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Antimicrobial resistance in New Zealand: the evidence and a call for action

Humphrey W Pullon, John Gommans, Mark G Thomas, Sarah Metcalf, Rebecca Grainger, Harriet Wild

Microorganisms (eg bacteria) are developing resistance to a range of antimicrobial drugs, including antibiotics: this is known as antimicrobial resistance (AMR). Standard treatments are now becoming ineffective, which increases the risk of adverse outcomes (including death) and the spread of the infection. AMR is increasing globally where poor sanitation, close contact between humans and animals and unregulated prescribing are common. In New Zealand, there is increasing resistance in infections caused by Staphylococcus aureus, Enterobacteriaceae (eg E. Coli) and Neisseria gonorrhoeae. These bacteria are common causes of infection, and may occur in hospital and community settings. New Zealand must prioritise a plan to prevent increasing AMR, which includes prescribing guidelines, antimicrobial stewardship programmes to promote optimal use of antibiotics and public health campaigns.

Pathways to ambulatory sensitive hospitalisations for Māori in the Auckland and Waitemata regions

Carol Barker, Sue Crengle, Dale Bramley, Karen Bartholomew, Patricia Bolton, Michael Walsh, Jean Wignall

Māori are more likely than non-Māori to be admitted to hospital with a condition that could potentially be prevented or treated in primary care; these are known as Ambulatory Sensitive Hospitalisations (ASH). This study found barriers for Māori accessing primary care including affordability of General Practitioner and after-hours care, appointment availability and lack of transport. Measures to reduce ASH rates for Māori include timely access to primary care through electronic communications, increased appointment availability, extended opening hours and low cost or free after-hours care and addressing transportation barriers.

Traditional Chinese medicine practitioners in New Zealand: differences associated with being a practitioner in New Zealand compared to China

Asmita Patel, Vahideh Toossi

There has been an increase in the use of Traditional Chinese Medicine (TCM) based acupuncture in New Zealand. TCM is viewed as an alternative from of treatment by the general New Zealand population. Acupuncture is predominately used for pain management purposes. Acupuncture appears to be utilised by individuals from a number of different ethnic groups, reflecting the ethnic diversity of those who seek this type of treatment in New Zealand.

Medical students' experiences of practising medical procedures on patients, other students and themselves

Michelle Bai, Helen Nicholson, Kelby Smith-Han

This study examined different ways medical students learn invasive clinical procedures, such as taking blood, and suturing. The majority of students indicated positive experiences for learning invasive clinical procedures, which included practising on peers and patients. A small proportion, 5%, reported practising procedures on themselves. To assist with safe practise of invasive clinical procedures, clearer guidelines for how students should practise clinical procedures may be helpful.

Prevalence of contraceptive use in New Zealand women

Jacqueline Chesang, Ann Richardson, John Potter, Mary Jane Sneyd, Pat Coope

A study of contraceptive use among New Zealand women aged 35–69 found that 89% of women have used oral contraceptives at some stage. The next most commonly used types of contraception were condoms and vasectomy. Over the last 25–30 years, ever-use of the pill and condoms has become more common. There has also been an increase in the ever-use of vasectomy, but a decline in female sterilisation.

A morbidity/mortality analysis of a tertiary level upper gastrointestinal/hepatopancreaticobiliary surgical unit

Susrutha K Wickremesekera, Ho Beom Seo, Mary-Anne Trimber, Simon Bann, Katherine Tse

Wellington's two-specialist surgeon, upper gastrointestinal/hepatopancreatico-biliary unit was established in 2006. Wellington is a relatively small volume centre. However, with a team approach to every patient, morbidity and mortality rates of patients following surgery have shown to be at acceptable rates when viewed alongside international standards.

Gynaecological cancer pathway for faster cancer treatment: a clinical audit

Catherine Askew, Anand Gangji

Gynaecological cancers make up 10% of female cancer deaths in New Zealand. The Ministry of Health has set up a 'Faster Cancer Treatment' programme to set about timelines for patients through the cancer pathway. This audit shows that Northland gynaecological cancer patients are meeting target of treatment within 62 days from first referral in only 39% of patient cases. Improvements that are needed include appropriate modernised tracking of cancer patients, increased frequency of meetings for treatment planning, prioritising operating lists for cancer diagnosis and standards of care that equate realistically to the targets set by the Ministry. With these improvements we can hope to provide more timely access to care for the women of New Zealand.

Comparison of documentation of patient reported adverse drug reactions on both paper-based medication charts and electronic medication charts at a New Zealand hospital

Wilson Shen, Bernice Wong, Jessica Yi Ping Chin, Michael Lee, Carolyn Coulter, Rhiannon Braund

Many patients report that they have drug allergies. These allergies can alter the choice of treatments for patients. Accurate documentation of the type of reaction can determine what therapy choice is appropriate. This study found that while many patients reported allergies, documentation of the types of reactions was limited irrespective of whether paper or electronic charts were used and so it is challenging for prescribers to make the most informed decision. Better documentation of drug reactions will improve this problem.

An open-label six-month extension study to investigate the safety and efficacy of an extract of Artemisia annua for managing pain, stiffness and functional limitation associated with osteoarthritis of the hip and knee

Sheena Hunt, Debra McNamara, Simon Stebbings

Artemisia annua is medicinal plant used in Traditional Chinese Medicine. Extracts from this plant are used as the treatment of choice for resistant malaria and are supported by the World Health Organization. In TCM, extracts are also used to treat arthritis. In this study we report the results of a study to assess whether an *A. annua* extract was a safe and effective therapy for osteoarthritis (OA) over a six-month period. This builds on an initial randomised controlled study showing it reduced pain in OA. Sustained benefit over this follow-up period was noted, and *A. annua* shows promise as a potential alternative to current medicines used to manage OA symptoms. The results of this extension study are encouraging, and further investigation is warranted.

Combating antimicrobial resistance demands nation-wide action and global governance

Scott Metcalfe, Michael G Baker, Joshua Freeman, Nick Wilson, Peter Murray, for the New Zealand College of Public Health Medicine and the New Zealand Medical Association

Antimicrobial resistance is a growing threat to global health and health systems everywhere. Curbing this threat demands both nation-wide action and strong international governance. The Royal Australasian College of Physicians, New Zealand College of Public Health Medicine and New Zealand Medical Association call for comprehensive, well-funded measures across New Zealand's veterinary medicine, agriculture, human community and healthcare settings. International action is needed in parallel—with effective governance structures, rules and targets.

Antimicrobial resistance (AMR) increasingly threatens New Zealanders' health and our health system. International recognition is growing; in recent weeks we have seen:

- The United Nations (UN) convening a special one-day meeting (only the fourth time the General Assembly has ever held a high-level meeting on a health issue), with global leaders committing to fighting antimicrobial resistance together.[1,2,3]
- The UN's Food and Agriculture Organization (FAO) releasing its action plan on AMR and the food chain.[4]
- The UN Secretary-General's High-Level Panel on Access to Medicines highlighting antimicrobials and AMR in particular.[5]
- In New Zealand, the New Zealand College of Public Health Medicine (NZCPHM) releasing the NZCPHM policy statement on AMR,[6] endorsed by the New Zealand Medical Association (NZMA), calling for national planning to be comprehensive, well-funded and monitored in the face of New Zealand's looming crisis.[6,7,11]
- And in today's issue of the *Journal*,[8] Humphrey Pullon and colleagues for The Royal Australasian College of Physicians (RACP) are strongly reiterating the RACP's explicit call[9,10] (supported by the NZMA[11]) for measures based on the World Health Organization (WHO)'s 2011 six-point plan.[12,13]

AMR is described as a leading global health issue that "threatens the very core of modern medicine".[14] Some common infections may become very difficult to manage and some forms of surgery and chemotherapy could become untenable or unsafe.[15] As the RACP cites,[8,9] left unchecked, AMR could cause 10 million deaths globally each year (more than from cancer) by 2050 and cost $US100 trillion in lost economic output (as context, the world's current annual GDP being $US107–113 trillion, see endnote *)—although fuller modelling of underlying cumulative incidence/future prevalence is needed (endnote ï).[15–18]

