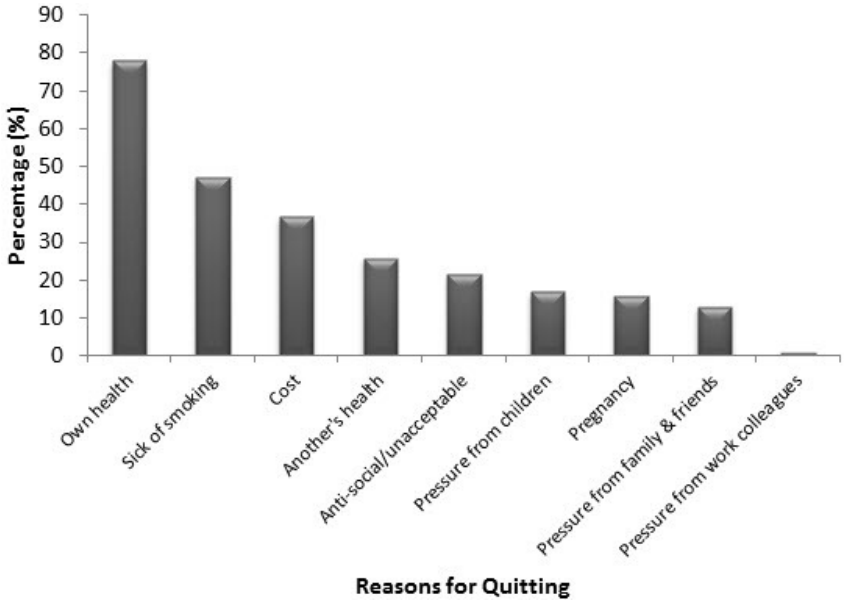
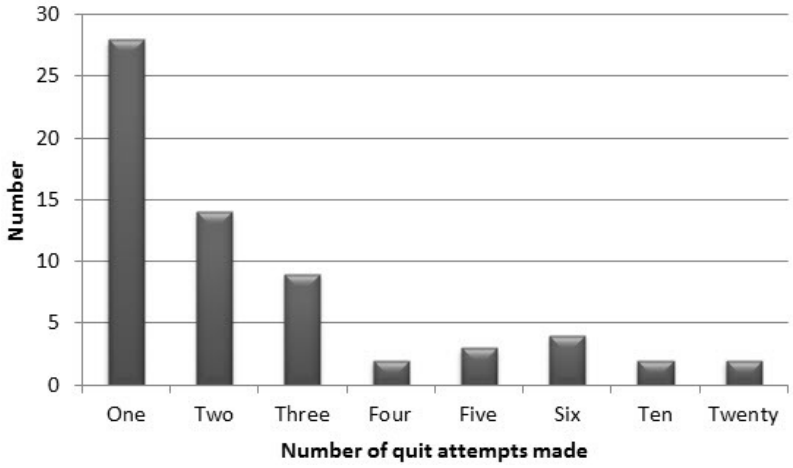


Figure 6. Previous quit attempts made (n=64)



Nurses and smoking—The majority of nurses agreed that stopping smoking was a priority for Māori health (84%) and that helping people to quit was important (94%) (Table 2). While 44% agreed Māori nurses were more effective in providing smoking cessation advice to Māori than non-Māori, 40% responded neutrally. We found 73.5% indicated that smoking did not help them in relating to their clients.

Being a nurse and a smoker was a conflict for 68% of the nurses, while 44% reported that nurses' smoking compromised the provision of effective smoking cessation advice to others.

Table 2. Views about smoking cessation role and nurses who smoke

Nurses' Role in Smoking Cessation		Percentage (%) Agreement/Disagreement				
		Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
1	Māori nurses give more effective smoking cessation advice to Māori than non-Māori nurses	19	25	40	13	1
2[R]	Stopping smoking is a priority compared to other health needs of Māori	55	29	6	6	4
3	Smoking helps me relate to my clients better	1.7	8	16.5	22	51.5
4	Helping people to quit is really important thing I can do to help improve their health	67	27	5	0.7	0
Nurses Who Smoke						
5[R]	There is conflict between being a nurse and being a smoker	33	35	18	10.8	4.5
6	I'd feel guilty if I was seen smoking while wearing my nurses uniform	65	19	11	3	2
7	Nurses who smoke can give effective advice to others about smoking cessation	10	24	21	20.5	24.5

Note: [1] Percentages were calculated to first decimal point

Smoking cessation strategies – Table 3 shows the majority of respondents thought smokefree workplaces helped to reduce smoking. According to 61% of respondents who smoke, increasing tobacco tax punishes smokers and makes them poorer, although 47% of respondents thought increasing the cost would assist quitting. One in three smokers indicated that being told not to smoke made them more determined to smoke. Almost 50% thought being told not to smoke in their cars was excessive. Removing visibility of cigarettes and the branding on packaging had little influence on reducing of the temptation or appeal of cigarettes for most smokers.

Table 3. Views about smoking cessation

View		Total Respondents (n=410) (%)	Nurses Who Smoke (n=88) (%)
1	Increasing the tax on tobacco just punishes smokers and makes them poorer	47%	61%
2	Increasing the cost of smoking will be the extra push some will find helpful to quit	66%	47%
3	I think employers are right to refuse to employ nurses who smoke	32%	16%
4	A smoke free workplace makes it easier to cut down	76%	61%
5	Being told you can't smoke in your own car is going too far	45%	49%
6	Being told not to smoke in your own car is going too far	21%	31%
7	Cigarettes not being visible behind the counter reduces the temptation to buy them	53%	29%
8	Unbranded packaging will reduce the appeal of cigarettes	35.4%	19.3%

Discussion

The survey reveals useful information about Māori nurses' and student nurses' smoking behaviours and attitudes. While 87% indicated they had 'ever smoked', 68.5% did not currently smoke. Importantly, Māori registered nurses' smoking prevalence appears to have reduced from 30.7%[2] to 20%. Nevertheless, this remains higher than the prevalence for all nurses and midwives (13.6%),[2] but is lower than the rate for Māori women in the general population.[7] In view of the high prevalence of Māori who smoke and the negative impacts on health, supporting Māori nurses to quit smoking is a priority.

Māori nurses have indicated that helping people to quit is an important activity, particularly for improving Māori health. Yet, nurses are under-utilised in health promotion activities,[4,5] and we found, that being a smoker compromises their ability to support Māori to stop smoking or prevent smoking uptake. The indications are that nurses who smoke may be amenable to a tailored quit intervention—over half signalled their intention to quit smoking, and almost one in five considered quitting within the next 30 days.

Of concern are the results for Māori student nurses with over one-third currently smoking at the time of the survey. Higher smoking rates for students may be partly explained by the higher smoking rates in the general population's younger age groups.[7] What this signals is the need for targeted smoking cessation interventions with Māori student nurses.

Personal health and being sick of smoking are key motivators for Māori nurses' to quit smoking. Remarkably most respondents who had either quit or attempted to quit, did not access the range of cessation support programmes available. While many smokers attempt to quit cold turkey,[14,15] best practice guidelines suggest a combination of support programmes and pharmaceutical interventions is most effective.[16] Tailored by Māori for Māori approaches and interventions (e.g. such as noho marae,[17] group quit and win initiatives such as WERO[18] and whānau[12,19] approaches) appear to be more effective for supporting Māori smokers.

We found that strategies to support smoking cessation, such as increasing costs of tobacco were viewed differently by smokers and non-smokers with current smokers identifying some strategies such as tax increases and point of sale display restrictions as less effective. In addition, we found the belief that smoking as a right and choice was reinforced by respondents' negative reactions to directive messages about not smoking or smoking in cars, and that authoritative messages made them more determined to smoke; a finding supported by previous research[20].

A positive finding was the small number smoking inside their houses, possibly reflecting the impact of health messages about smoke free homes, particularly for children. However, further health promotion or legislation is needed to curb smoking in cars; a point currently being supported by Māori politicians and health advocates[21].

Furthermore, policies promoting the non-employment of staff who smoke as a District Health Board strategy to reduce smoking and model healthy behaviours[22] were not supported by most respondents. Although non-smokers were more supportive of a ban, implementation of such a policy would be difficult to enforce and would need widespread support and education. Further exploration is required to determine the most appropriate approaches employers can initiate to support existing smokers to quit.

This web-based survey may be limited by selection bias and access to computers to complete it. The respondent profile, however, was representative of Māori nurses belonging to NZNO, and of Māori nurses in general.[1]

Conclusion

Registered nurses had a lowered smoking prevalence rate than expected, although surprisingly one in three student nurses' smoked. Māori nurses value smoking cessation for improving their own and other's health, although many do not see themselves as effective in supporting Māori with smoking prevention and cessation advice.

Most nurses who had attempted to, or had quit did not access available smoking cessation interventions – the reasons for this are unclear but could indicate the need for a tailored kaupapa Māori smoking cessation intervention. Many of the issues raised by the survey will be qualitatively explored in the next phase of the research.

The strong indication of intention to quit in this group is a positive indicator that they are open to a range of supportive interventions.

Competing interests: None identified.

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Acknowledgements: We thank the Health Research Council for funding this project and NZNO (Te Rūnanga o Aotearoa) for initiating the research and partnering with Whakauae and Auckland University of Technology to undertake the project.

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THE NEW ZEALAND MEDICAL JOURNAL
Journal of the New Zealand Medical Association

Increasing primary antibiotic resistance and ethnic differences in eradication rates of *Helicobacter pylori* infection in New Zealand—a new look at an old enemy

John Hsiang, Sri Selvaratnam, Susan Taylor, Joey Yeoh, Yu-Mwee Tan, Judy Huang, Alasdair Patrick

Abstract

Aims To determine the current prevalence, primary antibiotic resistance and eradication rate with standard triple therapy of *Helicobacter pylori* (*H. pylori*) infection in South Auckland, New Zealand (NZ).

Methods Consecutive patients undergoing gastroscopy in 2012 were prospectively enrolled. The prevalence of primary *H. pylori* infection was determined from all *Campylobacter*-like organism (CLO) tests performed. Antibiotic susceptibility testing was performed for a range of relevant antibiotics and the success of eradication therapy was determined by stool antigen clearance.

Results The prevalence of *H. pylori* infection by ethnic group; European (7.7%), Māori (34.8%), Pacific People (31.3%) and Orientals (23.8%). Metronidazole resistance was found in 49.3% of isolates, clarithromycin resistance in 16.4%, and moxifloxacin resistance in 9.5%. No isolates were resistant to tetracycline. Clarithromycin resistance (≥15%) was prevalent among Māori, Pacific People and Orientals. Metronidazole resistance has increased significantly from 32.7% in 1999 to 49.3% in 2012 (p=0.011), and clarithromycin resistance from 7% in 1999 to 16.4% in 2012 (p=0.021). The eradication rate (intention to treat) with standard omeprazole, amoxicillin and clarithromycin (OAC) therapy in ethnic groups where clarithromycin resistance was <15% was 85.7% versus 64.9% in groups where clarithromycin resistance was ≥15% (p=0.024).

Conclusion *H. pylori* infection is very common among certain ethnic groups living in South Auckland. Resistance to clarithromycin and metronidazole have increased significantly among treatment naïve patients compared to historical NZ data. Ethnic groups with clarithromycin resistance of ≥15% were associated with lower eradication rates with OAC therapy. This suggests a need to review the current NZ *H. pylori* eradication guidelines to accommodate ethnic differences in the response to first-line regimens.

It has almost been 30 years since the initial culture and identification of the micro-organism now known as *Helicobacter pylori* (*H. pylori*). There is an increasing body of evidence implicating the role of *H. pylori* in the pathogenesis of chronic gastritis; peptic ulcer disease;[1] mucosal associated lymphoid tissue (MALT) lymphoma and gastric adenocarcinoma; all of which contribute significantly to healthcare-related costs.[2,3]

Triple therapy consisting of omeprazole, amoxicillin and clarithromycin (OAC) is commonly recommended as first-line therapy but studies have shown variable

eradication rates of 65–90%.[4] Local data in 1999 suggested that 6.8% of *H. pylori* isolates were resistant to clarithromycin while 32% were resistant to metronidazole.[5] Worldwide clarithromycin resistance rates vary from region to region and range between 5% and 25%.[4,6–8]

Recent international data also suggest an emerging primary quinolone resistance in some countries, ranging from 5.7% to 39%.[9–12] In fact, a recent consensus report has even recommended first-line quadruple therapy instead of proton pump inhibitor (PPI)-based triple therapies in regions with high clarithromycin resistance (≥15–20%) due to reported high rates of treatment failure associated with such resistance.[13]

The current eradication rate of *H. pylori* infection with standard OAC therapy in New Zealand (NZ) is unknown. Counties Manukau District Health Board (CMDHB) is a catchment area encompassing a diverse mix of ethnic groups. As seen in other countries,[4,14,15] it is highly likely that local primary antibiotic resistance, particularly to clarithromycin, has risen in the intervening years rendering the recommended first-line PPI-based triple therapies inadequate if the goal is to achieve successful (>90%) *H. pylori* eradication.[4,5,15] This warranted further scientific examination and underpins the basis of this study.

Methods

This is a single centre prospective study of consecutive patients recruited from the CMDHB Endoscopy Service. All patients' undergoing gastroscopies (in- and out-patients) between February 2012 and October 2012 were prospectively screened and enrolled. Ethnicity data was ascertained from the hospital computer database. Ethnicity coding reflected that used by the NZ Ministry of Health[2]; NZ-born European, Other European, Māori, Pacific People, Indian, Oriental and 'Other'. The 'Other' ethnic group included African and Middle Eastern ethnicities in this study. This study was further subdivided into three parts to ensure more accurate data collection and to provide separate data subsets.

Part I Methods: Prevalence—Point prevalence of treatment naïve *H. pylori* infection was determined by prospectively collecting positive CLO test results over a 4-month period.

Part II Methods: Antibiotic susceptibility testing—During gastroscopy, four gastric biopsies from the antrum and the body of the stomach were obtained for CLO testing and two further gastric biopsies were performed for culture and placed into 1 ml of brain-heart infusion (BHI) broth. The culture specimens were immediately refrigerated and sent to the on-site microbiology department if the CLO test was positive within 24 hours. 100 CLO positive cases were prospectively collected in this manner. The culture samples were macerated using a sterile scalpel blade and inoculated onto two *Brucella* agar plates of 5% sheep blood (Fort Richard Laboratories). The inoculated plates were then incubated at 37°C in microaerophilic conditions using a CampyGen generator (Oxoid) and examined for typical colonies on days 3 and 7.

Susceptibility testing was performed on any identified curved gram negative bacilli that was both oxidase and urease positive. Minimum inhibitory concentrations (MIC) of amoxicillin, clarithromycin, tetracycline, metronidazole and moxifloxacin were performed by E-test. A suspension of organism was prepared in saline to a two MacFarland standard density. This suspension was used to inoculate Mueller Hinton 5% sheep blood agar plates (Fort Richard Laboratories). One E-test was applied per plate and incubated at 37°C for 72 hours in microaerophilic conditions before reading the MIC. Moxifloxacin was chosen as the representative quinolone since this antibiotic is available in NZ in contrast to levofloxacin which is not. The European Committee on Antimicrobial Susceptibility Testing (EUCAST) breakpoints were used to interpret all the MIC results. Levofloxacin breakpoints were used to interpret the Moxifloxacin MIC results.[16] Resistance patterns were then compared to historical data from a similar cohort.[5]

Part III Methods: Treatment efficacy—Two cohorts were used for the third part of the study: the 100 patients who underwent *in vitro H. pylori* antibiotic susceptibility testing and the 40 random patients from the *Part I: Prevalence* study who did not consent for antibiotic susceptibility testing. The

two cohorts were used to minimise any selection bias that may occur from being followed up in the *Part II: Antibiotic susceptibility testing* study.

When a CLO test was positive a notification letter recommending NZ Guideline Group (NZGG) based standard OAC therapy (Omeprazole 20 mg, Amoxicillin 1 gram and Clarithromycin 500 mg twice daily for 7 days)[17] was sent to both the general practitioner (GP) and the patient, informing them of the positive *H. pylori* status.

Penicillin allergic patients would be substituted with Omeprazole 20 mg, Clarithromycin 500 mg and Metronidazole 400 mg (OCM) twice daily (BiD) for 7 days as per NZGG guidelines. A follow-up stool antigen test was performed 6–10 weeks after completion of antibiotic therapy (minimum of 4 weeks after the eradication therapy and 2 weeks off PPI therapy).

All patients for follow-up were contacted by phone within three months of completion of eradication therapy and data on treatment compliance, side effects and smoking status were obtained. A further notification letter was sent if there was no response from the patient after a period of 6 weeks. Data on the specific antibiotic regimen, duration of regimen and date of GP prescription were obtained from the regional pharmacy dispensary (TestSafe) database which is updated weekly.

Exclusion criteria—Patients with a history of previous *H. pylori* infection or previous positive rapid urease test (CLO test) as determined via the regional hospital computer database (linked to the regional community laboratory database) were excluded. Patients with severe cognitive impairment and patients who were unwilling or unable to provide written consent for antibiotic susceptibility testing were also excluded, as were patients who were deemed by the endoscopist to be at high risk of bleeding as a result of gastric biopsies. Patients who were subsequently diagnosed with metastatic malignancy of any kind or considered to have less than 6 months estimated survival due to newly diagnosed chronic disease or malignancy were excluded from treatment and subsequent follow-up stool antigen testing since the benefits of *H. pylori* eradication are unproven in these instances.

Data analysis and ethics—Treatment success (eradication rate) was ascertained utilising Clarithromycin and Metronidazole resistance data. The eradication rates and their respective 95% confidence intervals (CI) for both intention to treat (ITT) and per protocol (PP) analysis were calculated. The difference in eradication rates between ethnic groups was analysed utilising the Fisher's exact test and a p-value of <0.05 was considered significant. This study was approved by the NZ Northern X Regional Ethics Committee.

Results

Part I: Prevalence—592 patients were tested for *H. pylori* infection (CLO test) during upper endoscopy over the 4-month period. The proportion of male and female patients were equal (50% each) and the median age was 60.6 years (range 16–90.4 years). The overall prevalence of *H. pylori* infection in patients undergoing endoscopy was 18.6% (110 of 592 patients). Forty of the 110 with *H. pylori* infection during this period who did not have isolates for antibiotic susceptibility testing were included in the study cohort for *Part III: Treatment efficacy*.

Europeans (both NZ and overseas born) had a low prevalence of *H. pylori* infection at 7.7% while the prevalence was highest in Māori (34.9%) followed by Pacific People (29.6%), Oriental (23.8%) and Indian (19.2%).

Part II: Antibiotic susceptibility testing—A total of 593 patients were enrolled and consented for endoscopic gastric biopsy, culture and antibiotic susceptibility testing. Of these, 100 patients who were CLO test positive had biopsies obtained for culture. The CLO positive cohort consisted of 19% Māori, 6% NZ European, 30% Pacific People, 17% Indian, 14% Oriental, 9% Other European and 5% Other; 48% were male, 52% were female and the median age was 59.8 years (range 22–93.5 years). Seventy-three out of the 100 CLO positive patients were subsequently culture positive.

The overall resistance rates were; amoxicillin 5.5% (4 of 73 patients), tetracycline 0%, metronidazole 49.3% (36 patients), clarithromycin 16.4% (12 patients) and moxifloxacin 9.5% (6 of 63 patients). Ten patients did not have quinolone susceptibility testing performed due to unavailability of moxifloxacin E-tests when the study first commenced and these patients were therefore excluded from analysis involving the prevalence of moxifloxacin resistance.

The prevalence of any two antibiotic resistance was 12.7% (8 of 63 patients) and 6.5% (4 of 63 patients) for triple antibiotic resistance. Metronidazole and clarithromycin dual resistance was 8.2% (6 of 73 patients).

Table 1. Pattern and prevalence of *H. pylori* dual and triple antibiotic resistance

Antibiotic resistance	Dual resistance				Triple resistance	
	AMO and MET	AMO and CLA	CLA and MET	MOX and MET	MOX plus two other antibiotics (AMO/MET/CLA)	AMO and MET and CLA
Case/Total	1/73	0/73	4/73	3/63	3/63	1/63
Percentage (%)	1.4	0	5.5	4.8	4.8	1.5

AMO, amoxicillin; MET, metronidazole; CLA, clarithromycin; MOX, moxifloxacin.

Amoxicillin-resistant or moxifloxacin-resistant *H. pylori* strains were only isolated from patients born overseas and were not present in the NZ-born cohort. However due to relatively small numbers, this finding was not significant ($p>0.05$).

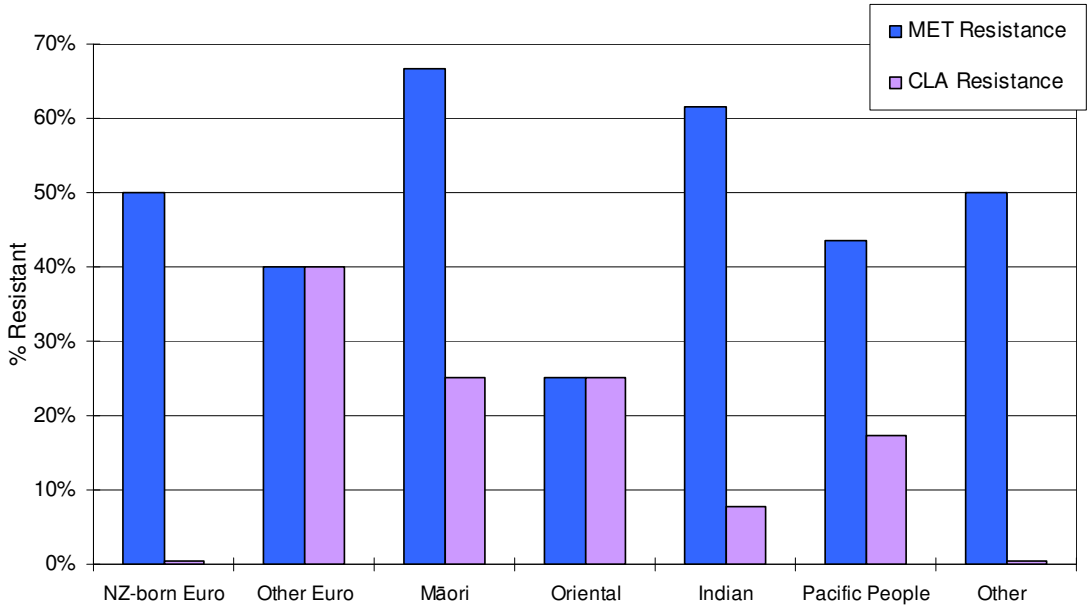
The four patients with amoxicillin-resistant strains were Oriental (1), Other (1) and Pacific People (2). The 6 moxifloxacin resistant strains were seen in Pacific People (2), Other (1), Other European (1) and Indian (2). Three out of four (75%) amoxicillin-resistant strains were resistant to at least two other antibiotics. Moxifloxacin-resistant strains were also resistant to at least two other antibiotics. Moxifloxacin resistance was a predictor of resistance to two or more antibiotics (OR 10.4, 95%CI 1.64–65.79, $p=0.046$).

The overall primary metronidazole resistance was 49.3% (95%CI 37.8–60.8%). There was no significant difference in metronidazole resistance between ethnic groups or by birthplace (Figure 1).

The overall primary clarithromycin resistance was 16.4% (95%CI 7.9–24.9%). No clarithromycin resistance was detected in NZ-born Europeans, however clarithromycin resistance was seen in 25% of NZ-born indigenous Māori. The prevalence of primary clarithromycin resistance was ≥15% in Māori, Orientals and Pacific People.

There has been an apparent significant increase in the prevalence of primary metronidazole and clarithromycin resistance in the Auckland region since the 1990s.[5] Indeed, clarithromycin resistance has more than doubled and there has been a smaller increase in metronidazole resistance as well (Table 2).

Figure 1. Primary *H. pylori* metronidazole and clarithromycin resistance rates according to ethnicity



MET, metronidazole; CLA, clarithromycin.

Other Euro, Europeans born overseas; Other: includes African, Middle Eastern people.

Table 2. Proportion of primary antibiotic resistance of *H. pylori* infection between 1993–2012 in the Auckland region of New Zealand

Antibiotic resistance	1999[5]	2012	P value
Metronidazole resistance	84/257 (32.7%)	36/73 (49.3%)	0.014
Clarithromycin resistance	18/257 (7%)	12/73 (16.4%)	0.032
Metronidazole + clarithromycin resistance	8/257 (3.1%)	6/73 (8.2%)*	0.13

* Includes two triple resistance strains [amoxicillin (1) and moxifloxacin (1)].

Part III: Treatment efficacy—The overall combined first-line treatment (OAC, OCM, and OAM) eradication success was 84.8% (89 out of 105 patients). The overall all-treatment compliance was 98.1% (103 out of 105). 16.2% (17) suffered side effects from eradication therapy. These were mainly gastrointestinal (GI) symptoms such as nausea, diarrhoea and abdominal discomfort (12), parageusia (4), and dizziness (1).

7.6% (8 of 105) patients were actively smoking and all but one of these patients had successful eradication. Only 4 patients (3 OAC and 1 OCM) in total were prescribed a 10-day treatment course whereas the rest were prescribed the standard 7-day course.

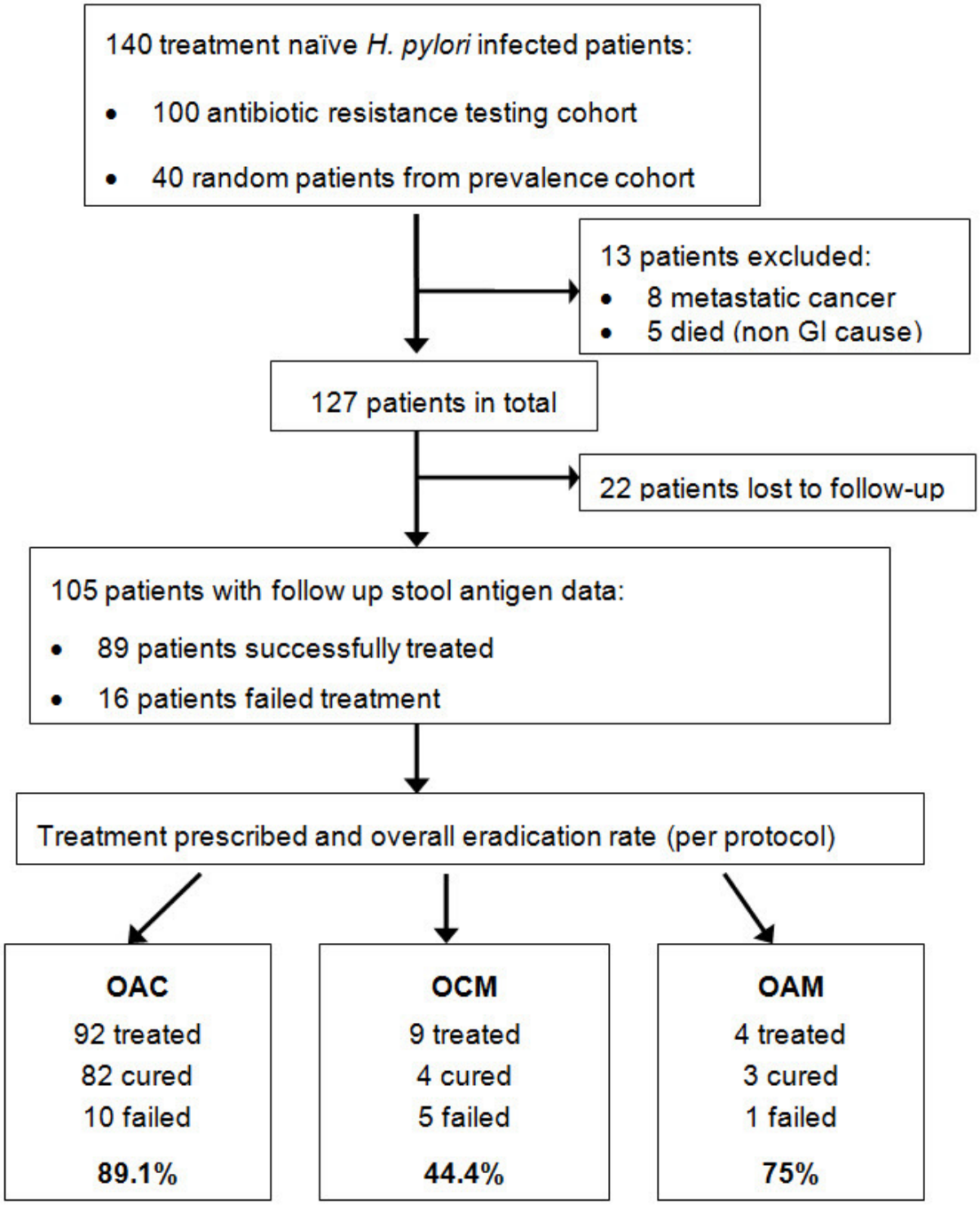
In total, there were 9 patients receiving non-standard under-dosing of the triple therapy and 2 of these patients had subsequent persistent *H. pylori* infection. Although 13 patients were prescribed non-penicillin based therapy, only 4 patients had documented penicillin allergy or penicillin intolerance and none had documented allergies or intolerances to macrolides.

In patients with available susceptibility data and who received clarithromycin-based eradication therapy (OAC or OCM), the eradication rate was 33.3% (95%CI: 2.5–64.1%) for those with clarithromycin-resistant strains, while the eradication rate was 95.2% (95%CI: 88.8–100%) for clarithromycin susceptible strains ($p<0.001$).

The difference in eradication success remained significant even when only OAC therapy was analysed (Figure 3). Although metronidazole resistance data was available, the total number of patients taking metronidazole-based (OCM, OAM) therapy was small (13 patients). Therefore the efficacy of metronidazole-based therapy could not be adequately assessed.

Ethnic subgroup analysis identified ethnic groups with low and high resistance to clarithromycin (Figure 1). Therefore the cohort was further stratified into two groups (Group A and B), by low (<15%) and high (15%) prevalence of clarithromycin resistance to further examine the efficacy of clarithromycin-based therapy; Group A (NZ Europeans, Indian, Other) and Group B (Māori, Pacific People, Oriental, Other European).

Figure 2. Flow diagram depicting number of patients initially identified, excluded, lost to follow-up and those who were finally followed-up with stool antigen testing providing data on eradication rates with three different eradication regimens used in the community

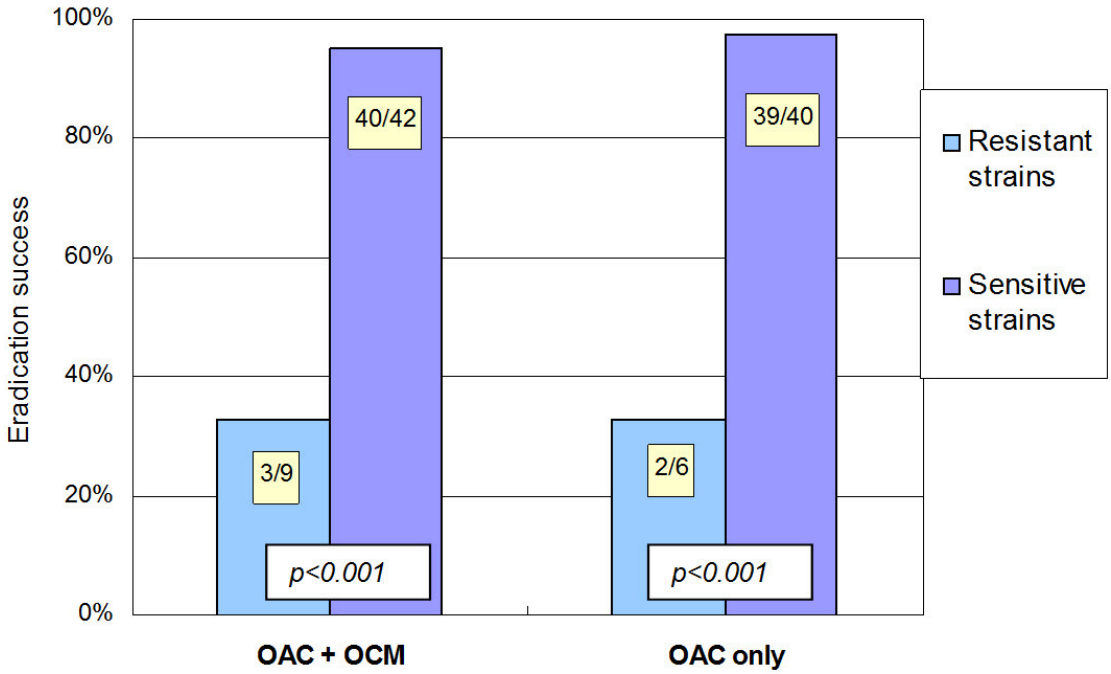


OAC: omeprazole, amoxicillin, clarithromycin.

OCM: omeprazole, clarithromycin, metronidazole.

OAM: omeprazole, amoxicillin, metronidazole.

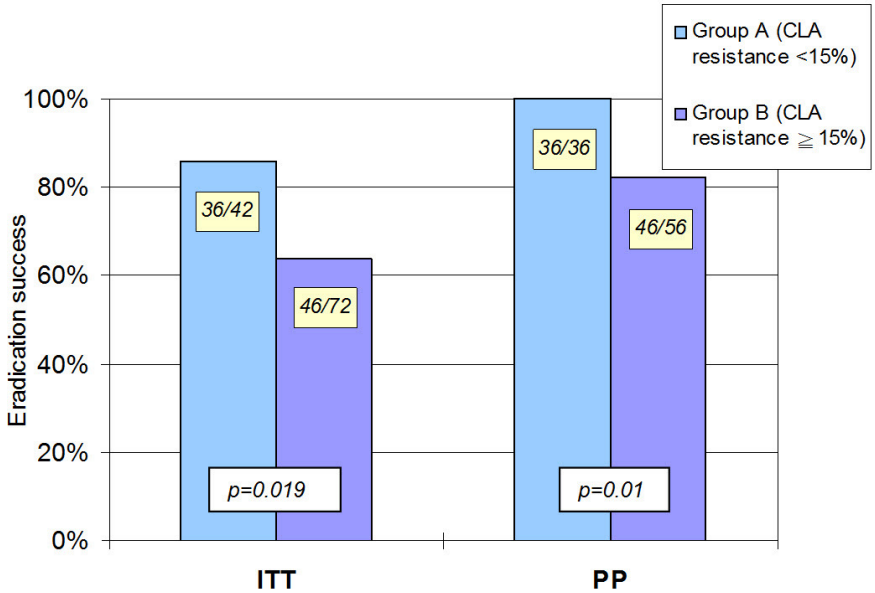
Figure 3. Impact of clarithromycin-resistant *H. pylori* strains on the efficacy of OAC therapy (numerical values represent ratio of successful eradication to total number treated)



OAC: omeprazole, amoxicillin, clarithromycin.

OCM: omeprazole, amoxicillin, metronidazole.

Figure 4. Efficacy of OAC therapy among treatment naïve patients with low and high prevalence of clarithromycin resistance (numerical values represent ratio of successful eradication to total number treated)



ITT, intention to treat; PP, per protocol; OAC: omeprazole, amoxicillin, clarithromycin.

The eradication rate of OAC therapy among treatment naïve patients with *H. pylori* infection was significantly higher in Group A (ITT: 85.7%, 95%CI: 75.1–96.3%) compared to Group B (ITT: 63.9%, 95%CI: 52.8–75%), see Figure 4.

When the minor ethnic groups (Other European, n=6; African and Middle Eastern, n=7) were removed from analysis, the difference in eradication success remained significant; 88.9% (95%CI: 78.6–99.2%) in Group A and 63.2% (95%CI: 51.7–74.7%) in Group B (ITT analysis, *p=0.008*) and 100% in Group A and 81.1% (95%CI: 70.6–91.7%) in Group B (PP analysis, *p=0.012*).

Discussion

The efficacy of *H. pylori* eradication therapy is dependent upon the prevalence of local antibiotic resistance. PPI-based triple therapy of 7 to 10 day duration has been the foundation of eradication therapy for many years and is the recommended first-line treatment in NZ and also the Asia-Pacific region.[14,17]

Alternative strategies recommended in NZ and in international guidelines[13,14,17] include OCM (in penicillin allergic patients) therapy as well as bismuth-based quadruple therapy.[4,12,14] However bismuth compounds and Tetracycline are not readily available in NZ and are expensive to purchase without subsidy.

Without current knowledge of the local prevalence of *H. pylori* antibiotic resistance and the efficacy of standard OAC therapy, there is a risk of treatment failure and development of multi-resistant strains.[18] Infection due to resistant strains would increase the subsequent risk of failing second-line and third-line eradication regimens. In contrast to successful early eradication, those with refractory *H. pylori* infections would continue to be at risk of gastric cancer and peptic ulcer disease.[19]

This study identified several significant findings via the careful administration of its three parts; prevalence, antibiotic susceptibility testing and treatment efficacy. Firstly, treatment naïve *H. pylori* infection is very common among Māori (~30%) and also immigrants from the Asia-Pacific region, similar to a previous study in 1999 by Fraser AG, et al.[5] Importantly, ethnic groups with high *H. pylori* prevalence have also been associated with higher incidence of gastric cancer locally.[20,21]

Secondly, study data suggests that there is an apparent increase in metronidazole resistance to almost 50% and a doubling in clarithromycin resistance to 16.4% in the Auckland region over the last decade alone. Our study used a different method of resistance testing (MIC testing rather than disc diffusion method[5] in the 1999 study) but we do not believe that this changed our finding.

The increasing prevalence of clarithromycin resistance is a concern and is reflected in the relatively poor eradication rate with OAC therapy (<90%). This is consistent with trends seen overseas over time.[15,22] Moxifloxacin resistance is a predictor of multi-resistant *H. pylori* in this study.

Moxifloxacin use in NZ is tightly regulated and would rarely be available for general use in the community setting. However other second-generation quinolones such as norfloxacin and ciprofloxacin are commonly prescribed and may potentially

contribute to *H. pylori* cross-quinolone resistance. Indeed, a recent study found a significant association between outpatient quinolone and long-acting macrolide use and levofloxacin and clarithromycin resistance.[22]

Finally, OAC therapy exhibits poor eradication rates in our region among those with a high prevalence of clarithromycin resistance (≥ 15%). In the multi-ethnic cohort in this study, the primary clarithromycin resistance varied among the different ethnic groups and this was reflected in the significantly different eradication rates between Groups A and B receiving OAC therapy. OAC therapy may still offer effective *H. pylori* eradication in certain ethnic groups such as NZ Europeans and Indians where primary clarithromycin-resistant strains are not common.

In another recent antibiotic susceptibility study performed in NZ in early 2000, metronidazole resistance was low (around 20%) and no resistance to clarithromycin was detected. However in that study, there were 62% NZ Europeans compared to only 6% NZ Europeans in our cohort.[23] Furthermore, there was only a small proportion of Māori, Pacific People and Oriental patients (personal communication from authors of that study). The absence of clarithromycin resistance and disproportionally low metronidazole resistance likely reflected the regional ethnic composition where the study was conducted.

In groups with a high prevalence of clarithromycin resistance (Group B), alternative treatment is required to improve the overall first-line eradication rate especially since extending the duration of OAC therapy from 7 to 14 days has not conclusively shown better eradication rates.[24,25] Regions with high metronidazole and clarithromycin resistance can utilize non-bismuth quadruple therapy; including sequential, concomitant or hybrid therapy. In a meta-analysis of 15 randomised controlled trials (RCTs), sequential therapy outperformed standard PPI-based triple therapies (91.7% versus 76.7%, ITT analysis) even in countries with high Clarithromycin resistance.[26,27]

Concomitant therapy consisting of a PPI and three antibiotics produced a reported eradication rate of >90% by ITT analysis in a Greek study where clarithromycin and metronidazole resistance was high (>20% and >40% respectively).[28] A RCT from Taiwan comparing sequential therapy with concomitant therapy found comparable eradication rates of 92.3% and 93.0% respectively (ITT analysis).[29]

Hybrid (modified sequential) therapy consisting of 7 days of dual therapy with PPI and amoxicillin BiD followed by 7 days of quadruple therapy with PPI, amoxicillin, clarithromycin and metronidazole BiD produced eradication rates of >95%. However studies based on hybrid therapy remain limited.

Bismuth-based quadruple therapy containing tetracycline, PPI, metronidazole and bismuth (De-Nol) can also be considered as a first-line therapy in NZ, specifically for patients of Group B ethnicities or penicillin-allergic patients. This study did not demonstrate any resistance to tetracycline but tetracycline is not readily available in many other countries.

Bismuth compounds and tetracycline have only recently been approved for use in NZ for *H. pylori* eradication by Special Hospital Authority request (Note 1). Doxycycline, the readily available alternative, does not have comparable efficacy to tetracycline (eradication rate of 65% for doxycycline versus 92% for tetracycline).[30]

Although metronidazole resistance was associated with a 37.7% (95%CI: 29.6–45.7%) reduction in the efficacy of metronidazole-based triple therapy according to a meta-analysis, there is some evidence that *in vitro* metronidazole resistance can be overcome by increasing the duration and dose of treatment.[31,32]

In addition, in ethnic groups with high metronidazole and clarithromycin resistance, OCM eradication therapy may not represent an effective strategy. Although patients on OCM regimen in this study were too few in number to make conclusions with statistical significance, a prior meta-analysis in 2004 had reported somewhat disappointing eradication rates with OCM therapy; 50% overall for metronidazole-susceptible and clarithromycin-resistant strains, 72.6% overall for metronidazole-resistant and clarithromycin-susceptible strains and 0% for dual resistant strains.[4]

There are also several limitations to this study; the first being that this was a single-centre study. However, this study involved an ethnically diverse cohort represented by the major ethnic groups in NZ, making study results applicable to the NZ population in general which has similar characteristics. Secondly, the number of culture-positive isolates were relatively small (less than 100 samples) but it has been shown, using available antibiotic-resistance data, that there are ethnic differences in antibiotic resistance rates directly contributing to observed eradication rates.

Conclusion

The observed eradication rates with current recommended OAC therapy is falling and is therefore unsatisfactory as first-line therapy in South Auckland, especially with the likely emergence of metronidazole and clarithromycin resistant *H. pylori* strains among specific ethnic groups. This trend is likely to continue over time.

Standard PPI-based triple therapy can no longer be recommended as an empiric first-line eradication therapy for ethnic groups with high clarithromycin resistance (≥ 15%) such as Māori, Pacific People and Orientals. Therefore, more effective first-line therapies should be sought and can conceivably be achieved with regimens tailored to predicted resistance patterns. Further study to examine eradication rates in the local population utilising alternative first-line therapies like sequential, concomitant or bismuth-based quadruple therapy should be undertaken.

Note 1: During the writing of this paper, the findings from our study were presented to the NZ government drug authority (PHARMAC) to suggest improving the availability of bismuth and tetracycline for first-line *H.pylori* eradication. As a result, bismuth and tetracycline have been approved as Section 29 drugs (special hospital approval) requiring pre-approval from PHARMAC at a subsidised price.

Competing interests: None identified.

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Acknowledgements: This research work was partially funded by the NZ Society of Gastroenterology research grant. The authors also thank the endoscopy staff (medical, nursing and administrative) of the Gastroenterology Department, Middlemore

Hospital and the laboratory scientists of Middlemore Hospital Microbiology Laboratory for their assistance.

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THE NEW ZEALAND MEDICAL JOURNAL
Journal of the New Zealand Medical Association

Timely delivery of hip fracture care, a Middlemore Hospital audit

C Ushan De Silva, Hla S Tha, Delwyn Armstrong, Kathy Walker

Abstract

Introduction New Zealand (NZ) hospitals lack a centralised audit process to evaluate hip fracture care whereas UK hospitals audit hip fracture care in relation to best practice guidelines. This study sought to evaluate multiple factors in hip fracture care at Middlemore Hospital (MMH). Comparisons were made with an audit from MMH in 2008 and a multicentre UK audit.

Method A retrospective audit of patients with hip fractures was carried out at MMH between January and June 2012.