The genie of AMR is already well and truly out of the bottle, with AMR impacts now widespread. Pan-resistant (or very close to pan-resistant) gram-negative organisms are found already in many countries, with drug-resistant infections thought responsible now for at least 700,000 deaths each year.[15,16] Given our increasingly interconnected world, these organisms are now being introduced and detected in New Zealand. The scale and extent are described by the RACP, NZCPHM, WHO and the O'Neill Review.[6,8,9,12–16]

Tackling AMR is both national and global. In response to a commitment to the WHO, New Zealand (co-led by the Ministry of Health and Ministry for Primary Industries) is developing a comprehensive national strategic plan for AMR, due by the end of May 2017.[19,20] Directions called for by the WHO, NZCPHM and RACP include:[6,8,9,12–14]

- financed national AMR plans and guidelines
- national quality improvement programmes[8,9]
- clinical governance
- enhanced AMR surveillance
- new antimicrobials and vaccines
- optimising existing antimicrobials
- preventing infections in community and healthcare settings (eg, immunisation; infection prevention and control (IPC)—including isolation and screening for multi-drug resistant organisms in patients previously hospitalised overseas[6])
- wise use of antimicrobials in human health and animal health/horticulture—with education and governance; a single national antimicrobial prescribing guideline[8,9]
- education/governance/regulation of antimicrobial used in veterinary medicine, agriculture and horticulture.[6]

Successful implementation will need widespread leadership and commitment across the healthcare, veterinary and agricultural sectors—using a 'One Health' approach.[6,21] This 'One Health' approach recognises that ecosystems and AMR development in humans and other species are inextricably linked, as are the solutions.[6]

Global efforts are needed beyond national action

National action is important but remains largely confined within countries. International action is essential to complement and coordinate local and national AMR efforts.[22] Globally, countries' AMR impacts, access to antimicrobials and abilities to address AMR vary widely,[22–25] yet all our health and health systems will depend on strong consistent action. The unwise and injudicious use of antimicrobials across and within nations has effectively 'depleted' them as a common resource for humankind (endnote ‡)—we are all affected and vulnerable. Like climate change,[26] with AMR the practices of some affect many others.[27–31]

Decisive AMR action is also justified from a health equity perspective.[23,32–34] Low- and middle-income countries suffer disproportionately from AMR-related disease, while also lacking resources and capabilities to mitigate this growing problem.[23–25,34–37] Unchecked, AMR is likely to significantly worsen the health of future generations in ways that are not yet conceivable.[23,32] Lack of effective action now has potentially serious implications for intergenerational equity.[23]

The high level UN Panel report[5] highlights the failure of the conventional market model to adequately stimulate the antimicrobial research and development (R&D) pipeline[5,15,38]—which is another reason for international cooperation and governance. To address this market failure, the UN Panel recommends countries negotiate a binding global Health R&D convention that delinks the costs of research and development from end prices, so that access can be universal. In particular, the UN Panel calls for such a global treaty focussing on public health needs, including neglected diseases and AMR.[5]

Equitable access to appropriate antimicrobial treatment is also essential in any international governance framework. Concerns about excess human antimicrobial consumption globally must balance against absent, or delayed, antimicrobial access—which is currently killing more children than AMR does.[34,39,40] Ironically, while children are dying because of lack of access, the same antimicrobials are used liberally to maximise commercial productivity in high intensity agriculture.[34]

But most importantly, resistant strains spread rapidly across borders,[41–44] and international cooperation and governance structures (eg, rules and targets) will be critical to tackling AMR.[22,27,34] These measures include:

- Improved and standardised international integrated systems of surveillance of antimicrobial use (both human and animal), AMR patterns and disease burden (and infectious diseases generally)—including data consistency and sharing.[15,45]
- Addressing the supply of poor-quality and falsified antimicrobial drugs[46,47] (endnote §) and the online sale of antimicrobials without prescription—which transcend borders.[47]
- Stricter regulation of antimicrobial use in agriculture,[6,48] in line with internationally agreed principles and including the revision of international standards.[4]
- Perhaps most crucially, global efforts might eventually include a new supra-national UN-level coordinating body and an international treaty with strong implementation mechanisms[15,31,22] that include rules, setting targets and holding nations to account.[22,27,34]

New Zealand can and should take leadership within this global response—with action both by government agencies and professional organisations. By being a relatively respected country internationally with good governance, and with our large agricultural export sector to future-proof with 'One Health',[6,21] we could be a key player. In particular we could help broker larger nations putting their weight into international action[22]—including governance structures, rules and targets[6,22,27,34]—to address the AMR threat.

Pullon et al[8] are absolutely right; we need to do much more in New Zealand now, to establish and follow best practice for control of AMR. Yet at the same time, we must not forget the wider picture. AMR is a big, tough, worldwide problem—and demands both nation-wide action and global governance.

Endnotes

* Purchasing parity power (PPP) gross domestic (US$–PPP) calculations by IMF, World Bank, CIA World Factbook, compiled at http://en.wikipedia.org/wiki/List_of_countries_by_GDP_(PPP)

ἶ The Review on Antimicrobial Resistance[15,16] estimates of AMR burden (year 2050 10 million AMR deaths and US $100 trillion cost) are broad-brush,[16] being notional scenarios of underlying cumulative incidence/future prevalence that need fuller modelling. The estimates were derived from commissioned reports by Rand Europe (http://www.rand.org/pubs/research_reports/RR911.html)[17] and KPMG (http://www.kpmg.com/UK/en/IssuesAndInsights/ArticlesPublications/Documents/PDF/Issues%20and%20Insights/amr-report-final.pdf),[18] which were high-level assessments of future impacts of AMR, based on notional scenarios for rising resistance and economic growth to 2050 (undiscounted). Costs were confined to labour force effects (but not including social or health sector costs), and deaths and costs confined to a subset of resistance (being just three (*K. pneumoniae*, *E. coli*, *S. aureus*) of seven priority drug-resistant bacteria highlighted by WHO as key concerns, and three public health issues (HIV, TB, malaria)), using notional 40% to 100% resistance scenarios, estimating by 2050 world productivity being between 2% and 3.5% less than projected if AMR kept at 2014 levels.[16,17,18] Costs were not discounted.

‡ Addressing the challenge of AMR is complicated by the 'tragedy of the commons'. This form of market failure is where, within any shared-resource system, no person, organisation or nation state is (or has incentive to be) responsible,[27,28,29,30] to the detriment of the global common good.[49]

§ According to The Review on Antimicrobial Resistance, poor quality and falsified antimicrobials fuel the development of AMR by delivering sub-therapeutic antimicrobial doses, providing sufficient exposure to start to develop resistance without adequately treating the infection. Growing numbers of online pharmacies also exploit gaps in the global regulatory mechanisms to offer antimicrobials for sale around the world, often without prescription or clinical guidance—which fuels self-medication and encourages the development of drug-resistant strains of infection by increasing unnecessary and excessive antimicrobials use.[47]

Competing interests:
SM is an observer on the joint Ministry of Health/Ministry for Primary Industries AMR action plan development group.[20] SM and PM are employed by PHARMAC; the views expressed do not necessarily represent those of PHARMAC.

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SM, MB, PM belong to the New Zealand College of Public Health Medicine, and SM, MB, JF, NW to the New Zealand Medical Association. All contributed to the NZCPHM's policy statement on antimicrobial resistance[6] at http://www.nzcphm.org.nz/media/97734/2016_08_24_nzcphm_antimicrobial_resistance_policy_statement.pdf, led by SM.