Results 120 patient charts were reviewed. In 2012, 14.2% of patients were admitted from ED within the guideline recommended period of four hours compared to 5.6% of patients in 2008. 72.5% received operative management within the guideline suggested period of 48 hours in comparison to 51% in 2008. Lack of available theatre space accounted for 51% of delays in 2008.

Conclusion There have been considerable improvements to timely delivery of hip fracture care at MMH between 2008 and 2012. However, there are ongoing delays to ward admission and operative management at our institution resulting in care that falls beyond the times recommended by international guidelines. The lack of available theatre space remains a major cause of delayed surgery. We advocate the development of a multicentre audit in NZ hospitals.

Hip fracture is the most common reason for an orthogeriatric admission, [1] and is associated with significant morbidity, mortality and functional impairment in the elderly. Incidence of hip fracture in New Zealand is estimated at 3000-4000 cases per year and incidence worldwide is projected rise with ageing populations.[2-3]

The significant disease burden of hip fractures has been well recognised internationally which has lead to the development of a number of guidelines of best practice.

The "Blue book", published jointly by the British Orthopaedic Association and British Geriatric Society, outlines six key standards of hip fracture management [4] (Table 1). Two of the key standards involve timely delivery of definitive treatment to hip fracture patients.

Firstly, all patients with a hip fracture should be admitted to an acute orthopaedic ward within 4 hours of presentation. Secondly, all patients with a hip fracture who are medically fit should have surgery within 48 hours of admission, and during normal working hours.

The National Hip Fracture Database (NHFD) audits hip fracture care at UK hospitals in relation to the six key standards. Currently, hospitals in New Zealand lack such a

centralised audit process, however efforts are underway to create an Austalian and New Zealand hip fracture registry.

Middlemore Hospital (MMH) is a large hospital in the Auckland region which treats elderly patients with hip fractures and offers an Orthogeriatrc service. However, performance of the service at our institution against international standards of best practice is unclear.

The aims of this study were to evaluate a number of factors in hip fracture care at MMH in relation to the Blue Book guidelines. We sought to compare data collected in audits performed at MMH in 2012 and 2008. We then sought to compare our figures with local data from Auckland City Hospital (ACH) published by Fergus et al[5] and data published in the NHFD National Report 2012.[6]

Table 1. Blue book. Six key standards of hip fracture care

1	All patients with hip fracture should be admitted to an acute orthopaedic ward within Four hours of presentation.
2	All patients with hip fracture who are medically fit should have surgery within 48 hours of admission, and during normal working hours.
3	All patients with hip fracture should be assessed and cared for with a view to minimising their risk of developing a pressure ulcer.
4	All patients presenting with a fragility fracture should be managed on an orthopaedic ward with routine access to acute orthogeriatric medical support from the time of admission.
5	All patients presenting with fragility fracture should be assessed to determine their need for antiresorptive therapy to prevent future osteoporotic fractures.
6	All patients presenting with a fragility fracture following a fall should be offered multidisciplinary assessment and intervention to prevent future falls.

Method

A retrospective case review was undertaken of patients aged 65 years and over who were admitted to MMH with non-pathological hip fractures over a six month period between January and June 2012.

Data was collected on age, sex, time from ED presentation to ward admission, time from admission to operation, fracture type, length of inpatient stay, and inpatient mortality. Data was collected via review of clinical notes and electronic records and entered into a purpose designed MS Access electronic database.

Comparisons were made with a previous audit performed at MMH in 2008. Local comparisons were made with a study published by Fergus et al (2011) from Auckland City Hospital (ACH) and international comparisons were made with data published in the 2012 NHFD report.

All analyses excluded patients who died prior to surgical intervention apart from mortality analysis. The study was approved by the regional ethics committee.

Results:

A total of 120 patients aged 65 and over were admitted to MMH with a hip fracture from January to June 2012. In 2012, two patients were treated non-operatively therefore were excluded from time to theatre analysis, however were included in all other analyses.

During the same 6-month period in 2008, 112 patients were admitted with hip fracture. Three patients were excluded from all analyses in the 2008 group due to pathological fractures. Two patients died prior to surgery. Therefore 107 patient charts were reviewed in the 2008 group. As shown in Figure 2, baseline patient characteristics of the 2012 and 2008 study populations were similar.

Table 2. Baseline characteristics

Characteristic	2012 (n=120)	2008 (n=107)	P-value
Age (Mean)	81.8 yrs	82.1 yrs	0.844
Females (%)	78	72.9	0.394

Clinical characteristics—Clinical characteristics were comparable between the 2012 and 2008 groups. In 2012, 54% of patients suffered intracapsular fractures, whereas in 2008, 54% suffered extracapsular fractures (Table 3).

Table 3. Clinical Characteristics

Characteristic	2012 (n=120)	2008 (n=107)
Fracture type (%)		
Subcapital	41.6	41
Midcervical	2.5	2.8
Intracapsular unspecified	7.5	1.9
Basicervical	2.5	0
Intertrochanteric	41.6	48.6
Subtrochanteric	4.2	5.6

Processes of care—The average time from presentation at the Emergency Department to ward admission in the 2012 group was 6 hours and 24 minutes with 14.2% being admitted within 4 hours. This was vast improvement from 2008 where the mean time to admission was 8 hours and 42 minutes and only 5.6% of patients were admitted within 4 hours. In the 2012 group, two patients were treated non-operatively due to significant comorbidities, resulting in 118 patients being offered operative management.

The median time from admission to theatre in the 2012 group was 27 hours with 72.5% of patients being operated within 48 hours. This is a significant improvement from 2008 where the median time from admission to theatre was 46.4 hours with only 51% of patients receiving operative management within 48 hours (Table 4).

In 2008, the lack of available operating theatre space was the primary reason for delays of more than 48 hours, accounting for 51% of delayed cases.

Table 4. Processes of care

Measure	2012 (n=118)	2008 (n=107)
ED to ward time (Mean)	6 hours 24 minutes	8 hours 42 minutes
Admitted <4 hours (%)	14.2	5.6
Time to theatre (Median)	27 hours	46.4 hours
Operation <48 hours (%)	72.5	51

In 2012, the average length of stay in both the acute and rehab wards was approximately one day shorter than in 2008. However the findings were not statistically significant and there was no overall difference in total inpatient length of stay between the 2012 and 2008 groups (22.4 days vs. 22.5 days, p = 0.958).

A higher proportion of patients were admitted to AT and R (Assessment, Treatment and Rehabilitation unit) in 2012 than in 2008 (70.8% versus 61%, p=0.123). Again the findings were not statistically significant (Table 5).

Table 5. Length of Stay and AT&R Admission

Measure	2012 (n=120)	2008 (n=107)	P-value
Mean length of stay (days)			
Acute episode	9.8	10.8	0.212
Rehab episode	17.8	19.1	0.528
Total	**22.4**	**22.5**	**0.958**
AT&R admission (%)	70.8	61	0.123

Outcomes of care—In the 2012 group only one patient died as an inpatient, in comparison five patients died whilst being an inpatient in the 2008 group. Two patients in 2008 died prior to surgical intervention (Table 6).

Table 6. Mortality

Mortality Measure	2012 group (n=120)	2008 group (n=107)	P-value
Inpatient mortality (%)	0.83	4.67	0.1025

Discussion

This audit has highlighted considerable improvement in the timely delivery of care to elderly patients with hip fractures between 2008 and 2012 at our institution.

The average time taken from ED presentation to ward admission in 2012 was 6 hours and 24 minutes, over two hours fewer than in 2008. 14.2% of patients were admitted within the Blue book guideline recommended period of four hours, an improvement from 5.6% in 2008.

The improvement in admission times may be attributed to a nationwide campaign to reduce ED waiting times, which aims to have all patients admitted or discharged from ED within 6 hours of presentation. Despite the improvement demonstrated, our institution still lags significantly behind figures reported from UK hospitals. The 2012 NHFD report quoted a figure of 51% of patients being admitted within 4 hours.

Ideally, all patients, if medically fit should be operated within 48 hours. In 2012, the median time to surgery at our institution was 27 hours. 72.5% of patients received surgery within the guideline recommended period of 48 hours. This is a significant improvement from 2008 where the median time to surgery was 46.4 hours and only 51% of patients received operative management within 48 hours.

The figures from our institution compare well other local data from a study published in 2011 by Fergus et al from Auckland City Hospital (ACH). The ACH study reported 59% of patients had received operative management within 48 hours.

Despite our institution performing well by local standards, we fall short of the figure of 81% published by the NHFD for patients receiving operative management within 48 hours.

There is evidence to show that delays to surgery are associated with increased risk of pressure sores and early surgery minimises the risk of complications such as UTI and chest infections and reduces hospital length of stay. [4,7] There is however mixed evidence in the literature regarding the timing of surgery and effect on mortality.

The audit shows that delays to theatre at our institution are primarily caused by organisational factors with over half of all delays in 2008 due to a lack of available theatre space. MMH is a large hospital that houses a busy surgical service with a high demand for theatre space. Therefore hip fracture operations are often postponed to accommodate more urgent operations.

The postponement of hip fracture surgery due to theatre constraints is a common issue faced by many centres. Establishment of an operating theatre dedicated to hip fracture surgery has been proposed as a potential solution to the problem; [7] however resource constraints and the erratic nature of hip fracture presentations have dampened interest in the proposal for a dedicated hip fracture theatre at MMH.

Between 2008 and 2012, there was an approximate increase of 10% in the proportion of hip fracture patients being admitted to AT and R (70.8% versus 61%). Although this increase was not statistically significant, it shows there is a growing demand for AT and R services.

The length of stay in the acute and rehab wards in 2012 were 9.8 days and 17.8 days respectively. This was similar to the figures from 2008. The average total inpatient length of stay was 22.4 days in 2012, which compares well with the figure of 28.1 days published by Fergus et al at ACH.

Secondary prevention of osteoporotic fractures is a key part of hip fracture management. Prescription of bisphosphonates was not directly measured in 2012 however data from 2008 showed that 88% of patients were discharged on bisphosphonates.

We expect similar high rates of bisphosphonate prescription in 2012 as there is an ongoing culture of regularly prescribing bisphosphonates to hip fracture patients among the clinicians in the Ortho-Geriatric Service at MMH. Our data for bisphosphonate use is comparable to local figures of 93% at ACH. Our figure compares well to data from the NHFD, which reports a bisphosphonate prescription rate of 69%. From data gathered in 2008, only a minority of patients (19.6%) who presented with hip fractures were taking bisphosphonates prior to admission.

Although data regarding previous fractures was not obtained in this audit, other studies have shown that up to 45% of patients who suffer hip fractures have had previous "signal" fractures.[8] All elderly patients who present to hospital with fragility fractures should be assessed for anti-resportive therapy. [9] Unfortunately many of these "signal" fractures present to services other than inpatient Orthopaedics (For example, Emergency department and fracture clinics) where the opportunity for intervention is often missed. The appointment of a fracture liaison may improve rates of secondary prevention of fragility fracture.

Although not directly measured in 2012, data from 2008 suggests that complication rates are at an acceptably low level at our institution. In 2008, there was a pressure ulcer rate of 11.2%.

In comparison, the NHFD reported a pressure sore rate of only 3.7%. However rates of other important complications such as wound infection (2.8%), re-operation (1.9%) and thromboembolism (0.0%) were low. Inpatient mortality in the 2012 group was 0.83% compared to 4.67% in 2008. The figures are comparable to local figures from ACH, which reported inpatient mortality at 5%.

There are several limitations of this study. Not all of the variables measured in the 2008 study were measured in 2012, for example bisphosphonate prescription and complications. Therefore accurate comparisons for these factors could not be made.

Conclusion

The audit highlights improvement at our institution in a number of facets in the care of elderly patients with hip fractures between 2008 and 2012. There has been an improvement in ED presentation to admission times, which may be a reflection of the nationwide six-hour campaign.

There has been particular improvement in waiting times for operative management. The waiting times compare well with local data however continue to lag behind guidelines of best practice and audit data from hospitals in the UK. The primary determining factor for delays to surgery is the lack of available theatre space.

Whilst marked improvements have been made since 2008, further organisational changes are required to provide timely delivery of hip fracture care at our institution.

A thorough regular audit process must be established to keep up with evolving clinical practice and organisational changes. The lack of a standardised audit makes

local and international comparisons difficult, however the launch of a trans-Tasman hip fracture registry will help to overcome this issue.

Competing interests: None identified.

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Acknowledgements: We thank Dr S Paul (Orthogeriatrician, Middlemore Hospital, Auckland) and Mr B Coleman (Orthopaedic Surgeon, Middlemore Hospital, Auckland).

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THE NEW ZEALAND MEDICAL JOURNAL
Journal of the New Zealand Medical Association

Retrospective analysis on timeframes of referral, diagnosis and treatment of patients with endometrial carcinomas in Dunedin Hospital, 2008–2011

Michael Yoon Kang, Peter Sykes, Peter Herbison, Simone Petrich

Abstract

Aim To quantify time taken for patients diagnosed and treated for endometrial cancer in Dunedin Hospital in context of Ministry of Health New Zealand (MoHNZ) best practice indicators for cancer diagnosis and treatment, and to identify factors which could potentially cause delays if present.

Method Retrospective audit was carried out based on patients discussed at a Gynaecology-Oncology Multi-Disciplinary Meeting (GOMDM) at Dunedin Hospital during 2008-2011 for primary endometrial cancer. Median time taken between referral dates, first specialist appointment, date of histological diagnosis, staging scan, date when patients were waitlisted for surgery, and date of first treatment were calculated. Possible factors which could contribute to delay if present were identified and further explored.

Result 44 eligible patients were identified. Compared to MoHNZ recommendations delays were present from initial referral to first treatment (93 days actual timeframe vs. 62 days recommended timeframe) and some delays present from initial referral to first specialist assessment (21 days vs. 14 days), with only 20% and 32% of patients being seen and treated within the best practice timeframes respectively. Patients were treated within the recommended time once they were wait-listed for first definitive treatment (19 days vs. 31 days) with 75% of patients being treated within the recommended timeframe. Waiting time for hysteroscopy and dilatation and curettage was seen to contribute towards considerably longer delays in diagnosis and treatment of endometrial cancers. Other potential factors contributing to delay identified were patients not attending clinic appointments and difficulty in obtaining a conclusive histological sample through pipelle biopsy at the initial clinic visit.

Conclusion Currently the practice in Dunedin Hospital does not meet the planned MoHNZ standards, and significant changes in practice and reallocation of resource will be required to meet the MOH standards for women with endometrial cancer. Training of General Practitioners in pipelle biopsy, better patient education about post-menopausal bleeding, reducing the time taken for radiological scans, and expediting referrals to the first specialist appointment and hysteroscopy for patients with high suspicion, could reduce delays.

Timely diagnosis and treatment of any cancer is a desire shared by patients, clinicians and politicians alike. This is based on strong belief that that early diagnosis and treatment of the cancer will positively impact on the patient's overall outcome.[1] Some studies to date have shown that diagnostic delays in cancers adversely affect outcome in studies about breast, lung, head and neck cancers.[2]

Endometrial cancer is the one of the most common gynaecological cancers in New Zealand, with approximately 315 new cases and 80 deaths being reported each year.[4] Patients commonly present to medical practitioners with post-menopausal bleeding (PMB), and its relatively slow oncologic velocity and well defined referral pathway for PMB at Southern District Health Board makes it an ideal candidate to investigate delays.

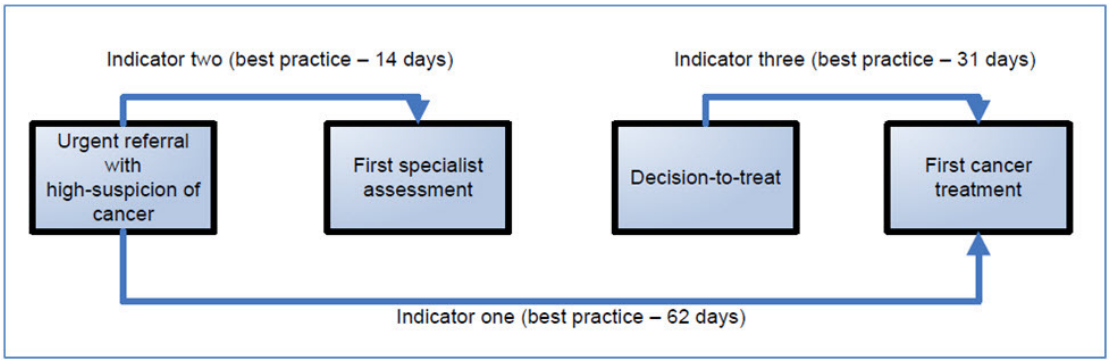
Within the literature, only a few studies to date have specifically looked at delays in diagnosis and treatment of gynaecological malignancies. A recent study by Vandborg et al[5] showed median time from patient presentation at a GP clinic to initiation of treatment across all gynaecological cancers to be 14.4 weeks. Another Denmark-based national survey by Robinson et al showed median total timeframe (date of first cancer-related symptom to date of operation at gynaecological surgical centre) to be 12 weeks.[6]

Available New Zealand specific data includes a retrospective audit at Christchurch Women's Hospital in 2009 for all gynaecological cancers which showed median time from initial patient presentation to treatment to be 7.8 weeks, with time from referral to diagnosis at 3.8 weeks, diagnosis to treatment plan at 1.4 weeks, and treatment plan to surgery at 2.6 weeks.[7]

The Ministry of Health New Zealand (MoHNZ) is proposing target timeframes for cancers based on three indicators as shown on the figure one below.[3] Hence the information regarding current performance of healthcare delivery in cancers is essential in putting the proposed target timeframes into perspective and to identify areas where improvements can be made.

This audit aims to quantify the time taken in the diagnostic and treatment process for endometrial cancer at Dunedin Hospital, a tertiary hospital with the associated Medical School of the University of Otago, where a visiting Gynaecological Oncologist from Christchurch comes for clinics, combined gynaecology-oncology multidisciplinary meeting and surgery every 2 weeks. A second aim of this audit is to identify factors along this pathway contributing towards significant delays if present.

Figure 1. Ministry of Health New Zealand indicators of best practice for diagnosis and treatment of all cancers



Method

The pathway of primary care referral, investigation and treatment for this audit was based on a one-directional pathway model as described by the MoHNZ.[3]

Patients discussed at a Gynaecology-Oncology Multi-Disciplinary Meeting (GOMDM) at Dunedin Hospital during 2008-2011 for primary endometrial cancer were included, if they were initially referred by their general practitioner or their private gynaecologist. Patients were excluded from the audit if they were referred from Southland hospital, or other than their general practitioner/private gynaecologist, as information was not readily available on these patients.

The iSOFT clinical patient database, patient management system (iPM) and clinical notes where necessary were used to collect information required for this audit, which were; patient age; date when the initial referral was first received; type and duration of presenting complaint on initial referral; date of first specialist appointment (FSA); date of Pipelle biopsy and/or hysteroscopy and dilatation and curettage (D&C); date of staging CT and/or MRI; when the patients were first waitlisted for their treatment; FIGO (Federation of International Gynaecologists and Obstetricians) grade and stages of the cancer; date of multidisciplinary meeting when definitive management plan was decided; and finally the date when first medical/surgical treatment was initiated.

Based on the dates collected, time duration between different points of the diagnosis and treatment pathway were calculated in days. The date when patients were waitlisted for surgery was regarded as the date of treatment decision. Descriptive statistics were used to summarize the data.

The 10 longest outliers were further identified and information on their demographic details, medical comorbidities, and number of did-not-attended appointments (DNA), and waitlist urgency criteria for hysteroscopy were collected to identify reasons which may have contributed towards significant delay in this patient group.

Results

Eighty-seven cases of suspected endometrial cancers discussed at GOMDM during 2008-2011 were identified. Based on the exclusion criteria, 40 cases were excluded: 19 cases for being Southland hospital referrals; 7 cases due to final diagnosis not being endometrial carcinoma; 6 cases for being referrals other than from GPs or private gynaecologists; 5 cases for being re-referrals on the basis of previously diagnosed endometrial carcinoma; and finally 3 cases due to diagnosis of endometrial cancer being made outside the 2008–2011 period. Three further cases were not included in the analysis due to unavailable records.

Table 1 describes demographic details of the included patients. After exclusions, 44 patients were included in the final audit. Mean age of the patients was 64 years (range 41-89), with the majority of the patients initially being referred by their general practitioners. 64% were referrals within the geographical boundaries of Dunedin city, and rest were referrals from outside Dunedin (which were defined as ‘rural’ areas).

Majority of the patients (86%) were post-menopausal women. The most common reason for referral to the specialist clinic was post-menopausal bleeding (75%), followed by incidental finding of abnormal cells on cervical smear (11%).

In cases where patients were experiencing a specific complaint such as post-menopausal bleeding, the time from beginning of the complaint to presentation at a GP clinic varied between 1 to 24 months, with about one-third of the patients presenting within 6 months of symptom onset, and another third presenting after more than 6 months.

Table 1. Demographic details of the patients

Variables	N	%
Age, mean (range)	64 (41-89)	N/A
Location		
Dunedin city	28	64%
Rural	16	36%
Original referrer		
General practitioner	38	86%
Private gynaecologist	4	9%
Unknown	2	5%
Menopausal state		
Pre/Peri-menopausal	6	14%
Post-menopausal	38	86%
Reason for referral		
Post-menopausal bleeding	33	75%
Incidental finding on cervical smear/ultrasound scan	5	11%
Other	6	14%
Duration of complaint		
Less than 6 months	16	36%
More than 6 months	14	32%
Unknown duration	14	32%
Seen at first specialist assessment by		
Consultant	26	59%
Registrar	19	41%

In terms of diagnostic methods and cancer characteristics, (Table 2), 22 patients (51%) had pipelle biopsy, while 18 patients (42%) underwent hysteroscopy and D&C. Three patients (7%) who had pipelle biopsy done further underwent D&C for diagnosis due to inadequate samples obtained from the initial pipelle biopsy.

Amongst 18 patients who underwent hysteroscopy and D&C, pipelle biopsy was attempted but unsuccessful in nine patients due to tight cervical os preventing the procedure. Pipelle biopsy was not attempted in the rest of the patients prior to D&C due to reasons which included patients having had successful or unsuccessful pipelle biopsy done by their private gynaecologist prior to referral, patients who have never been sexually active, or reasons otherwise unspecified from medical notes.

Ultrasound scan of the pelvis during the diagnostic process was done in the majority of patients (82%). In total, 61% of these scans were done prior to FSA with 21% of them being done following FSA. Both CT and MRI of the pelvis were utilised with similar frequency, with 41% of patients having had MRI of the pelvis (which is routinely performed in Dunedin for G1 adenocarcinomas for preoperative assessment of depth of infiltration) and 36% of them receiving CT of the pelvis.

In terms of cancer characteristics, the majority of the cancers were of low grade at grade 1 (66%) and stage IA (52 %), and of adenocarcinoma in origin (91%).

Table 2. Diagnostic methods and cancer characteristics

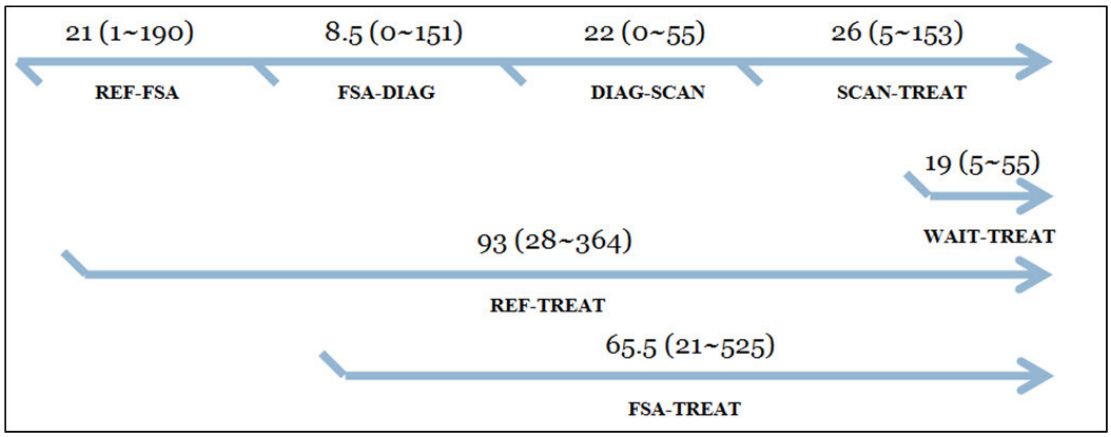
Variables	N	%
Biopsy method		
Pipelle biopsy	22	51%
Hysteroscopy and D&C	18	42%
Both	3	7%
Unknown	1	2%
Radiological imaging		
CT	16	36%
MRI	18	41%
Both CT & MRI	7	16%
Unknown	3	7%
Ultrasound scan of pelvis		
Before FSA	27	61%
After FSA	9	21%
Unknown	8	18%
FIGO grading		
G1	29	66%
G2	10	23%
G3	5	11%
Revised 2010 FIGO Staging		
IA	23	52%
IB	10	24%
IIA	4	10%
IIIA	1	2%
IIIC	5	12%
IVB	1	2%
Histological diagnosis		
Adenocarcinoma	40	91%
Endometrioid	32	80%
Clear cell	5	13%
Serous	3	8%
Carcinosarcoma	4	9%

Figure 2 shows the summary of the time taken between different components of the diagnostic pathway for endometrial cancer in patients included in this audit. Numbers represent the median time taken in days with ranges shown in brackets. Table 3 shows the definitions of each timeframes.

Comparing the results of this audit to the MoHNZ recommendations, excess delay was present for time taken from referral to treatment initiation (93 days vs. 62 days), and a lesser delay was present from referral to FSA (21 days vs. 14 days). The waiting time for staging scans after confirmed diagnosis of cancer also appeared long with a median time of 22 days, contributing to the length of delay in FSA to treatment decision timeframe.

The time taken between treatment decisions to treatment initiation was shown to be shorter in Dunedin Hospital compared to MoHNZ cancer proposals. (19 days vs. 31 days).

Figure 2. Median times in days (range) between different components of the diagnosis and treatment pathway



Definitions of timeframes

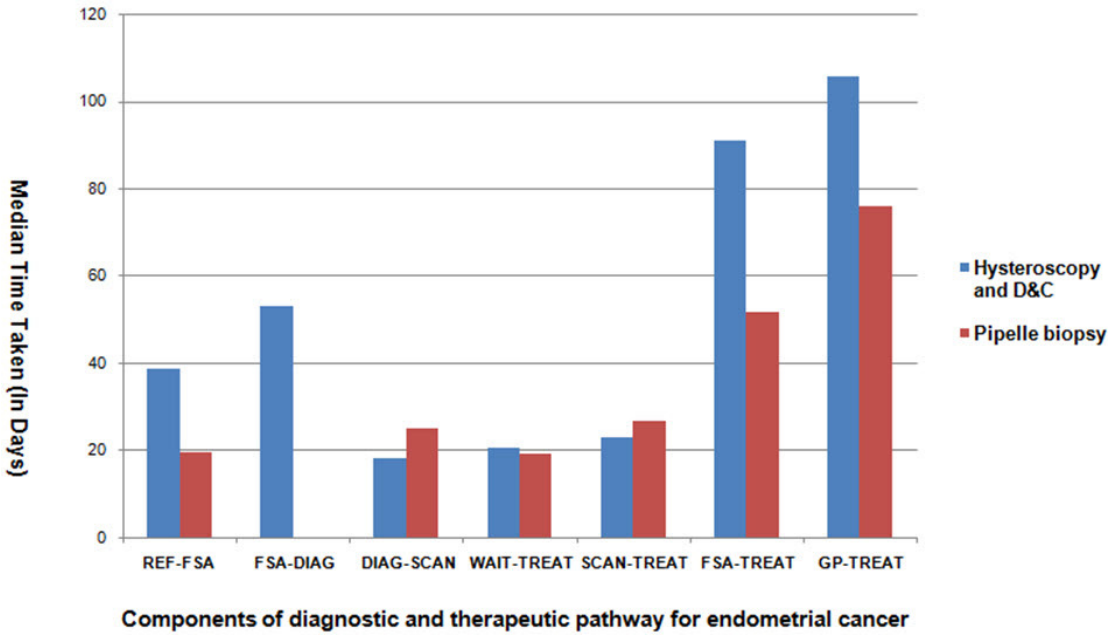
1) **REF-FSA:** Time taken between initial referral to First Specialist Appointment
2) **FSA-DIAG:** Time taken between First Specialist Appointment to histological diagnosis via Pipelle Biopsy and/or D&C
3) **DIAG-SCAN:** Time taken between diagnosis via Pipelle Biopsy and/or D&C to staging scan (CT/MRI)
4) **SCAN-TREAT:** Time taken between staging scan (CT/MRI) to initiation of treatment
5) **WAIT-TREAT:** Time taken between when patient was waitlisted for treatment to commencement of treatment
6) **REF-TREAT:** Time taken between initial referral to initiation of treatment
7) **FSA-TREAT:** Time taken between First Specialist Appointment to initiation of treatment

Table 3 shows that 75% of patients were treated within the MoHNZ best practice indicator 3 (time duration between waiting listed to first definitive treatment). In contrast, only 20% and 32% of patients were seen within the best practice timeframe for indicator 1 (time from referral to first treatment initiation) and indicator 2 (time from referral to FSA) respectively.

Table 3. Proportion of patients meeting/not meeting MoHNZ best practice recommendations

Indicator	Recommendation met N (%)	Recommendation not met N (%)	Information unavailable N (%)
Indicator 1 (62 days)	9 (20%)	29 (66%)	6 (14%)
Indicator 2 (14 days)	14 (32%)	25 (57%)	5 (11%)
Indicator 3 (31 days)	33 (75%)	6 (14%)	5 (11%)

Figure 3. Comparison of times between pipelle biopsy vs. hysteroscopy and D&C groups



When timeframes between patients who received pipelle biopsy for diagnosis as opposed to hysteroscopy and D&C were compared (Figure 3), timeframes were longer in the hysteroscopy and D&C group for REF-FSA (38.5 days vs. 19.5 days) and FSA-DIAG (53 days vs. 0 days). As a result of these initial differences, the Hysteroscopy and D&C group had considerably longer timeframes for FSA-TREAT and REF-TREAT when compared to the pipelle biopsy group. DIAG-SCAN, WAIT-TREAT, and SCAN-TREAT timeframes were similar for both groups.

Ten patients with longest timeframes were further selected and their clinical history was looked into order to identify factors which contributed towards delays.

A systemic aspect contributing to the delay within this patient group was the waiting time for hysteroscopy and D&C, where it took between 53 days to 136 days in the five longest outliers despite the hysteroscopy priority score (80–100) indicating the urgency for the procedure (80–100 out of 100 according to Clinical Priority Assessment Criteria score system).

An important patient-related factor was multiple did-not-attends (DNAs) identified in two outliers, which likely mirrored patients' denial of a potential cancer diagnosis. Time taken for patient to consider and agree to a treatment plan was also another significant factor with one patient's case taking 103 days for treatment to be initiated after the staging scan.

The most important clinical factors were insufficient or inconclusive histological Pipelle samples for diagnosis and documented difficult examination at FSA, which were present amongst five out of ten longest outliers. Other possible factors identified from these patients were rural referrals (2 out of the 10 longest outliers), multiple medical comorbidities requiring lengthy medical review prior to operation, and low clinical suspicion on FSA referral with 9 out of 10 longest outliers having been triaged as semi - urgent (to be seen within 6–12 weeks) or even lower priority.

Discussion

This audit aimed to quantify the duration of time taken for diagnosis and treatment of endometrial carcinoma at Dunedin Hospital New Zealand, and to identify areas where significant delays may be present. When compared to the findings from similar audit done at Christchurch Women's Hospital in 2009, times from referral to diagnosis were considerably longer in Dunedin Hospital (93 days vs. 26.6 days), but similar in treatment decision to treatment initiation (19 days vs. 18.2 days). It is important to note however that the Christchurch audit included all gynaecological cancers, not solely endometrial carcinomas; hence it is difficult to make a direct comparison of results.

Symptom duration experienced by patients before presenting to their GP or private gynaecologist was seen to vary between 1 to 24 months. It is worth keeping mind that the symptom duration is not included in the calculation timeframes. Patient related delay therefore may contribute significantly towards overall delay in diagnosis and treatment of endometrial cancer.

The delays seen compared to MoHNZ recommendations could be due to factors specific to Dunedin Hospital which is part of the Southern District Health Board (DHB). The Southern DHB has a land area of over 62,356 sq km making it geographically the largest DHB region in New Zealand. 7.1% of the national population live within the Southern DHB catchment area, with 59% of the catchment population residing outside Dunedin City.[8]

The nature of distribution of population and the large geographic catchment area means effective health resource distribution is challenging. Although referrals from Southland Hospital were excluded in this audit, patients referred from Oamaru, Dunstan, and other rural areas were included which may have contributed towards the delays seen in some patients. Attempts were made to compare time delays between referrals from urban Dunedin and rural areas; however results were not statistically significant, likely due to low power.

As shown previously in Figure two, median times were much longer in the hysteroscopy and D&C group compared to the Pipelle biopsy group in REF-FSA time (38.5 days vs. 19.5 days), FSA-DIAG time (53 days vs. 0 days), FSA-TREAT time (91 days vs. 51.5 days), and REF-TREAT time (105.5 days vs. 76 days).

Understandably, the longer duration in FSA-DIAG timeframe in the hysteroscopy and D&C group is likely to have been due to patients having to wait until the procedure could be done, while pipelle biopsies were able to be taken either at GP clinics prior to FSA or on the day of the FSA, which explains the median time of 0 days in FSA-DIAG timeframe for Pipelle biopsy group.

These results suggest the waiting time for hysteroscopy and D&C in a patient for histological diagnosis is a prominent factor in timely diagnosis and treatment of endometrial cancer. Measures such as supporting the approach of GPs performing pipelle biopsies by increased training of general practitioners and streamlining of referral processes for hysteroscopy and D&C in suspected endometrial carcinoma may prove to be effective in reducing the delays seen.

Inability to perform pipelle biopsy due to tight cervical os was also seen to be a common barrier, with 50% of the patients who had hysteroscopy and D&C requiring it for this reason. Difficulty in insertion of the pipelle is often encountered in endometrial biopsy with one study showing that even after excluding women with cervical stenosis, difficulty in passing pipelle through the cervix was experienced in 41.7% of the patients.[9]

Some have suggested the use of misoprostol for cervical ripening prior to pipelle biopsy as a means to improve the success rate. However there has been only one small randomized controlled trial to date,[10] which showed little benefit of 400mcg oral misoprostol prior to biopsy, and even noted an increased incidence of pain and cramping during the procedure compared to controls. A larger randomised controlled trial on the topic is hence warranted.

Hysteroscopy and directed biopsy, given its superior diagnostic potential compared to other endometrial biopsy methods, has been promoted to provide precise diagnosis of intrauterine pathologies even when provided in an office setting with a narrow scope.[12] The option of an assessment of patients with post-menopausal bleeding at their first FSA appointment in an office hysteroscopy setting has recently become available in Dunedin hospital, and may help to shorten the timeframe to diagnosis as ideally a hysteroscopy and curettage can a be performed at the first FSA appointment.

Shortages in access to theatre and imaging for patients to yet be diagnosed with cancer are additional aspects of delayed diagnosis and treatment of cancer patients. The new best practice standards of the Ministry of Health might improve the situation for cancer patients as they are likely to receive higher priority in accessing these resources, however it does not address the actual overall shortage in these areas.

Factors identified from the 10 longest outliers have also been identified by other studies within the literature. A study by Robinson et al[11] investigated the association between socioeconomic factors and diagnostic delays among all gynaecological cancers, and found that rural patients were at greater risk of experiencing delays compared to urban counterparts in time taken from GP referral to first specialist appointment (odds ratio [OR]=2.20).

The presence of medical comorbidities was also associated with increased risk of experiencing secondary-care related delays (OR=1.66). Interestingly, younger patient age was associated with overall increased risk of experiencing delays, and the authors have suggested a few reasons for this; the main points being younger women feeling

less urgency to contact their medical practitioner with initial onset of symptoms, less suspicion of cancer from referring doctors due to the patient demographics, and the fact that younger women are more likely to be working hence may find difficulty in scheduling a time for an appointment.

While factors such as inconclusive histological samples and difficult gynaecological examinations may not be modifiable, factors such as multiple DNAs may be due to the patient's poor understanding of the significance of symptoms such as post-menopausal bleeding.

No studies to date have specifically explored New Zealand public's perception of risk in post-menopausal bleeding. Hence, such research may be helpful in determining whether a stronger emphasis on patient education is required in order to reduce impact of patient-related factors such as multiple DNAs in diagnostic delay of endometrial carcinoma.

Internationally, specific cancer timeframe recommendations such as NICE guidelines in United Kingdom have demonstrated improvement in faster cancer diagnosis since its implementation[13] and some centres are now adopting multi-centred accreditation process[14] to standardise care for cancer patients. The Faster Cancer Treatment programme of the Ministry of Health NZ aims to improve services by standardising care pathways and timeliness of services for cancer patients throughout New Zealand.

The four main focus areas of this programme are: faster cancer treatment indicators, patient pathway coordination, tumour specific standards and multidisciplinary meetings. The planned collection of consistent data throughout the country will provide up-to-date information about the appropriateness of our current target timeframes as well as aid in its development, and hopefully improve in the context of work done in parallel within the other three main foci of work.

This audit is a first assessment of time taken for referral, diagnosis and treatment of endometrial cancer in Dunedin Hospital. Although seemingly small in size, this single-centre based audit involved comparable caseload of endometrial carcinomas to the diagnostic delay study carried out by Vandborg et al[5] as well as the aforementioned 2009 Christchurch Women's Hospital Audit. Given its retrospective design however, this audit is affected by bias from missing data and it is possible that some patients with endometrial cancer were lost to follow up, therefore affecting the final result.

The results are specific to Dunedin Hospital, therefore is not readily generalizable to other regions in New Zealand, however it is likely that the problem of delay in diagnosis and treatment does not involve Dunedin Hospital alone. This audit specifically looked at patients diagnosed with endometrial carcinoma; hence patients who may have been investigated for PMB but were subsequently found not to have endometrial cancer were not included.

Therefore, further research looking into timeframes for patients presenting with post-menopausal bleeding may provide more robust information regarding our current PMB diagnostic pathway performance.

Conclusion

The results of this audit show that the best practice times as proposed by MoHNZ for timely cancer diagnosis and treatment have not been met for patients with endometrial cancer, specifically with regards to time from initial referral to treatment, and to a certain extent from initial referral to first specialist appointment. Once the diagnosis was made, treatment was usually within the appropriate timeframe.

The main factor contributing to the delays which could be identified was waiting times for hysteroscopy and D&C for histological diagnosis. Better education of patients about post-menopausal bleeding, training of general practitioners in pipelle biopsy, expedited hysteroscopy and D&C in an office gynaecology setting, and reduced waiting times for imaging and surgery could be possible ways to address the delays.

Competing interests: None identified.

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THE NEW ZEALAND MEDICAL JOURNAL
Journal of the New Zealand Medical Association

Pacific students undertaking the first year of health sciences at the University of Otago, and factors associated with academic performance

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Abstract

Aim To describe Pacific students in the first year of health sciences at tertiary level, their academic performance, and factors associated with academic outcomes.

Method Routinely collected data for students who enrolled in the Health Sciences First Year (HSFY) programme at the University of Otago between 2007 and 2011, including their school National Certificate in Educational Achievement (NCEA) results were obtained in anonymous form. Descriptive statistics were calculated and regression analyses were undertaken using SAS v9.2 software.

Results A small but increasing number of Pacific students are enrolling in health sciences at tertiary level. Pacific students had poorer performance compared to non-Pacific students in both NCEA and the HSFY programme. Factors associated with academic performance were gender, NCEA results, school decile, accommodation type, ethnicity, international status and disability.

Conclusion Pacific students are under-represented in health sciences and would benefit from better preparation from school. Pacific solutions are required to improve academic outcomes over and above mainstream policy solutions. Tertiary institutions need to engage prospective students earlier to ensure they are well informed of requirements, and are appropriately prepared for study at the tertiary level.

Pacific peoples in New Zealand currently make up 7.7 % of the total population, a proportion that is expected to increase to 10% by 2026.[1] Pacific peoples are over-represented in poor health and education outcomes.[1-4] The Tertiary Education Strategy,[5] Tertiary Education Commission Statement of Intent[6] and the Pasifika Education Plan[7] outline the need to do better for Māori and Pasifika.

The Ministry of Health has indicated clearly its intention to increase the Pacific health workforce in New Zealand, as part of its plan to improve health and education outcomes for Pacific communities.[8] There have been efforts aimed at improving Pacific outcomes in the health and education sectors in New Zealand.[8-13]

Despite these efforts, Pacific peoples continue to be under-represented in the health professional workforce, and there is an increasing gap in the health and education outcomes between Pacific peoples and all other New Zealanders.[2,3,14-16] There is a small but increasing body of knowledge which outlines the importance of incorporating the Pacific context, ethnic-specific worldview and realities, identities, cultural norms and values, language, cultural pride including a strength-based approach in efforts aimed at improving Pacific education outcomes.[17-22]

Researchers have found unfair and unequal treatment of minority students by educators have been part of the problem.[23,24] Pacific students have clearly identified the need for visible senior Pacific leadership within institutions, and to have Pacific-led support separated from Māori-led support services.[20] Education institutions should be part of the solution which includes proactive and appropriate engagement with Pacific communities, families and prospective students.[17,20,22]

The University of Otago is one of the largest providers of health professional training in New Zealand.[25] All students who wish to enter any health professional programme (Medicine, Pharmacy, Physiotherapy, Dentistry and Medical Laboratory Sciences) through the undergraduate pathway are required to undertake a prescribed programme.

The admissions criteria for each health professional programme are based on an academic and aptitude threshold. An affirmative action programme within the Division of Health Sciences assures entry for indigenous Māori and Pacific students who meet the admissions criteria.[15]

The transition experience from secondary education, and engagement of students in the first year in higher education, are important factors in student success and retention.[26,27] Engagement in this context is defined as "the extent to which students devote time to educationally purposeful activities; it also refers to policies and practices that institutions use to encourage students to take part in these activities".[28-30]

To encourage engagement, the University of Otago introduced a 13 week tailored orientation programme (Pacific Orientation Programme @ Otago – POPO) in 2011 for first-year Pacific students.[12] It was modelled in part on the Peer Assisted Student Sessions programme (PASS)[31,32] to assist with the transition to and engagement in the tertiary environment. Additional support for Pacific students was available during the year through the Student Learning Centre, Residential Colleges, Pacific Islands Centre and Student Health Services.[12]

The academic performance of Pacific students in the first year of health sciences at the University has not improved significantly despite these efforts. Thus there is a need to understand why we are not achieving expected outcomes, identify factors associated with academic performance, and invest into areas identified as likely to influence positive outcomes.

This research seeks to describe Pacific students in the first year of health sciences at tertiary level, their academic performance and factors associated with academic outcomes.

Method

Routinely collected data for students who enrolled in the Health Sciences First Year (HSFY) programme at the University of Otago between 2007 and 2011 were obtained in anonymous form. This included their NCEA Level 3 results in five key subjects (Biology, Chemistry, Mathematics with Calculus, Physics, and Mathematics with Statistics).

'NCEA score' refers to the number of credits accumulated by a student in a subject in high school, weighted by level of achievement (two for 'Achieved', three for achieved with 'Merit', four for achieved with 'Excellence'). First semester Grade Point Average (GPA) scores only included students who achieved a mark in all four of the first semester papers in HSFY.

The first semester papers are; CELS 191 – Cells and Molecular Chemistry, CHEM 191 - The Chemical Basis of Biology and Human Health, HUBS 191- Human Body Systems, and PHSI 191- Biological Physics. NCEA subjects analysed were selected because of their relevance to the HSFY papers.

Students who registered for the HSFY programme but did not confirm their attendance at Otago were excluded.

The term 'Pacific' refers to any student who declared at least one Pacific ethnicity at the time of enrolment, regardless of whether that student also declared any non-Pacific ethnicity (e.g. NZ European, Māori).