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Living up to our own standards in the care of women with gynaecological cancer

Peter Sykes

Over recent years there has been an effort to systemically improve cancer care in New Zealand. This approach brings similar changes to those seen in the UK as a result of the Calman-Hine report,[1] which followed recognition of poor cancer outcomes in the UK when compared to continental Europe. In addition to the ethnic and social inequities in cancer outcome that are well documented in our own country,[2] concerns have been raised in New Zealand regarding cancer outcomes when compared to Australia.[3] At the head of the New Zealand National Cancer program initiatives is the faster cancer treatment (FCT) program,[4] while there is a clear political imperative, this approach in time has the ability to deliver assurance that New Zealanders, regardless of geography or socioeconomic circumstances, will receive treatment for their malignancy in a reasonable time frame. While time itself is not necessarily of essence in cancer treatment, there is no doubt that for many malignancies treatment delays are associated with poor outcomes.[5] The importance of early treatment may vary from one patient's cancer to the next, however for patients and their health professionals, knowledge that their cancers will be treated in a timely fashion is very reassuring. While this general approach to timeliness of cancer care is to be supported, care needs to be taken to ensure that it does not result in perverse incentives that negatively impact on the care of, for example, those that either need urgent care or for those whom treatment is better deferred.

It is self-evident that not only the speed of cancer care but its quality is essential to ensure optimal outcomes, therefore the faster cancer treatment timelines have been embedded within tumour type oriented standards of treatment.[6] These standards were developed de novo by groups of individuals invested in good cancer care in New Zealand and are the result of, where possible, evidence, expert opinion and Ministry of Health input. They were published as provisional standards in 2014 and district health boards (DHB) and cancer networks were encouraged to audit against these standards. While it only audits selected standards, the paper published in this journal reflects such an audit of gynaecological treatment standards published in a peer review journal. These audits are important to determine areas in which our cancer treatment may be improved and to guide future development of the standards.

As such, the treatment standards are work in progress, in fact review of these standards is due to commence soon. A number of common themes regarding the standards have already emerged. Foremost of these is the difficulty in auditing these standards from current data sets; other standards lack outcomes against which audit can occur. The authors of this paper have concentrated on a number of timelines in the standards and associated good practice points that relate to flow of the patient pathway culminating in the faster cancer treatment times. While the results cannot necessarily be generalised nationally, the following observations were made. The minority of patients with cancer were classified as having a high suspicion of cancer at their initial referral. This most likely reduced access to early first specialist assessment (FSA) and rapid investigation. The second issue related to delays in the attainment of biopsy specimens and the third, delays due to multiple discussions at the regional multi-disciplinary meeting. This resulted in only 39% of women being treated within the 62 day FCT timeframes. These findings are not unique, other authors have

reported difficulties in the timely treatment of gynaecological cancers particularly for women with endometrial cancer.[7] While these findings are disappointing, they give clear direction on areas in which the patient pathway can be improved. High suspicion of cancer definitions have been developed,[8] the consistent implementation of which will improve access to early FSA and investigations. Most health professionals regularly treating gynaecological cancer believe that review of all patients at a regional MDM promotes quality and equitable access to appropriate multimodality treatments. The development of regional patient management pathways and treatment protocols will assist the streamlining of the patient journey, reduce discussion times at MDMs and reduce the need for multiple presentations at MDM. These initiatives are works in progress. The engagement of health professionals and administrators has been encouraging so far and the ministries FCT targets will incentivise DHBs to resource these developments. It is reasonable to expect the gynaecological cancer community will continue to work cooperatively on guidelines and protocols and so improve access to treatment and hopefully outcomes for women with gynaecological cancer. Future published audits will be an important aspect of this progress. The hard work of those performing audits and cooperating in the development of standards, pathways and protocols must be acknowledged, as much of this work occurs in the participants own time and where possible should be formally recognised and remunerated within non-clinical DHB duties. While not all women will access optimal treatment within current FCT timelines there is reason to be optimistic that the implementation of audited standards will lead to tangible improvement in cancer care in New Zealand.

Competing interests:
Nil.

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Gynaecological cancer pathway for faster cancer treatment: a clinical audit

Catherine Askew, Anand Gangji

ABSTRACT

Gynaecological cancers make up 10% of cancer cases and 10% of female cancer deaths in New Zealand. The services for investigation and treatment of these women are regionally specific rather than centrally organised; hence we need appropriate standards of service and clear pathways for communication and management of these patients to ensure consistent care that is in line with the Ministry of Health goals for faster cancer treatment.[1]

AIM: The aim of this audit is to ensure faster gynaecological cancer management pathways for Northland patients.

METHODS: There were 72 gynaecological cancer cases identified from the gynaecological oncology referral data. These were the patients referred for multidisciplinary discussion of their newly diagnosed gynaecological cancer from June 2014–June 2015. Seventeen cases were excluded from this audit. The patients' information regarding their health care during the investigation and treatment of their cancer was obtained via an electronic patient record system. The time taken for each patient to complete various investigation, referrals, decisions and treatment was then compared against Ministry of Health faster cancer treatment targets and standards of service provision.

RESULTS: The results showed that the overall target of patients having their first treatment within 62 days of initial referral for suspected cancer was being met only in 39% of cases. The best performing area of the pathway was the time from first referral from Northland DHB until the date of the first MDM discussion for a patient with an aim of ≤14 days with 93% of cases meeting this. The worst performing area was the time from decision to biopsy for tissue diagnosis to the time the histology report was produced, aiming for ≤14 days. We met this target in only 35% of cases.

CONCLUSION: Over half of Northland patients are not receiving treatment in time that meets national targets. This delay seems to be mainly at the tissue diagnosis stage especially if operative intervention is required and while waiting on a management plan from the multidisciplinary team. Further input into appropriate tracking of cancer patients, management of prioritisation of operating lists and perhaps increased theatre time for gynaecology cancer patients should be considered. Increasing the frequency of multidisciplinary meetings for management plan decisions to be made should also be considered. The standards for service provision should also be altered to have a time course for referral, investigation and management that is in line with the Ministry faster cancer treatment targets.

Gynaecological cancers include malignancy in any of the following; ovarian, fallopian tube, uterus, cervix, vagina and vulva. These malignancies make up 10% of cancer cases in New Zealand and are responsible for 10% of cancer death in New Zealand women, with endometrial being the most common.[1] The global burden is even higher, with gynaecological cancers accounting for 19% of new cancer diagnoses.[2] The services for investigation and treatment of these women are regionally specific rather than centrally organised; hence the need for appropriate standards of service and clear pathways for communication and management of these patients to ensure consistent care across New Zealand. The Ministry of Health (MoH) is currently working with the health sector on the "Faster Cancer Treatment" (FCT) programme. This aims to improve the quality and timeliness of services for patients along the cancer pathway, and $11.2 million of funding has been made available

to support District Health Boards (DHB) to make sustainable service improvement.[8]

From this, two key targets can be identified:[3]

- Treatment should begin within 31 days of a decision being made that the patient will have that treatment.
- Patients receive their first cancer treatment within 62 days of the hospital receiving the referral.

The baseline performance in 2014 for patients receiving their first treatment within 62 days was reported by the MoH as 65% with a target of >85% by July 2016.[8] In conjunction with the FCT, the MoH has published "Tumour standards of service provision" which defines a minimum level of service that cancer patients should have access to.[2] These standards and good practice points have been developed using existing evidence based standards, clinical guidelines, patient pathways and expert opinion.[1] The standards incorporate the FCT targets, as well as describing other priority elements in cancer care. This is to ensure timely care for patients that are consistent and coordinated across New Zealand. This is especially important for Northland DHB, as although gynaecological cancer patients will be investigated in Northland, their management plan will be discussed with specialists at Auckland DHB (a tertiary level gynaecological treatment centre). The treatment planning takes place via the multidisciplinary meetings (MDM) for gynaecological oncology, and a large number of our patients will also have their treatment carried out in Auckland. This is essential, as the best management of gynaecological cancers uses centralisation of care and collaborative input of high level specialists to increase the chances of management prolonging the lives of these women. This model of care has shown to be particularly significant in ovarian cancer.[4] Currently there are no incentives to encourage DHBs to comply with the standards of service provision, however the MoH has stated that in the coming years, DHBs will be expected to review local services against these standards to identify areas for improvement.[3] This clinical audit looked at patients with a new diagnosis of a gynaecological cancer and their pathway through treatment. More specifically it investigates if these patients are meeting standards of care in relation to specific time frames set out by the current tumour standards and FCT targets. Time is the only parameter measured in this audit.