The term 'school leaver' refers to any student who met all of the following criteria:

- The student must have gained University Entrance by achieving NCEA Level 3;
- The student must be included in at least one of the NCEA result files provided by the New Zealand Qualifications Authority (NZQA) to New Zealand universities for the period 2005-2010 (students often complete their NCEA Level 3 credits over two years, hence the need to include 2005 results);
- Their last year of secondary education must have been at a New Zealand school;
- Their last year of secondary education must be immediately prior to enrolment in the HSFY programme;
- The student must be in his or her first year of tertiary study;
- They must have matriculated in the year of enrolment in the HSFY programme and;
- They must have enrolled at the start of the year in the HSFY programme.

Non-school leavers included students who entered the HSFY programme after undertaking a foundation programme or as mature students. Descriptive statistics were calculated and regression analyses were undertaken using SAS v9.2 software.

Results

Comparatively few Pacific students in any given year were enrolled in HSFY programme, with a maximum of 66 students in 2010 (Table 1). Most Pacific students were female (63%), similar to that for non-Pacific students (60%). Fewer Pacific students than non-Pacific students gained NCEA Level 3; 76% compared to 92% respectively (data not shown).

Table 1. Total number of Pacific and non-Pacific students enrolled in the HSFY programme (2007–2011)

Year	Headcount (%)	
	Pacific	Non-Pacific
2007	48 (3.6)	1293 (96.4)
2008	53(4.1)	1250(95.9)
2009	44(3.5)	1215(96.5)
2010	66(4.9)	1289(95.1)
2011	64(4.6)	1318(95.4)
Total	**275(4.1)**	**6365(95.9)**

Samoans constituted approximately one-third of all Pacific students, while Tongans and Cook Islanders each made up 14% and 12% of the total Pacific student population respectively (Table 2).

Students from most Pacific ethnic groups were under-represented compared to their proportional representation in the general population, except for Fijians. The majority in the Fijian cohort were Fijian Indians.

Table 2. Ethnic affiliation of all Pacific students enrolled in the HSFY programme (2007–2011)

Ethnic affiliation	Headcount	Proportion of Pacific HSFY	Proportion of the NZ Pacific population
Cook Island Māori	33	12.0%	22%
Indigenous Fijian	20	7.3%	4%
Fijian Indian	65	23.6%	
Niuean	13	4.7%	9%
Samoan	88	32.0%	49%
Tokelauan	4	1.5%	3%
Tongan	38	13.8%	19%
Other	33	12.0%	–

Note: Percentages do not add up to 100% as students may declare up to three ethnicities at enrolment.

Four out of five enrolled Pacific students were domestic students (i.e. they were citizens or permanent residents of New Zealand) and three-quarters of all domestic Pacific students were from the North Island. Thirty-six percent were from Auckland, 19% from Wellington and 13% from Christchurch. Only five percent of all Pacific students were from the Otago area (data not shown).

In the Auckland area, two out of three Pacific students attended decile 1–4 schools, whilst almost three-quarters of non-Pacific students attended decile 8–10 schools. For the rest of New Zealand, Pacific students were spread more evenly across the three decile bands, and nearly 60% of non-Pacific students attended decile 8–10 schools (Table 3).

Pacific students had lower mean weighted NCEA scores in all five subjects compared to non-Pacific students.

The greatest difference was in Chemistry and Physics, where the average NCEA scores for non-Pacific students were approximately 40% higher than the average scores for Pacific students.

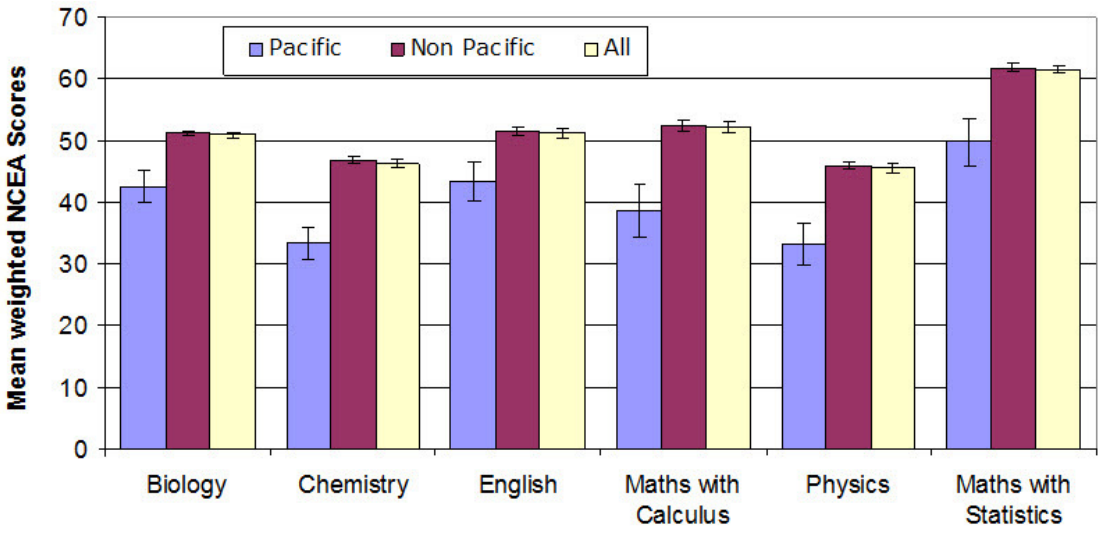
Table 3. School region and decile group for all Pacific and non-Pacific students enrolled in the HSFY programme (2007–2011)

School region	Decile	Headcount (%)		
		Pacific	Non-Pacific	Total
Auckland	1-4	56 (65.9)	193 (15.4)	249 (18.6)
	5-7	9 (10.6)	149 (11.9)	158 (11.8)
	8-10	20 (23.5)	911 (72.7)	931 (69.6)
	All	85 (100)	1253 (100)	1338 (100)
Rest of New Zealand	1-4	36 (26.7)	373 (8.6)	409 (9.1)
	5-7	52 (38.5)	1480 (34.1)	1532 (34.2)
	8-10	47 (34.8)	2493 (57.4)	2540 (56.7)
	All	135 (100)	4346 (100)	4481 (100)
All decile areas*	1-4	92 (41.8)	566 (10.1)	658 (11.3)
	5-7	61 (27.7)	1629 (29.1)	1690 (29)
	8-10	67 (30.5)	3404 (60.8)	3471 (59.6)
	All	220 (100)	5599 (100)	5819 (100)

* Total in school regions with a decile excludes those from other areas or overseas.

The average scores in Mathematics with Calculus scores were 36% higher for non-Pacific students, while scores in Biology, Mathematics with Statistics and English scores were on average approximately 20% higher. All students had lower scores in Chemistry and Physics compared with all other subjects (Figure 1).

Figure 1. School leavers mean* weighted NCEA scores for all Pacific and non-Pacific students enrolled in the HSFY programme (2007–2011)



* Intervals represent 95% confidence intervals for the means.

A regression analysis of NCEA scores showed that Pacific students had a lower score for all subjects compared to all other ethnic groups after adjusting for a number of variables.

Table 4. Regression model coefficients for ethnicity and other variables on NCEA scores[§] for school leavers enrolled in the HSFY programme (2007–2011)

Variables	Coefficient (SE)					
	Biology	Chemistry	English	Maths with Calculus	Physics	Maths with Statistics
Intercept	39.06 (1.329)***	35.438 (1.585)***	35.904 (1.646)***	42.981 (2.121)***	35.765 (1.743)***	48.72 (1.583)***
Women	1.117 (0.54)*	-0.237 (0.636)ns	5.352 (0.695)***	-0.682 (0.828)ns	-3.522 (0.679)***	-0.93 (0.644)ns
Disability	-11.369 (2.968)*	-10.925 (3.462)*	-4.65 (4.605)ns	-2.018 (5.201)ns	-7.481 (3.91)ns	-10.821 (3.576)*
International student	-10.93 (2.048)***	-5.097 (2.335)*	-8.211 (3.555)*	0.654 (2.678)ns	-9.608 (2.503)*	-5.25 (2.204)*
European	4.874 (0.95)***	3.239 (1.128)*	3.941 (1.158)*	0.634 (1.528)ns	3.087 (1.259)*	2.274 (1.123)*
Maori	-2.017 (1.124)ns	-3.69 (1.322)*	-2.178 (1.368)ns	-4.804 (1.902)*	-4.483 (1.497)*	-3.152 (1.308)*
Pacific	-5.132 (1.525)*	-10.206 (1.806)***	-4.006 (1.819)*	-10.774 (2.602)***	-9.44 (2.105)***	-8.881 (1.831)***
Asian	3.263 (0.988)*	4.473 (1.173)*	0.931 (1.211)ns	8.373 (1.582)***	4.728 (1.303)*	6.357 (1.171)***
Decile	1.009 (0.12)***	1.095 (0.142)***	1.274 (0.151)***	0.88 (0.19)***	1.201 (0.158)***	1.409 (0.144)***
Number of observations	4031	4209	2686	2230	3467	3047

* indicates significance at the 0.05 level,** significance at the 0.01 level, *** indicates significance at the 0.001 level ns – not significant

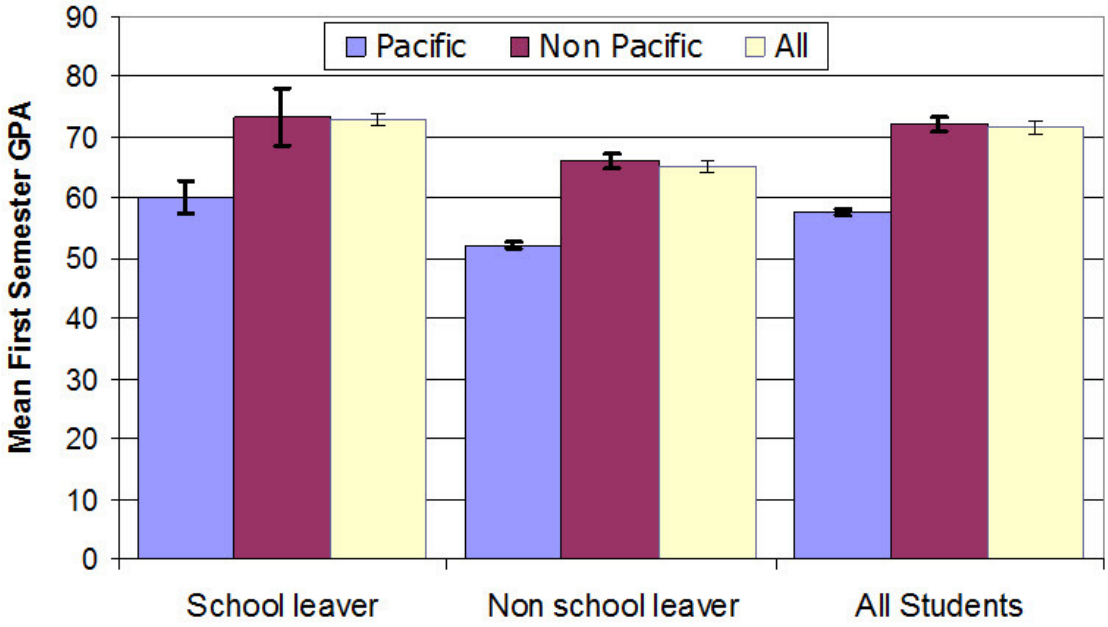
§ Students with 'zero scores' in a given subject were excluded from this analysis.

In particular Mathematics, Chemistry and Physics were the worst subjects for Pacific students. Women were more likely to do well in Biology and English but less likely to do well in Physics. Increased school decile ranking had a significant influence on all subjects (Table 4).

Approximately two out of three Pacific students entering HSFY were school leavers compared with 83% of non-Pacific students. Fewer (46%) Pacific students remained in the HSFY programme until the end of the year, compared to 68% of non-Pacific students (data not shown).

The mean first semester GPA of school leavers was higher than the mean GPA of non-school leavers, in both Pacific and non-Pacific groups. However, the mean GPA of Pacific students in the HSFY programme was lower compared to non-Pacific students for both school leavers and non school leavers (Figure 2).

Figure 2. Mean first semester GPA* in the HSFY programme by school leaver status, for all Pacific and non-Pacific students (2007-2011)



* Intervals represent 95% confidence intervals for the means.

Table 5 shows the regression analysis of HSFY scores on ethnicity and other related variables. Of all ethnicities, being Pacific had the greatest negative impact on mean first semester GPA scores. Factors that had a positive influence on first semester GPA scores were living in a residential college, enrolled in a school with a high decile rating and having high NCEA achievement.

Conversely, being female or an international student were negative influences on GPA scores.

Table 5. Regression model coefficients for ethnicity and other variables on first semester HSFY GPA scores for all students (2007–2011)

Variables	Coefficient (SE)
	First semester GPA
Constant	2.006 (0.158)***
Female	-0.351 (0.043)***
Disability affecting Study	-0.478 (0.258)ns
International Student	-0.878 (0.159)***
European	0.23 (0.077)*
Māori	-0.335 (0.091)*
Pacific	-0.714 (0.125)***
Asian	0.431 (0.08)***
Residential College	0.316 (0.057)***
NCEA or equivalent	1.827 (0.122)***
School decile	0.096 (0.01)***
Number of observations	4636

* indicates significance at the 0.05 level, ** indicates significance at the 0.01 level, *** indicates significance at the 0.001 level.

Discussion

A small but increasing number of Pacific students are enrolling in health sciences in tertiary education. Pacific students were more evenly distributed across the three school decile groups compared to non-Pacific students. Most students entered University immediately after high school (school leavers).

All Pacific groups except Fijians were under-represented in the health sciences compared to their percentage in the national population. The majority in this group were Fijian Indians. Most Pacific students (75%) were from the North Island, of which approximately one third were from Auckland.

Pacific students had lower NCEA scores and HSFY GPA compared to non-Pacific students. Chemistry, Physics and Mathematics were the worst subjects. School leavers performed better than non-school leavers.

Factors that had a significant association with academic performance in higher education were gender, NCEA results, school decile, accommodation, ethnicity, international status and having a disability.

Mismatches between population demographics and enrolment demographics at tertiary education institutions can occur for a variety of reasons.

Encouragingly, an increasing (though small) number of Pacific students are enrolling in health sciences in tertiary education. Given that the proportion of Pacific peoples in New Zealand is 7.7%, we might have expected 511 Pacific students to have enrolled in HSFY at Otago University over the study period of 2007–2011.

The actual enrolment of 275 represents a 46% shortfall based on ethnicity demographics. We have sought in this study to describe the cohort of Pacific students entering HSFY at Otago, and begin to assess factors that contribute to the success or otherwise of these students, with a view to increasing both the participation and success of Pacific students in health sciences.

The Pacific community in New Zealand is diverse. With the exception of Fijians (with the majority in this group being Fijian Indians), all Pacific groups were under-represented in HSFY relative to their proportion in the national population.

On average, student numbers in these groups were 59% of what would be expected if the cohort mirrored New Zealand society. Whilst this suggests that a Pacific-wide strategy is required to elevate student numbers, it may also be the case that ethnic-specific programmes are required, though the small numbers of students in these subgroups makes it difficult to identify sub-group specific performance factors in this study.

From an educational perspective, the Pacific students entering HSFY are likely to be amongst the highest achieving of their peer-group because of the high academic marks required for entering these restricted programmes. Despite this, their performance in key NCEA sciences was below that of their non-Pacific classmates, with the greatest discrepancies in Physics and Chemistry. This is important because our experience is that overcoming deficiencies in preparation for these subjects in HSFY is more difficult than for biological sciences.

Physics and Chemistry also comprise half of the first semester papers, and thus it is unsurprising that like performance in NCEA, Pacific students in the first semester of HSFY lags behind that of the non-Pacific cohort. There is a need also to highlight Mathematics with Calculus to prospective students, as this is of particular relevance for HSFY Physics.

In the context of increasing the proportion of Pacific participants in health professional training programmes, and by extension the health professional workforce, addressing these knowledge gaps is important. This is because selection into health professional programmes is in part based on academic performance, and progression into the second semester of HSFY is predicated on successful completion of the first semester programme. Thus, identifying factors associated with better performance in HSFY is an important step in increasing Pacific students' entry to health professional programmes.

We found that school decile (a measure of the socio-economic status of the communities in the catchment area of a school, with a decile of 1 indicating the highest proportion of low socio-economic communities) was a significant factor associated with both NCEA and HSFY performance.

Forty-two percent of Pacific students came from decile 1-4 schools (compared to 10% of non-Pacific students) and 30% came from decile 8-10 schools (compared to 61% of non-Pacific students).

Given the interrelationship between NCEA and HSFY performance and the differing socio-economic histories of Pacific and non-Pacific students, attending a low decile school is an important factor in, and arguably a barrier to success for Pacific students in the HSFY programme.

Whilst this analysis may indicate there is a "decile problem" that needs to be addressed rather than a "Pacific problem", we would contend that "Pacific solutions" need to be included in the efforts to improve outcomes.

Our regression analysis showed that being Pacific was second only to being an international student as a negative effector on school leaver performance in HSFY. Furthermore, in a separate analysis (data not shown) HSFY performance within any given decile band was worse for Pacific students than other ethnic groups.

There has been concern over the years about the poor performance of Pacific students in education institutions in New Zealand. To improve educational outcomes will not equate to a simple linear equation.

There is a need to understand better and respond appropriately to the context for Pacific peoples in Aotearoa, their migration history and lived realities in New Zealand, discrimination in the education system which are either overt or embedded in institutional processes and procedures, and have equal inclusion and participation of key stakeholders (includes Pacific staff, students, communities and families) in developing the pathway forward.[17,18,20,22]This will shift the focus from a deficit model within education institutions to a strength-based approach.[20,21]

What part can tertiary institutions play in contributing to the development of a Pacific solution? Whilst developing a pathway forward is likely to be multifactorial, not all parts of the solution will necessarily be difficult to implement. For example, our analysis shows that accommodation in a residential college has a positive effect on HSFY performance. This finding is supported by a previous study which found that living in residential colleges was a significant factor in the completion rates of students (in both actual and adjusted terms).[33]

The academic and social programmes offered by residential colleges have a key role in maintaining the previously discussed "engagement" that contributes to success in HSFY. Thus encouraging Pacific students to stay in a residential college, and assuring acceptance of Pacific students into colleges, coupled with Pacific accommodation scholarships where necessary, would be relatively easy to implement and likely be a well-placed investment.

Clearly, improving preparation from schools will improve HSFY performance. It may be that tertiary institutions need to be more proactive in the engagement of, and the provision of pathways for, Pacific students from schools into higher education. However, if policy deliberations deem this neither desirable nor achievable, tertiary institutions still have a role in maximising the success for Pacific students enrolled in the institution.

In addition to strengthening orientation programmes (e.g. the previously described POPO programme), other programmes could include early identification/prediction of Pacific students who are likely to require additional support prior to the start of the academic year. Targeted early advice and appropriate remedial and ongoing support to assist these students could contribute to improving Pacific educational outcomes, and ultimately Pacific participation in the health workforce.

Conclusion

Pacific students are under-represented in health sciences, and need better preparation from schools in science subjects. Pacific solutions are required to improve academic outcomes over and above mainstream policy solutions.

Every effort must be made to give Pacific students the opportunity to stay in a residential college especially in the first year at University. Further research is required into Pacific students' performance in low decile schools. This might identify emerging successful approaches that could be replicated elsewhere.

Tertiary institutions need earlier engagement with prospective Pacific students so they are well informed of the requirements, and to ensure they are appropriately prepared for study at the tertiary level. This is entirely consistent with the government's intention to support a "pipeline approach" where students can transition well from schools into higher education.

Competing interests: None identified.

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THE NEW ZEALAND MEDICAL JOURNAL
Journal of the New Zealand Medical Association

Why a shared care record is an official medical record

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Abstract

The literature describes three categories of health records: the Official Medical Records held by healthcare providers, Personal Health Records owned by patients, and—a possible in between case—the Shared Care Record. New complications and challenges arise with electronic storage of this latter class of record; for instance, an electronic shared care record may have multiple authors, which presents challenges regarding the roles and responsibilities for record-keeping.

This article discusses the definitions and implementations of official medical records, personal health records and shared care records. We also consider the case of a New Zealand pilot of developing and implementing a shared care record in the National Shared Care Planning Programme. The nature and purpose of an official medical record remains the same whether in paper or electronic form.

We maintain that a shared care record is an official medical record; it is not a personal health record that is owned and controlled by patients, although it is able to be viewed and interacted with by patients. A shared care record needs to meet the same criteria for medico-legal and ethical duties in the delivery of shared care as pertain to any official medical record.

Background: record-keeping in New Zealand

The management of patient records involves complex and contentious issues such as how to protect patient confidentiality,[1] who has ownership and access rights,[2, 3] as well as what are the roles and responsibilities involved in record-keeping.[4]

The New Zealand (NZ) Medical Council recommends that healthcare professionals should keep clear and accurate patient records reporting:

- Relevant clinical findings,
- Decisions made,
- Information given to patients, and
- Any drugs or other treatment prescribed.[5]

Standards regarding record-keeping are also published by local professional bodies such as the criteria of medical records by The Royal NZ College of General Practitioners (RNZCGP),[6] as well as the guidance on documentation by the Nursing Council of NZ[7] and by the Pharmacy Council of NZ.[8]

The *Health Information Privacy Code* 1994 (HIPC)[9] provides rules on handling health information regarding the purpose of data collection, rights of access and limits on disclosure.[10]

NZ District Health Boards (DHBs) and the Ministry of Health, as public offices, are also governed by the Public Records Act 2005 that stipulates two core record-keeping requirements:

- DHBs must create and maintain full and accurate records which must be accessible over time, and
- DHBs must obtain the authority of the Chief Archivist in order to dispose of public records.[11]

Accordingly, medical record-keeping under the current legal and ethical frameworks requires healthcare professionals to record what happened in patient care and to provide other healthcare providers the capacity, motivation and instruction to act if requested.

The official medical record—increasingly stored electronically

Health care information, including a patient's medical record, is increasingly written, stored and accessed electronically; according to a 2009 international survey, 97% of NZ general practices used electronic medical records.[12] These electronic records have been referred to by various terms in the literature, including computerised/ electronic medical records, electronic patient records, and electronic health records (EHRs). They are provider-centric medical records in a doctor's office or clinic;[13] and their purpose is similar to that of a paper-based medical record—as "a legal document and a collaboration and reminder tool."[14]

Such official medical records, whether on paper or electronic, are held and controlled by a single healthcare professional or one institution as the legal records of what happened in the care delivered by that healthcare professional or organisation.[14] It also serves the purposes of giving other healthcare providers a capacity, motivation and instruction to act when requested.

The nature and purpose of official medical records remain the same whether in the form of paper or electronic. As stated in *Cole's Medical Practice in New Zealand*, "the obligations around medical records exist regardless of the form in which they are kept."[10]

What is a personal health record?

As compared to the official medical record managed by healthcare providers, a personal health record is owned and personally supervised by the individual patient. Tang et al define a personal health record system as "a repository for patient data" with possible decision-support capabilities; personal health records "capture health data entered by individuals and provide information related to the care of those individuals."[15]

Patients can use personal health record to record details of screening, immunizations, and other health promotion or disease prevention information; and they have "the right to mask any information he/she does not want to be read"[16] by others. Electronic personal health records may take any of a variety of forms, including thumb drives or smart cards held by the patient, but frequently are accessed as Web sites, in which case they may be termed 'portals'.[17–19] Personal health records can be standalone, can

link to the EHRs of one or more providers (termed 'integrated') or to just one provider (termed 'tethered').[15]

A 2007 US study found that most organizations that provided an electronic personal health record have supported patient-centred functions such as to facilitate communication between clinicians and patients and to enable data access by proxies for minors or those with other impairments (e.g. Alzheimers).[20,21] Personal health record portals offer features such as to make appointments, view laboratory results, refill medications, and communicate with providers.[18,22–24]

The use of secure patient-doctor email messaging at Kaiser Permanente has been associated with improved effectiveness of care.[17] A further potentially transformative capability of personal health records is to allow patients to offer amendments to linked provider records, e.g. to add information (such as Alternative Medicine treatments they may be pursuing), or to correct errors or incomplete information.[25]

Shared care record—in-between an official medical record and a personal health record

The NZ National Health Information Technology (IT) Plan proposes a single shared care record as a structured and comprehensive record developed by the patient, their family/carer and their health professional(s), and which defines mutually agreed problems, goals, actions, timeframes and accountabilities for all those involved.[26]

Implementing this IT Plan, NZ is conducting a pilot of the National Shared Care Planning Programme (NSCPP), which has been unfolding in progressively larger phases of deployment in the Auckland area from 2011 to 2013, to investigate approaches to implementing shared care planning as an enabler to support long-term condition management.[27,28]

The underlying principle of the shared care record is to connect all members of the care team including the patient. Central to its purpose is that a shared care record provides information access to multiple users, including those on a multi-disciplinary care team that, for instance, consists of healthcare professionals at primary and secondary services (from multiple organisations) as well as the patient themselves.

A shared care record is not to be confused with an opt-in (or opt-out) shared repository. Such a repository is often referred to as a 'shared record' meaning that it has been agreed to be shared. One example of this is Testsafe in the northern region, which brings together diagnostic results, reports and medicines information from DHB facilities and community laboratories, as well as medications dispensed by community pharmacists, and then gives healthcare providers access to this information for patients under their care.[29]

The shared care record concept applies to a patient's medical record that is longitudinal, and is contributed to, validated and utilized by a multi-disciplinary group of healthcare professionals involved in the care of the individual. As a result, an electronic shared care record that supports shared access to common information can facilitate effective transfer of care,[6] a patient-centric longitudinal (womb to tomb) electronic record,[13] and continuing, efficient and quality integrated health care.[30, 31]

It aims to facilitate active partnership for care delivery and record-keeping among multiple healthcare professionals, as well as with the patient themselves. However, the anticipated health benefits of a shared care record such as improvements in the quality and safety of care, access to care, and cost effectiveness are yet to be confirmed.[32]

There are a variety of shared care record approaches internationally. One example is the Danish model of a national health portal to shared records, which exports patient data from legacy EHR systems and stores the data in a repository database, then provides access to other authorised parties, including patients, through a secure web browser.[33] The portal provides access to data such as biochemistry laboratory results, medication profiles and hospital discharge abstracts.[13]

The access control takes an approach that authorized healthcare professionals can look up any patient registered in the system with a prompt for a self-declaration of the access rule; the information retrieval will be logged in the system along with the declaration and this log can be monitored by the patient. The philosophy behind this approach is that "no patient should die because a system blocked access to vital data."[34]

Another example of shared care record development is Australia's "personally controlled electronic health record system (PCEHR)" as a centralized approach to a shared "health summary" record.[35] The Australasian College of Health Informatics (ACHI) has pointed out that it has not been made clear whether the PCEHR is a standalone concept or part of a total EHR, and whether the desired outcome is a collection of personal health information for consumer reference like a health diary/log, a system to empower the patient to control access to their personal health information as contributed to and collected by healthcare providers, or a system to benefit healthcare providers in their day-to-day care of patients.[36]

Furthermore, medicolegal experts have warned Australian GPs to "be wary of assuming responsibility" for creating and maintaining such summaries because of 1) the information volume, 2) significant liability due to inaccuracies in the shared summary, and 3) shared liability for clinical mismanagement by another provider who used inaccurate information in this summary.[37]

A shared care record is an official medical record—it is not a personal health record

A patient's health data can be stored in official medical records held by healthcare providers, personal health records owned by patients, and – as an in-between case – in shared care records. The distinction among these three categories involves issues such as funding models, governance, ownership and data stewardship.[13]

In the authors' opinion, a shared care record is still an official record and needs to meet the criteria for ethical and medico-legal duties of medical records. It is a dynamic, real-time record and can be used to direct care (not historical or just storage); and it is not a personal health record that is owned and controlled by patients. The management of all three categories of patient records involves complex and contentious issues, especially the complications regarding a shared care record.

The implementation of shared care records presents several challenges including standards and interoperability (a shared care record may source data from multiple systems), clinical responsibility (with multiple data contributors, whose duty is it to validate and integrate the record?), and risks from a patient restricting health professional access to all or part of the information.

The UK Royal College of GPs (RCGP) has classified shared electronic patient record systems into four categories:

- A read-only shared record following an act of publication,
- A read-only system giving access to an external EHR system,
- Read and write access to a single logical record or separate records, and
- A shared record dependent on messaging.[32]

The American Health Information Management Association (AHIMA) pointed out the importance of authentication (assigning responsibility for user entries, including creating, modifying and viewing data) and attestation (applying electronic signature to show authorship and legal responsibility for a particular unit of information).[38]

While all healthcare professionals are responsible for all aspects of the shared record's security, confidentiality, integrity and availability, a particular challenge is how security needs to extend to multi-authorship. As pointed out by the RCGP, in the shared care and shared record environment each healthcare professional has a responsibility to inform the practice of others involved in the care of the patient; subsequently, the governance rules need to be clear on who has responsibility for all content or parts thereof and for action based on that record content within and between organisations.[32]

A further dimension of complexity comes from patients' contributions to a shared care record and patient communications through shared care IT portals. This presents a challenge to balance patient empowerment with the professional and legislative requirements of an official medical record. The RCGP's 2010 guide to GPs regarding patient access to the EHR stated, "unsolicited additions may need to be treated with caution and should not be accepted as a proxy for medical assessment."[39]

In 2012, the National Health IT Board held a series of public and community seminars concerning the issues of consumer and clinician input when personal health information is shared electronically.[40] However, the degree of impact on clinical workflow, workload, financial models and clinical outcomes by the record validation and integration process remains unmeasured.

In addition, it remains a challenge how we design a health IT platform that will provide the capacity to interrogate and compare the large number of data points (including medical records and, in the foreseeable future, molecular data) for patients in the context of predictive, personalized, preventive and participatory (P4) medicine.[41]

Such data points will include official medical records, personal health records and shared care records. The value of personal health records in supporting self-management is evident particularly through supporting information access and facilitating communication with clinicians.

Although we believe it is important to distinguish shared care records from personal health records and to examine the three concepts (Shared Care Record, Personal Health Record, and Official Medical Record) separately, we also believe they will merge and augment each other in the future. In other words, a shared care record is the next generation official medical record that empowers the patients as well as the clinicians.

An urgent task, though, is to understand the implications of developing and implementing this shared care record concept. For instance, how do we foster confidence in healthcare professionals to use an iterative and real-time care planning/delivery process and to co-partner with the patient in this process?

A few challenges, with their sometimes complicated medicolegal implications, are the funding model, the shifting of workflow and the model of care, as well as the requirements for structural changes that will reward the benefits anticipated for shared care records. On the other hand, these challenges have not altered the nature and purpose of a shared care record, that is, to record what happened in a patient's care and to provide other care team stakeholders the capacity, motivation and instruction to act. In terms of professional responsibility, a shared care record, irrespective of the patient's participation in co-designing it, is still an official health record and must be managed as such.

Therefore, it must meet the criteria for medico-legal and ethical duties around record-keeping. And a patient will retain all the rights they have over the current paper record, including the right of access to information in their records, as this information belongs to the patient, whereas the record belongs to the provider.[5] Both clinicians and consumers need to be aware that a shared care record is part of the official medical records, with all the ramifications thereof—clinicians cannot ignore the shared care record; and patients need to take the shared care record seriously as well, and to embrace both the opportunities and responsibilities of their more empowered role.

Conclusion

It is the opinion of the authors that shared care records are the next generation official medical records; they are not personal health records. The underlying principle of the shared care record is to connect all members of the care team including the patient. A shared care record is a means to improve the accuracy and completeness of health information and to enable informed planning and decisions that are based on more complete data.

As such the fundamental nature and purpose of a shared care record is to record information, care decisions and actions in a single place so as to enable the capacity, motivation and instruction to act across more than a single provider or discipline dimension. This complexity does not exclude it from ensuring the same quality of security, confidentiality and accuracy that is expected with our existing provider-based systems, it does however pose challenges. The ongoing attempts worldwide, including the NSCPP pilot, will help address these challenges by expanding our experience with shared care and enhancing the shared care record by-product.

Competing interests: Nil.

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Acknowledgements: The NSCPP evaluation is commissioned by the National Health IT Board. We acknowledge the contribution of the Programme, the clinical and consumer leads, and the software vendor. We also thank Dr Eileen McKinlay for her advice on the manuscript.

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THE NEW ZEALAND MEDICAL JOURNAL
Journal of the New Zealand Medical Association

Rothia mucilaginosa: a rare cause of peritoneal dialysis-related peritonitis

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Abstract

We report a peritoneal dialysis-related peritonitis infection with *Rothia mucilaginosa* (*R. mucilaginosa*), a Gram-positive germ belonging to the normal flora of the human oral cavity. Successful treatment was achieved by intraperitoneal administration of cephazolin. This case report illustrates the potential virulence of *R. mucilaginosa* in patients on peritoneal dialysis. We propose to routinely perform specific staining and prolonged culturing techniques for unusual germs such as *R. mucilaginosa* in patients with peritoneal dialysis-related peritonitis

Case report

A 44-year-old Caucasian female with end-stage renal disease (ESRD), secondary to malignant hypertension on continuous cyclic peritoneal dialysis (PD) since October 2011, presented to our emergency department with pain abdomen, nausea and feeling unwell associated with cloudy dialysate drain without any fever.

The peritoneal fluid analysis revealed 1740 white cells/µL with 84% polymorphs and a negative Gram stain. She was treated empirically with cephazolin 1.5 g and ceftazidime 1.5 g intraperitoneally. Her specimen grew *Rothia* (*Stomatococcus*) *mucilaginosa* on enriched medium sensitive to first-generation cephalosporin and resistant to aminoglycosides.

Her ceftazidime was discontinued and she continued on intraperitoneal cephazolin for 2 weeks. She responded well to antibiotics with a progressive fall in PD fluid cell count, her white cell count reduced to 48 cells/µL with 20% polynucleotide and 80% mononucleated cells on the fourth day of treatment.

In the past she had two episodes of relapsing methicillin-resistant *Staphylococcus aureus*-related PD peritonitis needing removal of PD catheter and interim transfer to haemodialysis 1 year back

Discussion

Rothia mucilaginosa (*R. mucilaginosa*), formerly known as *Stomatococcus mucilaginosus*, is an encapsulated Gram-positive, coagulase-negative, encapsulated, non-sporing coccus found in pairs, clusters and tetrads and is considered as normal flora of the mouth and respiratory tract.

R. mucilaginosa colonies are sticky or mucoid; clear to white and adherent to the agar surface. The inability to grow in the presence of 5% NaCl distinguishes *R. mucilaginosa* from the members of the general staphylococcus and micrococcus species.[1,2]

R. mucilaginosa is considered as emerging opportunistic pathogens in patients with chronic immunosuppressive diseases. The bacterium has been implicated in serious infections such as septicaemia, endocarditis, meningitis, pneumonia, osteomyelitis and peritonitis mostly in neutropenic patients.[3–5]

The most common risk factors for infection are indwelling catheter, leukaemia, cancer, cardiac valvular disease, intravenous drug abuse and severe neutropenia. In non catheter-related bacteraemia, the portal of entry of *R. mucilaginosa* is usually the oral mucosa. *R. mucilaginosa* is generally susceptible to penicillin, ampicillin, cefotaxime, imipenem, rifampicin and glycopeptides.

In our patient, the portal of entry remains unclear, direct seeding into the peritoneal cavity via the periluminal route is generally the most common origin. *R. mucilaginosa* is part of the normal flora of the human oral cavity, a haematogenous seeding from the patient's mouth is another possibility, however our patient did not have any recent history of a dental work to definitely incriminate that aetiology.

Our patient has an ESRD with indwelling peritoneal dialysis catheter and previous history of multiple *Staphylococcus aureus*-related PD peritonitis needing catheter removal, we consider her to be at high risk for PD peritonitis related to atypical organisms like *Rothia* There are only two reported cases of PD-associated peritonitis due to *R. mucilaginosa* in the literature.[6–8] Infections with *R. mucilaginosa* are likely to be under-reported since it is not routinely included in the database of automated microbiologic identification systems.

Since a significant number >20% of the patients with PD-related peritonitis are culture negative, it emphasises the fact that special culture techniques should be used to isolate unusual causes of peritonitis, including bacteria fungi and mycoplasma for specific treatment and better outcomes in these unfortunate patient whose survival depends upon the well-functioning peritoneal cavity.[12]

Conclusion

Despite its low virulence, *Rothia* may be emerging as a pathogen of greater importance due to concurrent use of multiple antibiotics in patients with varying levels of immunocompromise. We propose to routinely perform specific staining and prolonged and specific culturing techniques for unusual germs such as *R. mucilaginosa in* patients with peritoneal dialysis-related peritonitis

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Amelanotic conjunctival melanoma

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Clinical—A 49-year-old lady presented with a 6-week history of a painless, enlarging lesion on her right eye. There were no visual symptoms nor any previous ocular surgery or trauma. Examination revealed a conjunctival mass measuring 4mm by 4.5mm by 3mm without any scleral attachment (Figures 1 and 2). The differential diagnosis included a foreign body-induced granuloma, pyogenic granuloma, conjunctival intraepithelial neoplasm, and an amelanotic melanoma.

Figure 1. Amelanotic conjunctival melanoma (front view)

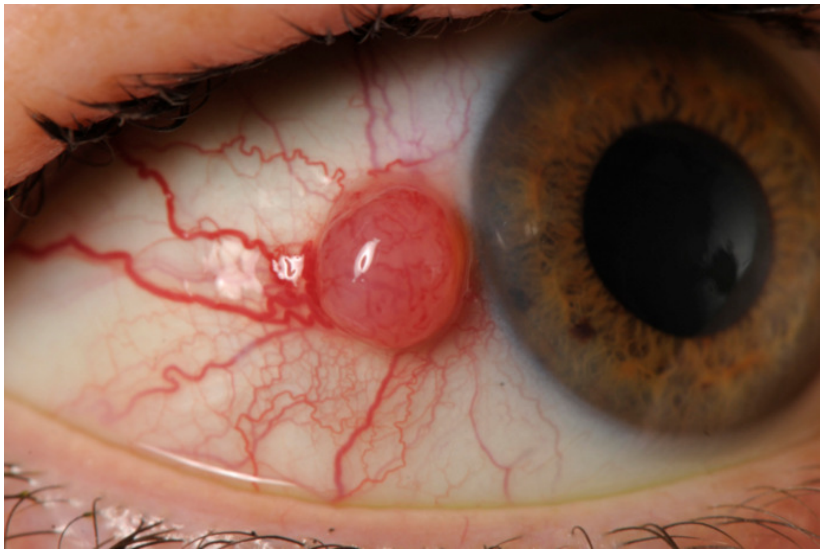

Figure 2. Amelanotic conjunctival melanoma (side view)

A wide local excision of the lesion with a conjunctival autograft was performed. Histological analysis revealed an amelanotic melanoma with clear surgical margins. A liver MRI scan did not show any metastasis.

After consultation with a specialist ocular oncology centre, no immediate adjuvant therapy was planned. However, the patient remains under close follow-up to detect any tumour recurrence.

Discussion—Conjunctival melanomas have an annual incidence of 0.2–0.5 per million in Western populations.[1] Although they are typically pigmented, amelanotic and minimally-pigmented conjunctival melanomas comprise up to 19% of cases.[2]

Notably, 9–25% of patients develop systemic metastasis and there is a significant mortality of 13–38% at 10 years.[2] As illustrated by this case, amelanotic conjunctival melanomas can mimic benign lesions and should be considered in cases of non-pigmented, rapidly growing conjunctival lesions.

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Is public meningococcal C vaccination the preferred value for money at cost-neutral?

Following the tragic death of our son Zachary Gravatt in 2009 of meningococcal septicaemia, the Coroner made several recommendations, which included:

> That the MOH reviews at the earliest opportunity the cost benefit of a publically funded vaccination programme for meningococcal C and undertakes appropriate consultation, including with consumers.

To the best of our knowledge no such cost benefit analysis has been undertaken.

We also note that Mills, Sexton and Carter reviewed in the *Journal* the success of the meningococcal C vaccination programme in Northland 2011 following an outbreak.[1] Dr Graham Mills wrote an editorial in the same edition concluding:

> Although public health units will continue to "fire fight" when clusters of serogroup C disease reach predefined "threshold" levels, has the time now come to include meningococcal C vaccine, a highly effective public health intervention, into New Zealand's immunisation schedule?
>
> The introduction of such a vaccine intio the vaccination schedule has been proven to be safe and effective with Australia introducing it into their schedule in 2003 following the highly effective experience of the UK in 1999. As a result they are both living with a much decreased burden of C disease than that which currently exists in New Zealand.

Since these publications, the responsibility for the New Zealand national immunisation schedule has passed to PHARMAC and there has been much discussion about the possible funding of additional vaccines in particular rotavirus and varicella.

A cost-effectiveness study conducted in 2002 and updated in 2006 of the UK meningococcal C vaccination campaign found that the cost per life year saved from the vaccination campaign was estimated to be as low as £2,760 per QALY (depending on the cost of the vaccine) using a vaccination strategy of first vaccination at 12 months with a catch-up vaccination at 18 years of age.[2]

A cost-effectiveness study from the Netherlands published in 2013 found that routine vaccination with conjugate meningococcal ACWY vaccine was cost saving.

We have conducted a preliminary cost-effectiveness analysis of routine meningococcal C vaccine in New Zealand based upon the published and peer-reviewed UK model above. This analysis estimates that a vaccination strategy of first vaccination at 12 months with a catch up vaccination at 18 years of age is cost-neutral at a vaccine cost of $25–40 per dose.

I have been unable to find any official mortality data for rotavirus in New Zealand. However, a specific cost-effectiveness study for New Zealand rotavirus vaccination by Milne found an adjusted cost per QALY of $46,092.[7]

	Base Case Estimates[a]	High Case Estimates[b]
Vaccine		
Efficacy	93%	93%
Coverage[g]	90%	100%
Invasive Meningococcal C Disease[5]		
mean cases per 100,000 population 2009-2012	0.60	1.05
average case fatality rate[c]	16.1	16.1
Disease Outcomes, proportion of patients[6]		
skin scarring	7.6	7.6
single amputation	1.9	1.9
multiple amputation	1.2	1.2
hearing loss	8.8	8.8
long-term neurological disability	2.1	2.1
Health Related QALY[6]		
skin scarring	1	1
single amputation	0.70	0.70
multiple amputations	0.61	0.61
hearing loss	0.72	0.72
long-term neurological disability	0.06	0.06
Unit cost of care and treatment parameters		
Rate of admission to hospital[5]	96.5	96.5
Rate of admission to intensive care[2]	14.9	14.9
Mean length of stay in intensive care (days)[2]	3.5	3.5
Mean length of stay hospital (days)[2]	7.9	7.9
Mean cost of intensive care per day[6]	$7,800	$7,800
Mean cost of general ward per day[6]	$2,700	$2,700
Deaths avoided	3.6	6.9
Mean Total Cost Hospitalisation	**$560,974**	**$1,004,688**
QALYs Saved[5]		
Life Years Saved[f]	224.3	434.4
single amputation	6.87	13.08
multiple amputations	5.64	10.74
hearing loss	29.70	56.53
long-term neurological disability	23.79	45.29
TOTAL QALYS Saved	**290.26**	**560.05**
Costs of Sequelae[2]		
Moderate ($1,000 per patient per year)[d]	$167,322	$286,660
Severe ($40,000 per patient per year)[e]	$2,064,155	$3,256,360
Annual Vaccination Cost		
Birth cohort NZ	62,000	62,000
Cost per dose Men C Conjugate Vaccine	$25	$40
Cost of Campaign (2 doses per infant)	$2,790,000	$4,464,000
Incremental Cost Per QALY	**-$8.44**	**-$149.46**

[a] average cases of confirmed meningococcal C 2009-2012

[c] weighted average CFR for different C strains

[d] single amputation and hearing loss

[e] multiple amputations and long-term neurological disability

[f] mean life expectancy 82.0 years

[g] assumes herd immunity

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Competing interests: Shareholder and Director in a vaccine supply company with interests in rotavirus and meningococcal virus vaccines.