Aims

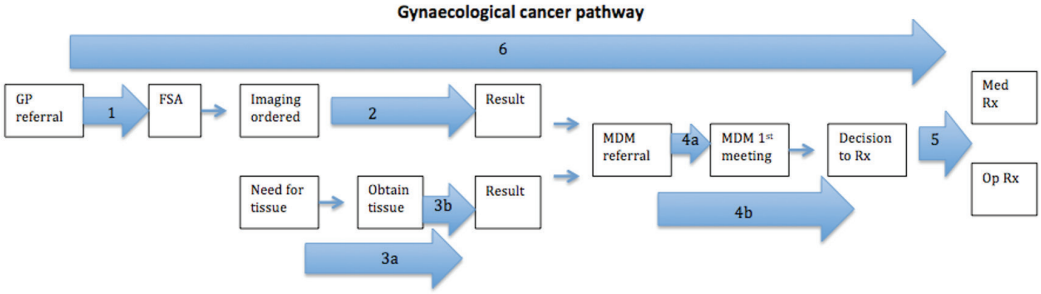
We aim to collect data from patient's clinical records to analyse their cancer pathway timeline to investigate if it complies with the gynaecological cancer standards of service provision and FCT targets. From this we hope to identify areas of improvement in the timeline for Northland patients to improve FCT target results. The patients who underwent their first treatment in Auckland are also included in the timeline analysis.

Methods

The population for this audit consisted of the patients in Northland District Health Board catchment areas that were referred to the Auckland Gynaecological cancer MDM in the time period of 1st June 2014 to 30th June 2015. Gynaecological malignancy includes vulval, vaginal, cervical, endometrial, ovarian and fallopian tube origin. In July 2015, the list of the above patients identified was obtained from the Gynaecology and Colposcopy outpatients Clinical Nurse Specialist (CNS). There were a total of 72 cases identified from the list that had been referred to the MDM. Of these 72 cases, 17 were excluded, as the first MDM referral was outside the prescribed timeframe of June 2014–June 2015 or the referral was for a recurrent cancer rather than a new diagnosis. The patients' information regarding their health care through the cancer treatment pathway was obtained via Concerto (the electronic patient record in Northland DHB). This involved looking at clinic letters, cancer tracking documents, MDM reports, radiology reports and histology reports. The data was collected and collated on an Excel spreadsheet. Simple statistics were then performed on the data to find the mean, maximum, minimum and percentage of each data set and if they met the audit datapoints. First, the timeline that our patients took through the health care system on the way to diagnosing and treating their cancer was identified below.

The various time points in the cancer pathway that needed to be met were identified. We then correlated the timeline with

Figure 1: Gynae-oncology pathway with numbered audit datapoints.
GP=General practitioner, FSA=First specialist appointment, MDM=Multidisciplinary meeting, Rx=Treatment, Med Rx=Chemotherapy or radiation therapy, Op Rx= Operative treatment.



the National faster cancer targets (FCT) and "Standards of Provision for Gynaecological Cancer Patients in New Zealand" standards and good practice points (see Table 1).[2]

After examining the National faster cancer targets and "Standards of Provision for Gynaecological Cancer Patients in New Zealand", there were still gaps in the timeline for potential delays. Subdivisions from these standards and good practice points were then created to avoid missing any potential areas that patients are experiencing delay to treatment. This created a set of Gynae-oncology audit datapoints (see Table 2). Standard 1a from the service provision standard was taken to become audit datapoint 1; time from GP referral to first specialist appointment being within 14 days. Standard 6 relates to radiological investigations; this was expanded to look at each modality of radiology (ultrasound (US), computed tomography (CT) and magnetic resonance imaging (MRI)) and times taken to obtain investigation. Good practice point 3.3 relates to histology and tissue diagnosis. The original service provision standard was

Table 1: Faster cancer targets, gynaecological tumour standards and good practice point.

National faster cancer targets[3]
1. Treatment should begin within 31 days of a decision being made that they will have that treatment. 2. Patients receive their first cancer treatment within 62 days of the hospital receiving their referral. (When the doctor receiving the referral believes there is a high suspicion of cancer and that they should be seen within two weeks).
Standards of service provision for gynaecological cancer patients[1]
Standard 1: The following timeframes are met. • Women referred urgently with a high suspicion of gynaecological cancer have their first specialist assessment (FSA) within 14 days. • Women with a confirmed diagnosis of gynaecological cancer receive their first treatment within 31 days of the decision to treat. • Women referred urgently with a high suspicion of gynaecological cancer receive their first cancer treatment within 62 days. **Pathology review good practice point 3.3:** • Provisional or final pathology reports are communicated with the lead clinician within 10 working days of the specimen being taken. **Standard 6:** • Women with a new diagnosis of gynaecological malignancy are offered an appointment for radiological investigations required for treatment planning that falls within two weeks of the date of receipt of that referral. **Standard 12:** • The MDM discussion takes place within 14 days of referral (provided referral criteria are met).

NZMJ 28 October 2016, Vol 129 No 1444
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"Provisional or final pathology reports are communicated with the lead clinician within 10 working days of the specimen being taken".[1] This was expanded after discussion with clinicians to include audit datapoint 3a, the time from decision to biopsy for a tissue diagnosis to the report being produced with a target of 14 days. The reason for this was to identify if there are delays in obtaining the biopsy due to additional requirements such as interventional radiology or operative intervention. Standard 12 was further subdivided to include audit datapoint 4b "The decision to treat takes place within 14 days of the first referral". This was included as it was hypothesised that although the MDM discussion may be taking place within the 14 days, in many cases it may be necessary to discuss a patient twice or more at separate meetings before a treatment decision is made. So hence it is essential to monitor this to ensure we are preventing unnecessary delay when coming to a final decision to treat. The "decision to treat" day was taken from the clinic/communication date following the final MDM plan to offer treatment. At this clinic, the patient had the treatment plan offered and discussed. This is in line with the FCT data definitions and treatment rules which the NDHB cancer tracker also uses.[9] If there was no such appointment, booking date or communication between patient and clinician documented, the "decision to treat" date was taken from the final MDM meeting where the decision to offer treatment was made. Standard 1b was taken to become audit datapoint 5; treatment should begin within 31 days of a decision being made that they will have that treatment.[3] Standard 1c was taken to become audit datapoint 6; time from first primary service referral for those who are referred urgently with a high suspicion of gynaecological cancer receive their first cancer treatment within 62 days.[3] These datapoints were then broken down to determine where the first treatment was taking place, Northland or Auckland. The treatment modalities included surgery, chemotherapy and/or radiation.

We also compared our results to those for all cancers tracked by the "Faster cancer treatment" tracking programme in our DHB. The data was pulled from clinical coding and the clinical cancer pathway tracker at NDHB. To be included in this tracking the patients have to be triaged as 'Urgent—high suspicion of cancer". This only included three of the 55 cases that were subsequently diagnosed as cancer.

Table 2: Gynae-oncology audit datapoints correlated from original standards of service provision for gynaecological cancer patients.

Gynae-oncology audit datapoints	Target (d)	Standards of service provision and FCT targets
1—Time to FSA	≤14	S1a—Women referred urgently with a high suspicion of gynaecological cancer have their first specialist assessment (FSA) within 14 days.
2a—USS wait	≤14	S6—Women with a new diagnosis of gynaecological malignancy are offered an appointment for radiological investigations required for treatment planning that falls within two weeks of the date of receipt of that referral.
2b—CT wait	≤14	
2c—MRI wait	≤14	
3a—Decision to take histology to report produced	≤14	GPP3.3—Provisional or final pathology reports are communicated with the lead clinician within 10 working days of the specimen being taken.
3b—Histology taken to report produced	≤10	
4a—MDM referral to 1st MDM meeting	≤14	S12—The MDM discussion takes place within 14 days of referral (provided referral criteria are met).
4b—MDM referral to Rx decision	≤14	
5—Decision to Rx—1st treatment	≤31	S1b—Treatment should begin within 31 days of a decision being made that they will have that treatment.
6—Treatment GP referral to 1st treatment—Overall	≤62	S1c—Women referred urgently with a high suspicion of gynaecological cancer receive their first cancer treatment within 62 days.

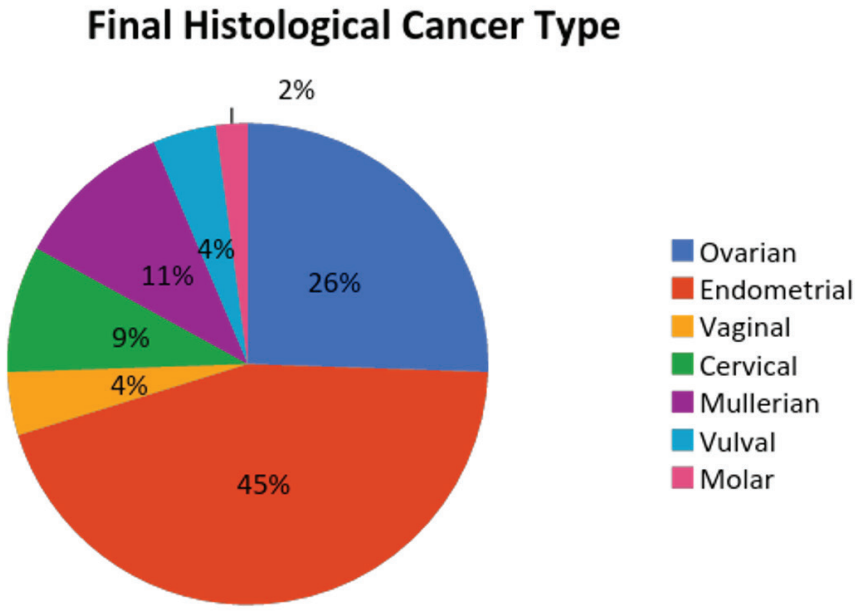
Results

The average age of our 55 patients was 58.2 years old, the oldest patient was 94 and the youngest was 15. The patients included 38 New Zealand Europeans (69%), 16 New Zealand Māori (29%) and one European patient (1.8%). Of all our patients there was one patient who died before full investigations were completed, one who died before she could receive her first treatment, one who elected to have her surgery in private and two who declined further input and treatment from the gynaecological service. The most common cancer type found on final histology was endometrial cancer, followed by ovarian and mullerian (Mullerian is a term used by pathologists based on immunohistochemical stains when the origin of the primary is unclear. It refers to a tumour that is likely developed from tissue with a similar embryological origin as the ovary, specifically the pelvic peritoneum, fallopian tubes or uterus).

The results relating directly to the national FCT targets are seen as audit datapoints 5 and 6. Point 5 was met in 73% of cases. The Northland patients had a mean time from treatment decision to first treatment; 29.6 days, 76% of Northland patients met the target of ≤31 days. Three patients in Northland required no further treatment after MDM final decision, as definitive treatment had already occurred while taking the tissue sample. For those patients who received treatment in Auckland, the average wait time was even less at 23.6 days, however, only 68% of cases met the 31-day requirement.

Datapoint 6 was met in only 39% of patients. In Northland the average wait time to first treatment was 111.3 days, with a maximum wait time of 525 days and a minimum wait time of five days. We met the target in 37% of cases. The Auckland treatment group had an average wait time, from GP referral to first treatment, of 79.6 days, with a maximum wait time of 202 days and a minimum wait time of 22 days. We met the target in 43% of cases. The Northland data was significantly influenced by one outlier patient in which a revised histology report was lost and a malignancy diagnosis was delayed by approximately six months. If we remove this outlier in the Northland data, the average wait time to first treatment is 97 days (max 252, min five). When analysing patients who underwent non-operative treatment, they all received the first treatment within 10 days from decision to treat except the patient who required chemo-radiation which took 27 days. The average wait for a non-operative treatment was 13.8 days (max 19, min five). Six received chemotherapy, one had chemo-radiation and two had radiation therapy.

Figure 2: Types of cancer identified in this audit.



NZMJ 28 October 2016, Vol 129 No 1444
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Table 3: Percentage of patients who met targets of audit datapoints 5–6, correlating to the FCT targets (mean, max and min waiting times also included).

Gynae-oncology timeline in Northland June 2014–June 2015						
	Audit datapoint definition	**Target value (d)**	**Target met (%)**	**Total number**	**Mean (d)**	**Min–max (d)**
5	**Treatment decision to 1st treatment—Overall**	≤31	73	51	28.5	0–161
	Northland		76	29	29.6	0–161
	Auckland		68	22	23.6	2–69
6	**Treatment GP referral to 1st treatment—Overall**	≤62	39	51	98.5	5–525
	Northland		37	30	111.3	5–525
	Auckland		43	21	79.6	22–202

When examining these datapoints for each gynaecological cancer, the worst performing disease entity was vulval cancer with neither point 5 or 6 being met in the two patient cases. Point 6 was also not met in either of the two cases of vaginal cancer but they both met point 5, achieving treatment within 31 days of the decision to treat. The only case of molar pregnancy meets all of the relevant datapoints including 5 and 6. Mullerian cancer also had all five cases achieve both the 31 and 62 day treatment targets (see Table 6). Of the three cases identified by our FCT tracking programme, two cases achieved both point 5 and 6. The other case was one of the vaginal cancer patients who, despite being flagged as "Urgent high suspicion of cancer" on receiving the referral, still did not meet the overall 62 day target.

The following results relate to the standards provided in the "Standards of Provision for Gynaecological Cancer Patients in New Zealand". The first point necessitates the time from the first referral to gynaecology service from either general practitioner or other hospital speciality to the time the woman receives her first specialist appointment to be ≤14 days. This took on average 10.5 days, with a maximum wait time of 60 days and a minimum wait time of 0 days. The 0 day wait time was achieved in those patients admitted acutely to the hospital. The target was met in only 65% of patient cases.

The second datapoint required the time from ordering radiological investigations to the time the images are obtained to be ≤14 days. This was analysed for each type of radiologic investigation. Ultrasound scans took on average 9.5 days, with a maximum wait time of 101 days and a minimum wait time of 0 days. The time target was met only in 81% of cases. CT scans took on average 6.5 days, with a maximum wait time of 26 days and a minimum wait time of 0 days. The target was met in 89% of cases. This was the best performing radiologic modality. MRI scans took on average 10.6 days, with a maximum wait time of 23 days and a minimum wait time of 0 days. The target was met in only 73% of cases.

Datapoint 3 was looked at in two parts. The first (3a) was an additional target created for this audit and related to the time from decision to biopsy for tissue diagnosis to the time the histology report was produced, aiming for ≤14 days. On average this took 31.5 days, with a maximum wait time of 140 days and a minimum wait time of 0 days. The audit data point aim of ≤14 days was achieved in only 35% of cases. This was the worst performing area of the audit. The worst performing area for point 3a, those patients who required an operation to obtain tissue as the target, was met in only 0–33% of cases. The range of wait times on average was 32–55 days.

Because of the small number of cases requiring interventional radiology it is hard to see a pattern. Targets for point 3a were met in 100% of cases for CT guided biopsy but only 50% in US guided biopsy. The best performing method of obtaining a tissue diagnosis quickly for point 3a was ascitic or pleural fluid sample with 75% of cases

Table 4: Percentage of patients who met targets of audit datapoints 1–4 (mean, max and min waiting times also included).

Gynae-oncology timeline in Northland June 2014–June 2015						
	Audit datapoint definition	Target value (d)	Target met (%)	Total number	Mean (d)	Min–max (d)
1	Time to FSA	≤14	65	55	10.5	0–60
2	USS wait	≤14	81	21	9.5	0–101
	CT wait	≤14	89	37	6.5	0–26
	MRI wait	≤14	73	22	10.6	0–23
3a	Decision to take histology to report produced	≤14	35	54	31.5	0–140
3b	Histology taken to report produced	≤10	70	54	8.9	0–29
4a	MDM referral to 1st MDM meeting	≤14	93	55	9.5	5–27
4b	MDM referral to Rx decision	≤14	59	53	22.3	5–162

meeting the 14-day target, with an average wait time of 10.5 days or pipelle biopsy with 71% meeting target, with an average of 13.3 days (see Table 5).