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A hundred dollars a minute

Dr Monasterio's letter[1] to the *NZMJ* on health care in the United States invites comment. He tells us that he paid $US1000 for a 10-minute consultation in a hospital, and one hopes that he had insurance. His letter appears just days before a block on government spending in that country, and the row is about Barack Obama's healthcare plan, under which most people not covered by a plan, or by government assistance, will take out their own insurance, and, as I understand it, be penalised if they don't (See Wikipedia, "Obamacare")

> "An individual mandate requires all individuals not covered by an employer sponsored health plan, Medicaid, Medicare, or other public insurance programs (such as Tricare)to secure an approved private-insurance policy or pay a penalty, unless the applicable individual has a financial hardship or is a member of a recognized religious sect exempted by the Internal Revenue Service. The law includes subsidies to help people with low incomes comply with the mandate."

In New Zealand, indigent and less-than-indigent patients are flooding into "free" casualty departments, and a whole new race of publicly-funded Emergency Care doctors is arising to manage them.

When I entered general medical practice in Wellington in 1962, the fee directly charged to the patient was the equivalent of 50 cents. For an adult, it is now more like 50 dollars. That is 100 times what it was. People are ducking for cover, and the government, currently forking out well over 15 billion dollars per annum, is moving in to help them with money that it might, or might not, happen to have. At present rates of inflation, a fee charged at the rate of 100 dollars a minute for a consultation remains a none-too-distant, but not a desirable, prospect.

I am pleased to see somebody talking about what he describes as an exorbitant bill handed to him in an American hospital. I am less certain about Dr Monasterio's remarks about the supposed disadvantages of "competing private health insurance." It is currently paying for a lot of work.

Several members of my family were living in the United States nearly 20 years ago. Enrolled in group plans, they only ever made a modest co-payment for a consultation. Three confinements were paid for in full. The insolvency anxieties besetting government programmes were clear by that time. In 1995, I purchased in New York City a book by the presidential aspirant Ross Perot. Entitled *"Intensive Care; We Must Save Medicare and Medicaid Now",* it contains a graph labelled (correctly) "Runaway Costs of Medicare and Medicaid (in Billions)." Another book that I bought in New York is called *"Bankruptcy 1995 The Coming Collapse of America and How to Stop It."* Scary stuff.

Anecdotal experience is OK up to a point, but did Dr Monasterio go to one of the hospitals that do Medicare work for the government. If he did, then maybe the institution has to balance the books by taking a bit more off the casual patients.

With regard to the overall costs of medical care, I am not beguiled by the figures produced by *Time* magazine, nor by any other media comment. The situation is

complicated. If you want to know how difficult it is, go to Wikipedia, and search for "Medicare." You will find a good article and you will need 20 minutes to read it. The United States has its own way of doing things, and the doctors have to treat a lot of obese people.

I have sampled online the websites of a few hospitals in the USA. It's largely hype about how good they are. They are not so different from the websites of our own District Health Boards, where you will find the services on offer, and a plenitude of telephone numbers, but you will not find out how much it costs to run a department.

After struggling for an hour with the Capital and Coast DHB site, I did not find out what anyone was being paid—not even the Board members. Plainly, I need help. By way of diversion, I went to the Canterbury DHB website, and I typed in 'psychiatry'. I was conducted to "Psychosis (Totara House)." Just now I don't need Totara House, and I'm going back to quizzes and cross-word puzzles.

Most DHB websites are too dense, and they present financial information in a form that I can't manage. The CCDHB Annual Report for 2012 has a section headed "Where the Money Went," but I could not ascertain who did what, and for what emolument or remuneration. The figures supplied, all 12 of them, added up to $897 million dollars. Elsewhere I think I found a figure of $846 million, but I can't be bothered doing it all again.

What we do know is that health spending is open-ended, budgets are getting bigger, and some District Health Boards seem to struggle on from one annual deficit to the next.

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Medication safety and quality improvement in PGY1 teaching

Background—We read with interest and admiration the recent letter in the *NZMJ*[1] which demonstrates the value of engaging junior medical staff actively in quality and safety practices and activities. The following describes our recent experience at Waitemata District Health Board (WDHB)

Prescribing is the commonest therapeutic intervention. It is also a major source of inadvertent harm for hospital patients. Medication errors and adverse drug events affect an unacceptable number of New Zealanders each year, with resultant permanent disability or death.[2]

WDHB has included medication safety as a consistent theme running through the PGY1 education programme. The aim has been to demonstrate and profile the role of the quality management team in promoting safe practice.

Improving prescribing practice is part of a nationwide patient safety agenda. We have profiled patient and medication safety, utilising the skills of our quality teams and pharmacists by including them in formal teaching and clinical learning thus creating opportunities for this to happen.

Intervention—Our goal was to promote collaboration between physicians and pharmacists and to role model high performance interprofessional teams in action, emphasising team work as one of the most effective approach's to ensure safe patient care.

Our quality pharmacist was co-opted onto the medical education team to incorporate and weave medication safety into the PGY1 programme. The two core goals were:

1. To promote and support workplace collaborative practice between pharmacists and PGY1 doctors
2. To promote safe prescribing in order to reduce the risk of prescribing and administration errors

The programme included interactive, case based activities during orientation and e-Learning modules on prescribing and medication safety in concert with formal teaching presentations.

The quality pharmacist contributed to House Officer teaching twice a month and was regularly present to contribute and answer questions. This included attending case presentations by junior doctors and responding to medication related questions as they arose.

Ward pharmacists supported these new prescribers on the ward and contributed to the formal teaching programme by delivering content from their specialist area.

The following are the key features of the year-long programme

- A blended learning approach utilised available internally developed e-learning prescribing modules as part of the programme, linked to consultant medical teaching sessions. We included pharmacist input into the teaching programme (often alongside other health professionals such as nurses and therapists) ensuring that collaborative practice was consistently modelled and utilised in teaching.
- Team pharmacists on the ward were included in the PGY1 programme to highlight their skills and encourage active on going engagement between the two professions on the ward. We linked teaching and practice in meaningful ways that engaged PGY1's actively in the pursuit of medication safety by problem solving and discussion on the wards
- Collaboration between pharmacists, medical staff and the quality team in the teaching was demonstrated.The management of medication safety incidents as they occurred was addressed. After reported events and near misses we provided feedback to the group on a monthly basis on local and national errors and/or any patient complaints as they occurred through the inclusion of feedback sessions from the broader quality team as a monthly scheduled session during PGY1/2 teaching.

Outcomes—We are currently evaluating this programme. Survey results to date show that PGY1s appreciate and value the programme, enjoy teaching offered by the pharmacists and self-report an increased awareness of prescribing and medication safety. From August we started collecting data to explore the impact on the prescribing practice of PGY1s and have undertaken a survey of PGY1 doctors to explore attitudes of this group to working with pharmacists.

Conclusion—The programme is successful and has enhanced interprofessional understanding (something shown by the WHO to enhance patient safety). This has been achieved by role modelling, dialogue across disciplines, collaboration both in practice and in formal teaching forums.

Prescribing is a challenging area of practice for PGY1 doctors. At WDHB we made a commitment to include medication safety as a thread running through the programme. Working as a team (Pharmacy and Medical Education) we used workplace and interprofessional learning theory to inform this creative project and successful project.

Acknowledgements: We thank Dr Penny Andrews (Clinical Leader Quality) for her contribution to monthly quality teaching forums for RMOs.

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Beating the blues—the association between fruit and vegetable intake and improved mood

Several recent studies have indicated that increased consumption of fruit and vegetables is associated with enhanced mood and psychological wellbeing and decreased depression.[1–3]

Fruit and vegetables are rich in essential micronutrients, many of which have been associated with improved mood via a number of proposed mechanisms.[4,5] Thus, it is plausible that increased consumption of micronutrient-rich fruit and vegetables might enhance mood, particularly in individuals with normally low dietary intakes.

Fruit and vegetables are particularly rich in vitamin C and β-carotene (pro-vitamin A) and circulating levels of these antioxidants have been shown to correlate with fruit and vegetable consumption.[6]

Vitamin C, being water soluble, is readily excreted and is an indicator for recent fruit and vegetable intake, whereas the lipid soluble carotenoids are retained by the body and are indicators for longer term fruit and vegetable intake. We have measured skin carotenoid status in several groups of individuals using a non-invasive biophotonic scanner. Scores of <10 to 25 indicate low fruit and vegetable consumption, scores of 25 to 35 moderate consumption and scores of 35 to 50+ indicate high consumption.

We screened a group of 134 young non-smoking males (primarily graduate students aged ~18-35 years) and found a mean skin carotenoid score of 28 ± 9. We also measured the skin carotenoid status of 24 laboratory personnel, both male and female (aged ~20-70 years) and found a mean score of 31 ± 9. There was no significant difference between men and women ($P = 0.894$) and their scores did not differ significantly from the group of male students ($P = 0.238$), even though the latter group are typically associated with less than ideal diets.

Of interest, however, we also measured 35 individuals who attended a Hauora Māori Day in Christchurch (2011). This group consisted of mixed genders, ages and ethnicity, although predominantly Māori. We found a skin carotenoid score of 24 ± 12, which was significantly lower than both the male students ($P = 0.009$) and laboratory personnel ($P = 0.016$).

Depressive disorders are a major health problem in New Zealand and appear to be more common in Māori than non- Māori.[7] Circulating carotenoids have been associated with enhanced optimism and decreased depression.[8,9] and are likely an indicator of overall fruit and vegetable intake.[6]

Consumption of fruit and vegetables is closely associated with socioeconomic status, with fruit and vegetable consumption decreasing with increasing neighbourhood deprivation.[10] Key findings of the 2008/09 New Zealand Adult Nutrition Survey indicated that more than one third of New Zealanders consumed less than the then recommended five or more half-cup servings of fruit and vegetables per day.[10]

However, now that the USDA has updated its dietary intake recommendations to nine half-cup servings of fruit and vegetables for adults, significantly more members of the general public will be consuming less than the new recommendations. The new recommendations are significantly higher than the familiar five plus a day, and a difficult target for many people to meet.

Since younger age groups (i.e. 15–30 years) consume significantly less β-carotene-containing foods than older age groups,[10] this suggests that they are the most appropriate target group for messages encouraging an increase in fruit and vegetable consumption, especially as a way to combat the increasing prevalence of depression and to improve overall mood.

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Vitamin C supplementation and kidney stone risk

In a recent research letter published in *JAMA Internal Medicine*,[1] Thomas and coworkers suggest that high-dose vitamin C supplements be avoided due to a two-fold increased risk of kidney stones observed in their cohort of 23,355 Swedish men. This study has been widely reported in the medical literature,[2,3] however, we would like to present a critique of their findings and emphasise that the findings relate to supplemental vitamin C and not dietary intake of the vitamin.

Concerns for the safety of vitamin C arise from one of its metabolites, oxalate, which is known to be excreted in the urine, although estimates of how much and at what doses of vitamin C have been controversial. A more recent metabolic trial demonstrated small increases of 20 to 33% in urinary oxalate in both normal individuals and kidney stone formers upon supplementation with 2 grams of vitamin C per day, although oxalate levels remained within the normal range.[4]

Because the majority of kidney stones are composed of calcium oxalate, and urinary oxalate is a risk factor for such stones, a number of cohort studies have sought to investigate the association between kidney stone risk and vitamin C intake or supplement use, with differing results.[5-7]

In women, no such relationship has been found.[5] The latest study[1] followed a group of Swedish men with no previous history of kidney stones for up to 12 years, having estimated vitamin C supplement use (along with frequency of use) only at baseline by self-reported questionnaire. The questionnaire was validated; however, with a positive predictive value of 74% for vitamin C use, at least one in four cases are likely to be misclassified at baseline, and even more misclassification is probable given that exposure status was not updated over the 12 year follow up. Additionally, there were only 31 cases of kidney stones in the vitamin C-supplementing group suggesting there is little room for such error.

The study design is observational and, while the authors account for confounders such as dietary intake of vitamin C, calcium and magnesium, and tea and coffee intake, they ignore other prominent risk factors such as dehydration and diuretic use.

Interestingly, randomised control trials, which avoid the issue of confounding, have shown no suggestion of increased risk of kidney stones with vitamin C supplementation even at high doses and for extended periods of time.[8] Additionally, it is important to highlight that the findings in regards to supplemental vitamin C should not be translated to dietary intake of the vitamin given the demonstrated protective effects of other components of the diet such as potassium[7] and also the likely dosage of vitamin C consumed in the study.

The authors have not measured dosage, but state that most of their participants are likely to be consuming 1000 mg tablets. This is significantly higher than the median daily dietary intake of 99 mg for the New Zealand population.

Finally, the authors did not measure plasma levels of vitamin C; intakes whether supplementary or dietary are not necessarily a good reflection of plasma levels, and it is plasma levels that are likely to be a better indicator for kidney stone risk.[9]

Lastly, we would like to point out that the statement "vitamin C supplementation has no benefits" is misleading. Whilst the original randomised control trials found no benefits of supplementation, many of those people would have gained no increase in vitamin C status due to their already saturating levels, and as such further well-conducted studies are required before deciding on the health effects of vitamin C.[10]

We believe the association between ascorbate supplementation and increased risk of kidney stone formation remains controversial, and at this stage should only be of concern to those individuals with a history of kidney stones.

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Updating New Zealand's national smokefree law to reduce anomalies and improve health protection

A Judicial Review[1] has identified problems with how "open areas" of buildings (where smoking is permitted in New Zealand) are determined in practice. In this letter we discuss the status of the New Zealand's national smokefree law and the need for an upgrade and expansion of this law.

This Judicial Review was the outcome of an application for a review of the instrument used to determine allowable smoking areas in licenced premises, that is, the "open area calculator".[2] The application was by a group of non-governmental organisations including the Cancer Society.[3] This application cited the case of the SkyCity Casino's Diamond Lounge, which had been given an approved "open area" status by Auckland Regional Health. The process they used for the approval depended on this calculator.[1]

The application for review noted that the calculator was based on the possible flow of air in a room, and was at odds with the Smoke-free Environments Act.[4] The view of these organisations equated with New Zealand based research evidence around very enclosed "open area" settings at bars and pubs, in which the measured air pollution ($PM_{2.5}$) from tobacco smoke can be quite high.[5,6] This air pollution from smoking in such "open areas" also drifts into indoor areas—exposing even more people to this hazard (as per other New Zealand research[7–9]).

The "open area calculator"[2] that was consider in this Judicial Review is routinely used by Smoke-free Enforcement Officers around the country to assess licensed premises. It is relatively complex and uses information about the total floor area, openings and windows, side and ceiling measurements.

The outcome of the Judicial Review[1] was that this calculator was inconsistent with the definition of an "open area" under the Smoke-free Environments Act. As a result it is possible that a new calculator will have to be designed by the Ministry of Health so that it produces results that are more consistent with the intent of the current law. However, such re-design may not be worth the effort and might even lead to further legal processes. This is because the Smoke-free Environments Act appears to us to have an in-built contradiction between its purpose and the definition of "internal areas".

The purpose of the relevant section of the Act on smokefree places (s.4a) is "to prevent the detrimental effect of other people's smoking" in indoor workplaces and public places.[4] The definition of an "internal area" stipulates an area that is "completely or substantially enclosed" (Section 2). The words "substantially enclosed" mean that according to this part of the Act, smoking can be allowed in *partly* enclosed areas. This means that, in contradiction to the purpose of the Act, the effects from smoking in partly enclosed places *cannot* be prevented, since there is no known safe level of tobacco smoke (a proven carcinogen[10]).

We suggest that the optimal response to this situation is to take the opportunity to upgrade the law and expand it, so that it better resembles state-of-the-art international practice. Such new legislation could:

- Require a simple and highly transparent approach to smokefree outdoor areas at restaurants and pubs/bars. That is, all areas within 10 metres from all built structures that the public use are required to be smokefree. This is somewhat like the 20 and 25 foot laws that appears to work well in parts of the USA (e.g. in Washington State, 25 feet from entrances, exits, windows that open, and ventilation intakes).[11]
- Include a smokefree car requirement for when children (<16 years) are present. This approach has public support in New Zealand[12] and is long overdue in this country when compared to Australia, Canada and various US states.
- Include smokefree children's playgrounds, parks and sports fields nationwide (to bring the country up-to-speed with developments in places like Auckland City[13]).
- Include smokefree transportation settings – all train platforms and 10 metres from all bus stop markings. Smoking in such settings has been identified as problematic in New Zealand research—e.g. in terms of air quality[14] and perceived health and nuisance impacts.[15]

Achieving all of these measures would bring the country closer to world-leading jurisdictions in North America and various Australian states. A new law requiring smokefree areas within 10 metres of "built structures that the public use" should also result in a situation that is simpler and more comprehensible than the present "substantially enclosed" law. That is, smokers will more readily understand the law, and members of the public can know when to report situations where the law is being breached.

A new law would also provide the opportunity to make the law fully consistent with the Government's Smokefree Nation Goal for 2025.[16] As such it could incorporate major endgame strategies such as regular effective annual tax increases through to the achievement of the goal, and the legal capacity to phase-down the number of retail outlets for tobacco products.

In summary, civil society is to be congratulated for highlighting the deficiency in the current national smokefree law. We now need an upgraded law that better protects New Zealanders from secondhand smoke and is a strong foundation for achieving the Government's 2025 goal.

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Persisting mobile phone use while driving and possible solutions for New Zealand

In New Zealand the use of hand-held phones while driving was prohibited in 2009, but 'hands-free' phones are still permitted. We recently presented the results of an observational study into mobile phone among Wellington drivers at a conference (for details see the proceedings[1]). The main findings were that out of 8335 cars systematically observed at traffic lights and 9520 cars in moving traffic (each at three different Wellington locations), the use of mobile phones was 1.87% (95%CI: 1.60-2.18) and 1.34% (95%CI: 1.13-1.59) respectively. As well as the significantly higher usage at traffic lights versus in moving traffic, other notable findings were:

- Younger drivers (<25 years) were significantly more likely to use their mobile phones while driving compared to older drivers (e.g., in moving traffic, risk ratio = 2.91, 95%CI=2.00–4.22).
- Overall, it was much more common for drivers to use their phones in a "non-ear position" as for "texting" (at 77.8%), than next to their ear. This was also significantly higher among younger drivers compared to older drivers.

It is difficult to interpret our Wellington results for 2012, relative to a pre-law study published in 2006 for Auckland[2] which reported 3.9% of drivers using mobile phones while driving. Not only might there be differences by location, there were various differences in study methods. Nevertheless, the lower usage level found in our Wellington study could reflect some partial successful effect of the 2009 law that banned the use of hand-held phones while driving. Although international data are somewhat mixed as to how effective such laws are in the long-term (e.g. for the UK[3] and New York[4 5]), it does appear that they can be successful, especially if there is stringent enforcement (e.g. Washington DC[6,7]).

Nevertheless, the current situation in New Zealand is still problematic, given that the science around the hazard of any mobile phone use while driving keeps getting stronger (e.g. Canadian research[8]). Furthermore, driver distraction associated with mobile phone use may be becoming more hazardous, with greater ownership of attention-demanding smartphones and other nomadic devices.

So what should be done? Continuing with New Zealand Government funded mass media campaigns around the hazard may help (as run during 2012), but a careful analysis of the message around driver distraction and the cost-effectiveness data on these campaigns should be undertaken. At the same time, we believe other options involving some combination of technological and legal changes should be explored as per the suggestions below:

- All new cars imported into New Zealand (e.g. from the year 2018) might be required to have technology that automatically stops mobile phones from ringing when the vehicle is in motion (along the lines discussed by others[9]).

- All new mobile phones permitted on the New Zealand market from 2018, could be required to automatically disable themselves from working when their internal GPS sensor identifies movement (albeit with an exemption for phoning the national emergency number). This option could work alongside the "smart car" option above, or may obviate its need. It could potentially help prevent injuries among people who use electronic devices while cycling (for whom injury risks appear elevated[10]).
- Introduce new regulations that increase fines and/or other penalties for infringements of the existing law. International evidence has shown this to have a strong deterrent effect and is key to maintaining the effectiveness of laws prohibiting drivers' use of mobile phones. One option includes mobile phone confiscation from those using them while driving.
- Address the residual need to prohibit hands-free phones in cars given the incontrovertible evidence, collected internationally[7] and in New Zealand,[11] that these are also highly distracting for drivers. Legislation treating hands-free and hand-held mobile phones uniformly will also add a degree of clarity around the reason for the prohibition (driver distraction rather than manual interference) in public education campaigns, which may ultimately be needed to address the proliferation of other in-car distractions. Exemptions for commercial drivers and emergency workers could still be permitted, once drivers' demonstrate appropriate knowledge around hazard mitigation (e.g. how to keep to short sentences when conversing).

There should be public discussions around these various options to potentially improve them and to identify even more effective and cost-effective solutions. Nevertheless, given that passing a law is not particularly expensive in New Zealand (e.g. typically at NZ$3.5 million[12 13]; 95%UI: 2.0–6.2 million), it would not take long for such a new law to be cheaper than one or two mass media campaigns. But the new law would probably also be much more cost-effective than media campaigns if its effects lasted many decades into the future. So while the New Zealand Government was relatively slow to introduce the 2009 law, let's hope for better progress with the next one. Perhaps it is time for the right mix of "smartphones", "smart cars" and "smart politicians"?

Acknowledgements: We thank Group B1 2012 medical students at the University of Otago, Wellington, who did the field work and contributed to the write-up of this observational study: Christopher J Drury, Zeid Abussuud, Georgina Allison, Ekta. Bhindi, Jessie Bustard, Joshua Chamberlain, Midori Fujino, Hamish Green, Leslie Harding, Ruth Ironside, Laura Judge, Kathleen Kerse, Emma Laing and Benjamin Liu.

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Extracts from current medical literature: Iodine as an antiseptic

Excerpt published in 1911 August;10(39):52–53.

Major F. T. Woodbury, Med. Corps, U.S. Army (New York Med. Jour.; Dec. 3, p. 1105J).—The writer believes that iodine is the long-desired ideal antiseptic. It is cheap, easily obtained, portable in small bulk, efficient in high dilution, does not damage tissue, even when its vitality has been reduced by traumatism or infection, and though it has great powers of tissue penetration the writer has not yet seen a case of poisoning even when it is mopped in full strength on the peritoneum and in the parturient uterus.