The second datapoint (3b) was the original standard set by the standards for service provision that required the time from the tissue specimen being sent to time of report produced being ≤10 days. This took on average 8.9 days, with a maximum wait time of 29 days and a minimum wait time of 0 days. The longest specimens on average taken to report on were those obtained by pipelle at 13.3 days; the fastest were those obtained by bone marrow biopsy with results available in two days but there was only one case of this sample (See Table 5).

The fourth gynae-oncology datapoint (Part 4a) looked at the time from first referral from Northland DHB until the date of the first MDM discussion for a patient with an aim of ≤14 days. On average this took 9.5 days, with a maximum wait time of 27 days and a minimum wait time of five days. Ninety-three percent of cases met this audit datapoint target. This was the best performing area throughout the audit. However, there may be more than one MDM discussion before a decision to offer treatment is made. Hence an additional standard for this audit, datapoint 4b was created. This examined the time from first referral to the time of decision to treat, with an aim of this total process being ≤14 days. On average this took 22.3 days, with a maximum wait time of 162 days and a minimum wait time of five days. This additional datapoint for this audit showed only 59% of cases meeting the ≤14 day target.

Discussion

Streamlining cancer pathways and creating national standards have been shown to improve service delivery and clinical practice to ensure efficient and timely care for patients.[1] When analysing the ideal time course of a patient moving through the pathway up until the treatment decision, our cohort has an average time from GP referral to decision to treat of 74.9 days (Sum of datapoints 1, 2, 3a, 4b mean values). This is over the FCT target of receiving the first treatment started within 62 days of referral. This is reflected with a very low rate of only 39% of patients meeting this 62-day target, well off the MoH target of >85% by the end of 2016, and even lower than the baseline of 65%.[8] The addition of the maximum time allowances for the standards of service provision (Good practice point 3.3, Standard 1a, 6 and 12) would give a time period of 52 days to treatment decision, assuming only one MDM discussion was required for treatment

plan (see Table 1). This would leave only a 10-day time period to meet with the patient and offer and organise the first treatment. This suggests that the service provision standards from which the audit datapoints are based on do not realistically equate with a true time course of investigating and making a decision on treatment for a gynaecological cancer patient. We can see from this audit that there is a significant delay during the investigation and management plan time, and it would appear that the greatest delay is time to obtain this tissue diagnosis, especially when the tissue requires an operation to obtain (datapoint 3a), with a highest average waiting time for tissue diagnosis being 55 days. The time that is spent discussing the treatment plan in the MDM meetings (datapoint 4b) also shows a significant delay in the pathway before treatment decision is made with a highest average wait time of 22.3 days. Our results suggest that having a time of 31 days from treatment decision to first treatment is realistic and obtainable (73% of patient cases met this target). However, to meet the overall 62 day target, the service standards of referral to treatment decision should equate to a maximum of 31 days. For example, only allowing a maximum of six days for first specialist appointment, five days for radiological investigations, 10 days for histological diagnosis and 10 days for the MDM to come to a final treatment decision.

Referral to a gynaecological oncology MDM is important to the patient's management, as those who have their surgeries performed by a gynaecological oncologist have been shown to have better outcomes.[6] However, there are few studies to show MDM meetings have an effect of improved care in patients with gynaecological malignancies.[6] Recent study of the Auckland Gynaecology MDM did however show that MDM did pick up discrepancies in patient care and results in 5.9% of cases, particularly in pathological diagnosis, but it is unclear whether changes made have an overall improvement in patient outcomes. Currently it is thought that overall MDM review and management do provide benefit and so is the standard of care.[6] However, it would also be prudent to feedback to the MDM team about the delay that multiple meetings prior to a treatment decision can cause for Northland patients. Perhaps there is room for improvement in MDM resourcing in tertiary centres to ensure patient cases receive timely assessment and management plans. Potential ways to improve this could be to increase the frequency of MDM meetings per week or potentially increased support or advice to referring doctors on additional investigations that may be required so that they could be arranged prior to MDM discussion. A 24-hour telephone consultation service is available in some states of Australia for those with confirmed or suspected gynaecological malignancy.[5]

Suggestions for improvement to obtain service provision standards could first be the consideration of further education for primary care doctors. This would be to ensure that they are aware of concerning features for gynaecological malignancy which can be reasonably non-specific in isolation. This would allow them highlight a patient's concerning features on referral with other relevant information to allow the specialists to prioritise them accordingly as "Urgent—high suspicion of cancer". This would mean those patients are then tracked by the FCT system and that they are seen urgently. It would appear that this is not occurring often enough in this cohort, with only three out of 55 cases of cancer initially flagged as "Urgent-High suspicion of cancer" on initial referral. For those patients who are seen at FSA and then are thought to have symptoms concerning for cancer, an improvement could be to then include these patients in FCT tracking also.

There is also room to enhance communication and prioritisation of patients onto operating lists for the obtainment of a histology specimen. Having more available gynaecological surgeons, theatre time and theatre staff to provide adequate space for these patients is also likely to be required. Also improvements in prioritisation across the investigation services (Laboratory and Radiology) of high suspicion of cancer patients so that their investigations are booked and processed first to avoid unnecessary delay.

This audit does have limitations and room for bias within. Firstly, having identification of patient cases from an informalised list from the CNS computer creates potential

for cases being missed. Currently there is no official MDM database in Northland or in Auckland. In 2012 the Cancer Nurse Coordinator (CNC) role was developed to help improve the timeliness and access to treatment services of patients with or suspected cancer. There are 60 in place currently with slight variations in roles/titles, however, it would appear that despite this there is still no official database to effectively track patients. Currently the CNC in Northland works closely with the overall DHB cancer tracker but tracking patients is not their responsibility. The evaluation of the impact of these nurses has been carried out from January 2013–June 2016, however, results are pending.[7] Having to rely on the information provided in the data provided on concerto is limiting, as the accuracy is unknown. It may be beneficial for a database of all patients discussed at MDM to be started in which the data for the national cancer pathway standards are incorporated. This would ensure correct dates and reasons for any delays are recorded and alerts for when patient is breaching or about to breach the prescribed timeframe. Instead of this being just one person for the entire DHB, this would ideally be someone who is involved in the care of the patients such as another gynaecology CNS/CNC or the patient's lead clinician. This should also be broadened from the current practice of only tracking those with "Urgent—high suspicion of cancer" triage to include all those who have a confirmed diagnosis of cancer.

Conclusion

This audit highlights the pitfalls in the current cancer care provided for Northland gynaecological cancer patients. Current management is a long way off managing to meet faster cancer treatment targets. It also highlights shortcomings in the standards of service provision for gynaecological cancers with the timeframes being inadequate to support treatment target times. Although this audit was done in the Northland region, it may bring to light concerns that are occurring in other secondary care centres that rely on communication with tertiary centres for cancer management and may also be present in patient pathways for other cancer types. Improvements in data collection and analysis of cancer patients are essential to develop improvements in process and ensure targets are met. Incentives for District Health Boards meeting these targets should also be considered. These results need to be acted on to ensure we are providing the best care for these women with a hope to reduce the number of gynaecological cancer related deaths in New Zealand.

Competing interests:
Nil.

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Additional information

Table 5: Breakdown of methods of tissue obtainment- Statistics on days waited and percentage of target met.