It can be used to disinfect the area of operation without previous preparation; to sterilize instruments, suture material, dressings, and the hands of the surgeon, during the time that the patient is going under the anaesthetic. But the writer prefers to boil his instruments when he can, as the continued use of iodine tarnishes and blunts the cutting edges, though the same in a lesser degree holds for the soda solution.

The writer uses iodine entirely to prepare his hands and it rarely causes irritation. It can be removed with boiled or raw starch, ammonia water, aromatic spirit of ammonia, hydrogen peroxide, Fowler's solution, or ether. If long periods of operating are expected, it is well to dip the hands in iodine and immediately decolorize with ammonia; rubber finger cots or rubber gloves; may be slipped on, and then redipped in the iodine. This is merely to protect the operator's hands from being dyed a deep brown, which is almost impossible to get rid of if the tincture is applied everyone or two days.

The solution of one teaspoonful of the tincture to the quart of normal saline solution ('007 per cent.) is most efficacious for irrigation in all inflammatory and catarrhal conditions of mucous membrane. It can be used for conjunctivitis with prompt improvement.

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Proceedings of the Annual Meeting of the Waikato Clinical School, September 2013

Comparison of referral rates and diagnosis of axial spondyloarthritis before and after an ankylosing spondylitis public awareness campaign

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Objectives To measure the effect of a national ankylosing spondylitis (AS) public awareness campaign on numbers of referrals for suspected AS and numbers of cases diagnosed with axial spondyloarthritis (SpA) in three New Zealand rheumatology services.

Methods A television and newspaper advertising campaign was conducted by Arthritis New Zealand in 2011 to raise public awareness of AS. The reach of the campaign was measured using target audience rating point (TARP) analysis. A retrospective analysis was made of referrals received by the rheumatology services based in three centres in the three months before the campaign started and the three months after the campaign ended. Total number of referrals received, number of referrals for suspected AS, number of referrals resulting in a diagnosis of axial SpA, and age and gender of cases were recorded.

Results Target audience rating point analysis indicated that the awareness campaign would have been viewed by 82% of young men between the ages of 18 and 40, and 88% of all people between the ages of 20 and 54. In the three months after the awareness campaign there was a significant increase (54 v 88, 63%, p = 0.0056) in referrals for suspected AS compared with the three months before the campaign. Referrals for other conditions remained constant over the same period. The number of referrals resulting in a diagnosis of axial SpA also increased (27 v 44, 63%, p = 0.0576). The mean ages of patients referred and of those diagnosed with axial SpA did not change before and after the campaign. The male:female ratio was 1:1 among referrals for suspected AS and 2:1 in referrals diagnosed with axial SpA, before and after the campaign.

Conclusion The Arthritis New Zealand AS public awareness campaign was associated with a significant increase in referrals to rheumatology services for suspected AS and increase in the diagnosis of axial SpA at the first clinic visit.

Impact of ethnicity on cardiac admission with thyrotoxicosis

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Thyrotoxicosis is one of the most common endocrine disorders with a local incidence of 0.2%[1]. The majority of patients with thyrotoxicosis have either Graves' disease (autoimmune thyrotoxicosis due to the presence of antibodies which stimulate the TSH receptor) or a toxic multinodular goitre (TMNG). Cardiac complications of thyrotoxicosis commonly include ischaemia, dysrhythmia and congestive heart failure

(CHF)[2]. Māori are over-represented in cardiac admissions[3], and an Australian group have raised the question of a relationship between Māori ethnicity and cardiac admissions[3]. However the relationship between thyrotoxicosis and cardiac admission has not been assessed in Aotearoa.

We carried out a retrospective review of all patients admitted to Waikato Hospital with cardiac complications of thyrotoxicosis between January 2005 and August 2012. Māori were over-represented within the group (38%) when compared to DHB population (18%). Māori patients were 12 years younger (66yrs vs 54yrs; p=0.01), were more likely to be admitted with CHF (21.7% vs 57.1%; p=0.01) and had an association with higher T4 levels (p=0.022).

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Impacts on couples of prostate cancer diagnosis & treatment

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Background Carcinoma of the Prostate (CaP) is common with the diagnosis and treatment affecting not only the man but also his partner. Problems for couples with CaP have been outlined in clinical reports but seldom formally studied. Women have been reported to be as affected by some psychological problems as their CaP partner.

Aim To investigate the psychosocial impact of CaP on couples.

Method This cross-sectional study investigated psychological and sexual function in a sample of 54 heterosexual couples, 2-6 years following CaP diagnosis and treatment. Couples completed the HADS, a stress scale, DAS, SIS and the FSFI-SF or IIEF-SF; couple's scores were correlated, and comparison made with population standards to understand the impact of CaP on couples.

Results Most couples reported that chances of sexual problems were 'somewhat' or 'very important' in choosing a treatment option for their CaP. Psychological distress (HADS) was significant in 30% of the women and 15% of men in the study. Stress was at higher levels than in the normal population. Despite this most couples were well-adjusted with 87-90% reporting relationships as 'happy', 'very happy', extremely happy, or 'perfect'. Women reported social intimacy levels comparable women presenting for marital therapy. 50% of women experienced sexual dysfunction and 21% were sexually dissatisfied. Of the men who completed IIEF-SF, 85% had erectile problems. Women's psychological stress/distress correlated with their partner's sexual function scores.

Conclusion The impact of CaP and its various treatments affects partners as much as the men with the diagnosis. Further studies of the impact of CaP on partners are required to develop suitable treatment options for the couple affected by this disease.

Intestinal bacterial colonisation patterns in very low birth weight preterm infants

Thirayan V, Mansell C, Nair A

Background Preterm, very low birth weight (VLBW <1500 g) infants often remain hospitalised in neonatal intensive care units for prolonged periods and are exposed to a variety of factors including antibiotics and formula feeds which may affect the composition of the intestinal microbiota compared to their term born peers. Growth, development and gut related morbidity in VLBW infants might be partly related to an altered intestinal bacterial colonisation pattern. In full term breast-fed infants *Bifidobacterium* spp are numerically dominant, which is presumed to be beneficial, while *Clostridium* spp, *Bacteroides* spp and facultative anaerobes such as *Enterobacteriaceae* and enterococci are found in relatively lower numbers. Recent reports indicate that administering probiotics to VLBW babies can potentially alter their intestinal colonisation pattern to achieve similar patterns to breast-fed full term babies. This may in turn help reduce necrotising enterocolitis, infection and mortality rates in the short term and may have long term benefits in the form of better growth, feed tolerance and reduction in allergy in these babies.

Type of Study Prospective observational study

Objective To characterise the bacterial colonisation pattern in serially collected stool samples from VLBW infants within the first few weeks of life to help define the natural history of succession in these babies at Waikato Hospital, in the absence of probiotic therapy.

Patients & Methods Serial stool specimens from VLBW babies were collected at approximately 1-week intervals postnatally for the study duration of 10 weeks. Pure cultures of aerobic and anaerobic isolates were identified by Matrix-assisted laser desorption/ionisation-time of flight mass spectrometry (MALDI-TOF). Bacterial diversity was assessed by numbers of distinct species identified and numbers were quantitatively expressed in CFU/g for analysis. Data were analysed by week of infant age, relative to patient demographics, antibiotic exposure and feeding patterns.

Results The average number of species per VLBW infant (n=11) increased from 2 to 9.7 between week 1 and 10 after delivery, respectively. The average number of species of skin organisms per infant decreased from 4 to 1.7; *Enterobactericeae* increased from 1.5 to 3.7; enteric streptococci from 1.5 to 3.7 and anaerobes increased from 0 to 2, only between week 2 and 10.

243 species were identified across the first 10 weeks of life. *Staphylococcus epidermidis* (13%), *Enterococcus faecalis* (9%), *Klebsiella oxytoca* (9%) and *Escherichia coli* (6%) were the most frequently isolated species. Beneficial species, included *Bifidobacterium breve* (0.8%), *dentium* (0.8%) and *longum* (0.8%) and *Lactobacillus paracasei* (0.4%), were found only between week 4 and 8. *Micrococcus luteus* and *Bacillus cereus* were found only in week 1. The most frequently identified

bacterial organisms in week 5 were *S. epidermidis* (12%), *E. faecalis* (11%), *K. oxytoca* (7%), *S. aureus* (5%), *E. coli* (5%), *K. pneumonia* (5%) and *Citrobacter freundii* (4%); and in week 10 were *C. freundii* (10%), *E. coli* (10%), *K. oxytoca* (10%), *E. faecalis* (10%) and *Veillonella parvula* (10%).

Average CFU/ml/infant increased between week 1 and 10 from 2 X 10^6 to 3.6 X 10^{11}. *K. oxytoca* was the most numerous species (94% of all cfu/ml). In week 5, the most numerous species was *Klebsiella pneumonia* (36%), *B. breve* (12%), *C. freundii* (7%) and *E. faecalis* (7%); and in week 10, the most numerous species was *K. oxytoca* (86%) and *S. aureus* (11%). Beneficial organisms accounted for 0.3% of all growth across the study.

Conclusions Breast-fed VLBW infants are colonised in succession. As the gut develops, skin and environmental organisms decrease and the numbers of *Enterobactericeae*, enteric streptococci and anaerobes increase. *S. epidermidis* was the most frequently isolated species and *K. oxytoca* was the most numerous. Lactobacillus and Bifidobacterium species were infrequently isolated. A follow up study, using the same methodology, is planned to assess the effect of introduction of probiotic therapy from March 2013 at the Waikato Neonatal Intensive Care Unit.

Characteristics of men diagnosed with prostate cancer in New Zealand general practice

Obertová Z, Hodgson F, Holmes M, Brown C, Lawrenson R

Objective to identify new cases of prostate cancer in a cohort of men enrolled in general practices in the Midlands Cancer Network region.

Methods The study population included 35,734 men aged 40+ years enrolled in 31 general practices in the Midland Cancer Network region. Computerised practice records, New Zealand Cancer Registry and local laboratory data were searched for new diagnoses of prostate cancer in men who had a prostate-specific antigen (PSA) test between 1 January and 31 December 2010. Biopsy information was obtained from local laboratories and cross-referenced with practice records. PSA level at referral, Gleason sum and clinical stage were noted when available. In addition, information about treatment following cancer diagnosis was obtained from the practice records.

Results There were 172 men diagnosed with prostate cancer in 2010/2011 following a PSA test. Twenty nine men (17%) were diagnosed following screening. The majority of men (59%) were diagnosed with a Gleason sum of 6, while 67% had PSA level at referral lower than 10 ng/ml and 69% had a clinical stage of T1c or T2. More than one-quarter of the diagnosed men have been treated with a radical prostatectomy but a proportion are managed with watchful waiting or active surveillance.

Conclusion Most men were diagnosed with low-risk prostate cancer. Only a small proportion of men were diagnosed following screening. The number of men with prostate cancer who are managed in general practice is steadily increasing, therefore it is necessary to establish guidelines that would help GPs to provide high-quality care for these men.

SDHB malignant paragangliomas: management in pregnancy

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Management of phaeochromocytoma/paraganglioma in pregnancy raises both diagnostic and therapeutic challenges. In the 1970s fetal and maternal mortality rates were as high as 50% for pregnancies complicated by phaeochromocytoma. Improved perinatal care for these patients has resulted in better survival for these high risk pregnancies although there still remains a significant maternal and fetal mortality of 2% and 10%, respectively.

We present a local series of eight pregnancies in four women with functioning paragangliomas during pregnancy and discuss issues regarding diagnosis, management and outcome.

Management of phaeochromocytoma during pregnancy presents a difficult balance between the critical need for adequate adrenergic blockade, while not compromising placental blood flow. Careful planning for delivery is necessary in order to minimise maternal and fetal risk. The optimal method of delivery is usually caesarean section as it is associated with lower maternal mortality. Invasive monitoring of the mother is required in order to monitor for haemodynamic instability.

Stat5a and Stat5b in the regulation of sexually dimorphic growth

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Introduction Growth hormone (GH) regulates insulin-like growth factor one (IGF-1) production predominantly through the intracellular signallers Stat5a and Stat5b. Loss of Stat5b results in reduced production of liver IGF-1 and loss of sexually dimorphic growth in males. However, no study has observed the phenotype beyond twelve weeks, or looked at normalised muscle mass and fat mass.

Methods The hindlimb muscles and abdominal fat of male and female Stat5b knockout mice and wild type mice were collected at 6, 12 and 24 weeks of age (n=16 per time and sex). Muscle mass was normalised to tibia length and abdominal fat mass was normalised to body mass. C2C12 myoblast cell lines were treated with viral Stat5b siRNA, Stat5a siRNA or a scrambled vector as a control, then differentiated and treated with 100ng/mL of GH for 24 hours. RNA and protein were harvested for quantitative PCR and Western blotting.

Results Nose-to-tail length, tibia length and normalised hindlimb muscle mass were decreased to a greater extent in male (29.8%) than in female (11.5%) Stat5b knockout mice versus wild type mice at all ages ($P < 0.001$). Both male and female Stat5b knockout mice had a greater abundance of abdominal fat than wild type mice at 24 weeks ($P < 0.05$). Individual Stat5a and Stat5b knockdown both blocked the GH

induced increase in IGF-1, IGF-1R and GHR mRNA. Additionally Stat5a knockdown blocked the increase in AR mRNA and decrease in myostatin mRNA. Stat5b knockdown reduced the abundance of mature myostatin protein.

Conclusions We conclude that (1), sexual dimorphism persists in Stat5b-null mice, (2) both Stat5a and Stat5b have essential signalling roles in skeletal muscle wherein Stat5a regulates AR and myostatin mRNA, Stat5b regulates myostatin protein and both Stat5a and Stat5b independently, or a heterodimer between the two, regulate IGF-1, IGF-1R and GHR.

Sugary drinks and the risk of gout: evidence for SLC2A9 gene interaction

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Objective To test for an association between consumption of drinks sweetened with sucrose (sugar-sweetened beverages, SSB) and prevalent gout among New Zealanders of European, Maori or Pacific descent. To test the hypothesis that genetic variants in the urate transporter gene SLC2A9 interact with SSB consumption to predict the risk of gout.

Methods Participants were recruited from the community in Auckland, Waikato, Bay of Plenty, Wellington region, Christchurch and Dunedin. There were 1634 New Zealand (NZ) European Caucasian, Māori and Pacific Island people and 7075 European Caucasians from the Atherosclerosis Risk in Communities (ARIC) study. NZ samples were genotyped for *rs11942223* and ARIC for *rs6449173.* Effect estimates were multivariate adjusted. Participants self-reported their daily consumption of SSB among other dietary information, and also recorded the occurrence of acute gouty arthritis.

Results A gradient of gout risk was observed with increasing SSB consumption. Compared with zero intake, the odds ratios for 4 drinks/day were: 6.89 (P=0.045) for European Caucasian, 5.19 (P=0.010) for Maori and 2.84 (P=0.043) for Pacific Island people. In those carrying the gout protective allele *SLC2A9* there was a 15% increase in risk with each additional daily serving of SSB(P=0.078), compared to a 12% increase in non-carriers (P=0.002). The interaction term was significant in pooled ($P_{Interaction}$=0.01) but not meta-analyzed ($P_{Interaction}$=0.99) data. In ARIC, with each extra daily serving, a greater increase in serum urate protective allele carriers (0.005 (P=8.7x10^{-5}) compared to 0.002 (P=0.016) mmol/L) supported the gout data ($P_{Interaction}$=0.062).

Conclusion We found evidence of an environment-gene interaction between consumption of SSB and SLC2A9 in determining the risk of gout, suggesting that sucrose negates the protective effect of this allele. The data supports people with gout limiting consumption of sugary drinks.

The impact of waiting time for elective surgery on the growth of periocular basal cell carcinomas

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Aim To investigate the growth of periocular basal cell carcinomas (pBCC) while awaiting excision.

Methods A prospective cohort study of patients with pBCC during a 24 month period at a public hospital and a private clinic. All patients underwent tumour excision by Mohs micrographic surgery and reconstruction. Demographic data, clinical photographs, tumour size at initial visit and at time of excision, histological subtype, resulting defect size, and reconstruction technique were recorded.

Results 112 consecutive patients were recruited. The mean age was 73 years, with 54% male. 63% of all patients were treated in the public hospital. There was a significant difference in waiting time for surgery between public and private patients (median 143.5 days public, 62 days private, $p<0.005$). In all patients, there was a significant difference in tumour size between their initial assessments and at the time of excision. (37.7mm^2 at the initial assessment versus 51.8 mm^2 at time of excision, $p<0.001$), but there was no statistically significant difference between the public and private patients. The median growth rate of the pBCC was 2.92mm^2 per 30 days, and the risk factors for a faster growth rate were male sex (OR 2.99, $p=0.018$) and recurrent tumours (OR 3.56, $p=0.037$). The effect of histological subtype of the pBCC and the technique used for lid reconstruction were analysed.

Conclusions In this group of patients, there was a significant increase in the size of pBCC while awaiting treatment. Due to more rapid growth rates, delays in surgery should particularly be avoided in men with pBCC & recurrent pBCC.

Bleeding risk in elderly STEMI patients post thrombolysis with Ticagrelor

Lee M, Pera V, Nuriman A, Devlin G

Aims Randomised controlled trials showed a significant mortality benefit with Ticagrelor over Clopidogrel following an Acute Coronary Syndrome (ACS), but due to concerns with increased bleeding, ST Elevation Myocardial Infarctions (STEMI) receiving thrombolysis were excluded. We report our experience with the use of Ticagrelor and Clopidogrel in thrombolysed STEMI patients at Waikato Hospital, New Zealand.

Methods We retrospectively audited 97 patients post thrombolysis with STEMI's from 1st January to the 31st of October 2012. Patients who had anti-platelet therapy withheld while awaiting surgical revascularisation were excluded.

Results There were no significant baseline differences between Clopidogrel (n=49) and Ticagrelor (n=48) groups. Bleeding complications occurred exclusively in the Ticagrelor treated group but this was not significant. In a subgroup analysis of elderly patients aged >80 years (Clopidogrel n=7, Ticagrelor n=4), we found a statistically increased number of bleeds for patients on Ticagrelor (p=0.047).

Conclusions Real world experiences with Ticagrelor show safety in younger patients but caution is recommended in thrombolysed elderly patients due to an increased risk of bleeding compared to Clopidogrel.

	CLOPIDOGREL (n=49) [%]	TICAGRELOR (n=48) [%]	p value
Age	63 ± 12.8	61± 10.8	0.66
Males	33 [67%]	35 [73%]	0.70
Diabetes	6 [12%]	5 [10%]	0.97
Haemoglobin (g/L)	137 ±19.6	139.5 ± 15.6	0.19
Creatinine (µmol/L)	82 ± 26.7	83 ± 22.1	0.95
Anterior STEMI	16 [33%]	20 [42%]	0.40
Inferior STEMI	30 [61%]	26 [54%]	0.54
Lateral/Posterior/LBBB	3 [6%]	2 [4%]	NS
PCI	41[84%]	40 [84%]	NS
Medical Rx	8 [16%]	8[16%]	NS
Bleeding in hospital (All)	0	3	0.23
Bleeding (age>80yrs)	0/7	3/4	**0.0474**
Deceased (age >80 yrs)	0	2/4 [50%]	0.20
Deceased (All)	0	3 [6%]	0.23

THE NEW ZEALAND MEDICAL JOURNAL
Journal of the New Zealand Medical Association

Intensive lifestyle intervention in type 2 diabetes

Weight loss is recommended for overweight or obese patients with type 2 diabetes on the basis of short term studies. These benefits include improvements in glycaemic control, risk factors for cardiovascular disease, quality of life, and other obesity-related coexisting illnesses. This study examines the long-term effects of such an intervention in terms of cardiovascular morbidity and mortality.

The researchers randomly assigned 5145 overweight or obese patients with type 2 diabetes to participate in an intensive lifestyle intervention that promoted weight loss through decreased caloric intake and increased physical activity (intervention group) or to receive diabetes support and education (control group).

The trial was stopped early (9.6 years median follow-up) as there was no difference between the groups with respect to the primary outcomes. They conclude that an intensive lifestyle intervention focusing on weight loss did not reduce the rate of cardiovascular events in overweight or obese adults with type 2 diabetes.

Disappointing, but the trial did confirm the short-term benefits.

N Engl J Med 2013;369:145–54.

Blood pressure targets in patients with recent lacunar stroke

Lowering of blood pressure prevents stroke but optimum target levels to prevent recurrent stroke are unknown.

This report concerns the effects of different blood-pressure targets on the rate of recurrent stroke in patients with small subcortical infarcts (i.e. lacunar strokes). 3020 patients with an MRI proven lacunar stroke were randomised to a systolic-blood-pressure target of 130–149 mmHg or less than 130 mmHg. The primary endpoint was reduction in all stroke (including ischaemic strokes and intracranial haemorrhages).

After 1 year the mean systolic blood pressure was 138 mmHg in the higher target group and 127 mmHg in the lower target group. There were non-significant rate reductions for all strokes within the lower target group. The rate of intracerebral haemorrhage was significantly reduced in the lower target group.

The conclusion reached was that “although the reduction in stroke was not significant, our results support that in patients with recent lacunar stroke, the use of systolic-blood-pressure target of less than 130 mmHg is likely to be beneficial.”

Lancet 2013;382:507–15.

Is maternal obesity associated with an increased risk of premature death and cardiovascular disease in adult offspring?

This interesting possibility is addressed in this cohort analysis of children born in Aberdeen between 1950 and 1976.

All women who delivered a live singleton birth at term (>37 weeks' gestation) between 1950 and 1976 and were overweight or obese according to BMI at first antenatal visit were included.

Follow-up to 2012 revealed that all cause premature mortality was increased in offspring of obese mothers (BMI>30) compared with offspring or mothers of normal BMI.

After adjustment for other factors—maternal age, economic status, birth weight and length of gestation—the hazard ratio was 1.35. The researchers note that only 4% of mothers in the cohort were obese, whereas currently 20% of women in the UK are obese at their antenatal booking.

A clear message.

BMJ 2013;347:f4539.