Standard 3a	Target met (≤14d)	Total number	Mean (d)	Max (d)	Min (d)
Ascitic/pleural	0.75	4	10.5	23	2
BM	1	1	2	2	2
Pipelle	0.71	7	13.3	28	5
Cone	0.33	3	55	120	4
Op-external biopsy	0	4	32	49	21
Op-hysteroscopy	0.2	10	52	63	36
Op-laparot	0.19	21	37.8	56	14
Us biopsy	0.5	2	21	28	14
Ct biopsy	1	2	7.5	9	6
Standard 3b	**Target met (≤10d)**	**Total number**	**Mean (d)**	**Max (d)**	**Min (d)**
Ascitic/pleural	0.75	4	8.5	22	2
BM	1	1	2	2	2
Pipelle	0.57	7	13.3	28	5
Cone	1	3	3.7	7	1
Op-external biopsy	1	4	12	29	3
Op-hysteroscopy	0.9	10	8.5	16	3
Op-laparotomy	0.57	21	10.8	23	6
Us biopsy	0.5	2	13	21	5
Ct biopsy	1	2	3.5	5	2

Table 6: Each disease entity and percentage meeting audit pathway targets.

Percentage meeting audit standard targets (%)											
	1	2-USS	2-CT	2-MRI	3a	3b	4a	4b	5	6	Number
Ovarian											
Borderline	100	100	67	NP	60	20	100	100	25	20	5
Malignant	71	83	100	100	29	29	86	29	86	71	7
Endometrial	45	33	93	80	80	40	100	65	65	20	21
Cervical	50	NP	NP	0	75	25	75	25	67	33	4
Mullerian	80	100	100	NP	80	60	100	60	100	100	5
Vaginal	50	NP	50	100	50	0	100	0	100	0	2
Vulval	50	NP	NP	NP	100	0	50	50	0	0	2
Molar	100	NP	NP	NP	100	100	100	100	100	100	1

NP= Not performed, one vulval cancer declined treatment, one cervical cancer failed to attend.

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Pathways to ambulatory sensitive hospitalisations for Māori in the Auckland and Waitemata regions

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ABSTRACT

AIM: Ambulatory Sensitive Hospitalisations (ASH) are a group of conditions potentially preventable through interventions delivered in the primary health care setting. ASH rates are consistently higher for Māori compared with non-Māori. This study aimed to establish Māori experience of factors driving the use of hospital services for ASH conditions, including barriers to accessing primary care.

METHOD: A telephone questionnaire exploring pathways to ASH was administered to Māori (n=150) admitted to Auckland and Waitemata District Health Board (DHB) hospitals with an ASH condition between January 1st–June 30th 2015.

RESULTS: A cohort of 1,013 participants were identified; 842 (83.1%) were unable to be contacted. Of the 171 people contactable, 150 agreed to participate, giving an overall response rate of 14.8% and response rate of contactable patients of 87.7%. Results demonstrated high rates of self-reported enrolment, utilisation and preference for primary care. Many participants demonstrated appropriate health seeking behaviour and accurate recall of diagnoses. While financial barriers to accessing primary care were reported, non-financial barriers including lack of after-hours provision (12.6% adults, 37.7% children), appointment availability (7.4% adults, 17.0% children) and lack of transport (13.7% adults, 20.8% children) also featured in participant responses.

CONCLUSIONS: Interventions to reduce Māori ASH include: timely access to primary care through electronic communications, increased appointment availability, extended opening hours, low cost after-hours care and consistent best management of ASH conditions in general practice through clinical pathways. Facilitated enrolment of ASH patients with no general practitioner could also reduce ASH. Research into transport barriers and enablers for Māori accessing primary care is required to support future interventions.

Ambulatory Sensitive Hospitalisations (ASH) is an academic construct of a group of conditions for which hospitalisation is potentially preventable through prophylactic or therapeutic interventions delivered in the primary health care setting.[1] ASH are often categorised as vaccine-preventable, acute or chronic conditions. Key pathways to this categorisation of ASH include inadequate vaccination, lack of early detection and treatment of acute conditions, and inadequate control of chronic conditions.[2]

ASH rates for 0–4 year olds have recently been employed as a measure of health care integration and whole system performance in the Ministry of Health's Integrated Performance and Incentives Framework.[3] ASH rates are also employed as an indicator for Māori Health.[4–6] The Ministry of Health have recently undertaken a review of the methodology and definition of ASH.[7]

ASH rates are consistently higher for Māori, with rates 1.6 to 2.3 times higher for Māori than non-Māori.[4] Multiple factors have been linked to ASH. Health care affordability, accessibility and availability have been shown to reduce ASH,[8–12] as has acceptability of care, quality of care and accommodation of patient preferences.[8,11,13] Access to the socioeconomic determinants of health including income,[9,10,12,14] education,[12,14] transport,[11] quality housing[15] and social supports can also reduce ASH.[13,14,16,17] Other factors that impact upon ASH include

health-seeking behaviour and practitioner factors.[8,11,13] While ASH are considered potentially preventable through interventions delivered in the primary health care setting, the impact of social determinants of health limit the use of ASH to determine preventability within primary care.[8]

Overall primary care access with regard to use and availability of services is lower for Māori than non-Māori as demonstrated by gaps in enrolment for primary care,[18] well child and oral health services.[19] However, this is variable across age groups and geographical regions, and ethnicity misclassification is likely to account for some of the difference.[20] Māori are more likely to face financial barriers for general practitioner (GP), after-hours and pharmacy services, to experience unmet need for health care due to lack of transport and are less likely to secure an available appointment within 24 hours of enquiry.[4] There is also evidence of poorer quality of primary care for Māori, who may receive shorter consultations, fewer investigations, fewer prescriptions and lower secondary care referral rates than non-Māori.[21] As an indicator of health system performance, within the context of known issues of primary care access and quality, high Māori ASH rates may represent an appropriate response of seeking necessary care from the most accessible source.

A number of interventions have been identified in the literature as beneficial in reducing ASH. These include condition specific, multidisciplinary, patient centric programmes; increased access to primary care, in particular for children and underserved populations; and managing patients out of hospital through community-based pharmacological and telemedicine interventions.[22]

Methods

The study used descriptive methodology to report perceptions about health care experience, pathways to admission, attitudes and behaviours. The study was a telephone administered questionnaire (Appendix 1 and 2) developed utilising standard validated questions from the New Zealand Health Survey (NZHS)[23] and Agency for Healthcare Research and Quality Clinician Survey.[24] The population of interest were Māori aged 0–74 admitted to Waitemata DHB (North Shore Hospital or Waitakere Hospital), or Auckland DHB (Auckland City Hospital or Starship Hospital) with a primary diagnosis of an ASH condition from January 1st–June 30th 2015. The Ministry of Health ASH definition at the time of the study was used to determine which conditions were classified as ASH. Usual ASH filters were applied (eg deceased patients, babies <28 days and admissions lasting <3 hours were excluded).[7]

Questionnaire surveys were conducted from April 8th–July 2nd 2015 by culturally appropriate, trained telephone interviewers using an agreed script. Verbal consent to participate was sought from participants or parents/guardians of children (less than 16 years). The survey included multiple choice questions with a number of free text options. Questions explored primary care enrolment and utilisation, history of the ASH condition, health seeking behaviours, health care journey in the week and year prior to admission, and barriers and enablers to accessing primary care. Interviews were between 15 minutes and one hour in duration.

Participant responses were matched with hospital data including: demographic data, National Health Index (NHI) number, admitting hospital, deprivation level and whether a named GP was recorded in the hospital records at admission. Ethnicity was prioritised according to standard ethnicity protocols.[25] Deprivation was assigned using the New Zealand Index of Deprivation (NZDep), a small area measure of deprivation derived from census data.[26] NZDep was categorised into quintiles (1 least deprived quintile, 5 most deprived quintile). At the time data were extracted, new domicile codes based on 2013 census area units were yet to be implemented, however, updated 2013 NZDep scores were available. Where a domicile code remained unchanged from 2006, its 2013 NZDep score was used. Where a domicile was no longer in use, the 2006 NZDep score was used as a proxy.

Descriptive statistics are presented and qualitative data were analysed using thematic analysis. Statistical analysis was undertaken in Stata 13.0 (StataCorp. 2013. Stata Statistical Software: Release 13. College Station, TX: StataCorp LP) and Microsoft Excel. Differences in characteristics between participants and non-participants were

assessed using two sample t-tests, Wilcoxon rank-sum test, Pearson's chi-squared and Fisher's Exact test.

The survey was considered low risk, not requiring formal approval from the Health and Disability Ethics Committee. DHB localities approval was granted. A $20 supermarket voucher koha was offered to survey participants. Systems were put in place to manage any possible disclosure of information, psychological distress or service complaints. Participants who raised any issues were offered follow up with hospital whānau support services (He Kamaka Waiora).

Results

A cohort of 1,013 eligible participants were identified from hospital records, 150 participants (97 adults, parents/guardians of 53 children) completed the telephone survey, giving an overall response rate of 14.8% (Figure 1). Of the eligible cohort, 802 (79.2%) were unable to be contacted despite up to three attempts at different times of the day/week, and 40 (3.9%) were found to have no such telephone number. Of the 171 people that were contactable, 150 agreed to participate (response rate of contactable patients of 87.7%).

Survey participants had similar demographic characteristics to non-participants (Table 1). Māori participants admitted with an ASH condition during the study period were more likely to live in the highest deprivation quintile compared with non-Māori admitted with an ASH condition (36.0% and 22.6% respectively). Participants were also more likely to live in areas of high deprivation compared with the total Māori population for Auckland and Waitemata DHBs, in which 27% and 14% of Māori live in the most deprived quintile.

Leading ASH conditions for adults surveyed were cellulitis, angina and chest pain, pneumonia and kidney/urinary infections. For children surveyed, leading ASH conditions included dental conditions, asthma and cellulitis (Table 1). Non-participants include persons who were non-contactable or who declined to participate.

Participants reported high levels of enrolment and utilisation of primary care services. Self-reported enrolment was higher than the percentage of participants who had a GP listed in the hospital data (95.9% versus 85.6% for adults, 100% versus 71.7% for children). Participants reported regular contact with primary care with 84.9% of adults and 90.2% of children being seen two or more times in the 12 months before admission (Table 2).

Participants reported a strong preference for seeing a GP first, rather than visiting a hospital or other health provider (74.7% adults and 94.2% children). Thematic analysis demonstrated preference for seeing a GP was due to ease of access and greater convenience of a GP compared with hospital

Figure 1: Flow diagram of participants eligible to participate in the pathways to ASH survey.

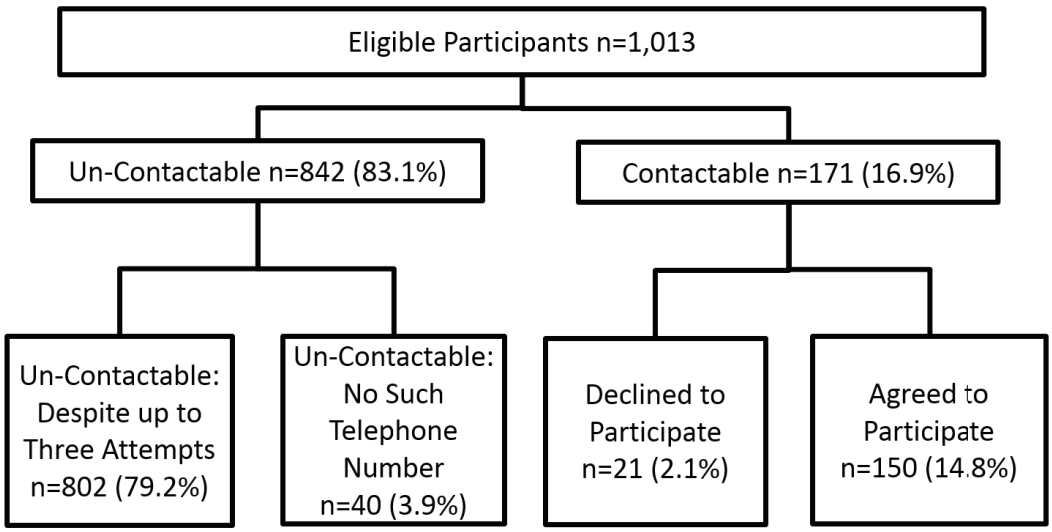

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Table 1: Comparison of characteristics for participants and non-participants.

Factor	Level	Participants (%)	Non-participants (%)	p-value
N		150	863	
Age, mean (SD)		33.4 (23.6)	33.1 (23.3)	0.89
Gender	F	72 (48.0)	455 (52.7)	0.29
	M	78 (52.0)	408 (47.3)	
NZDep quintile	1	12 (8.0)	57 (6.7)	0.91
	2	24 (16.0)	122 (14.2)	
	3	27 (18.0)	169 (19.7)	
	4	33 (22.0)	196 (22.9)	
	5	54 (36.0)	313 (36.5)	
GP recorded at admission	No	29 (19.3)	194 (22.5)	0.39
	Yes	121 (80.7)	669 (77.5)	
LOS, median (IQR)		1 (0, 3)	1 (1, 3)	0.46
ASH category	Cellulitis	23 (15.3)	182 (21.1)	0.062
	Dental conditions	21 (14.0)	112 (13.0)	
	Asthma	19 (12.7)	39 (4.5)	
	Angina and chest pain	12 (8.0)	95 (11.0)	
	Respiratory infections: pneumonia	11 (7.3)	45 (5.2)	
	Kidney/urinary infection	11 (7.3)	59 (6.8)	
	Gastroenteritis/dehydration	9 (6.0)	64 (7.4)	
	Congestive heart failure	6 (4.0)	39 (4.5)	
	Diabetes	6 (4.0)	29 (3.4)	
	Myocardial infarction	5 (3.3)	31 (3.6)	
	Stroke	5 (3.3)	14 (1.6)	

or other providers. Participants valued the long established relationships and history they shared with their GP. Many participants reported that hospitals were for emergencies and that it was inappropriate to visit a hospital for non-urgent issues. One in four adults preferred to visit a hospital or specialist first if they were unwell, needed a check-up or health advice. Reasons given for this preference included better quality of care, lower costs and lack of available appointments in primary care.

High levels of continuity of carer (GP or practice nurse) were demonstrated with the majority of adults (75.3%) and children (70.6%) reporting they would usually see the same GP or practice nurse. Participants reported receiving comprehensible health instructions from primary care staff about taking care of their illness (adults 83.0%, children 96.1%). High levels of concordance were seen between self-identified reason for admission and ASH category coded at discharge. Concordance was particularly high for children (92.5%) (Table 2).

Despite high levels of self-reported enrolment, utilisation and preference for general practice, a significant number of participants reported never seeing a health professional for their current ASH condition (22.7% adults, 39.6% children) and had not seen a GP or practice nurse in the week

Table 2: Summary of findings.

Findings	Adults (%)*	Children (%)*
Self-reported enrolment with a GP	93/97 (95.9)	53/53 (100)
GP details recorded in hospital data	83/97 (85.6)	38/53 (71.7)
Two or more GP visits in the 12 months before admission†	79/93 (84.9)	46/51 (90.2)
Four or more GP visits in the 12 months before admission†	65/93 (69.9)	29/51 (56.9)
10 or more GP visits in the 12 months before admission†	34/93 (36.6)	3/51 (5.9)
Prefer GP as first health contact‡	71/95 (74.7)	49/52 (94.2)
Continuity of carer when seen in primary care§	67/89 (75.3)	36/51 (70.6)
Received comprehensible health instructions in primary care in the 12 months before admission‖	73/88 (83.0)	49/51 (96.1)
Concordance between ASH coding and self-reported reason for admission	67/97 (69.1)	49/53 (92.5)
Did not see a health professional for the ASH condition before admission	22/97 (22.7)	21/53 (39.6)
Did not see a GP or Practice nurse in the week before admission**	39/95 (41.1)	13/34 (38.2)
Unwell for less than one week before admission	46/97 (47.4)	22/53 (41.5)
Unable to see a GP within 24 hours of request in the 12 months before admission	31/97 (32.0)	5/53 (9.4)
Used telephone or email to access GP practice in the 12 months before admission	27/97 (27.8)	6/53 (11.3)
Readmitted for the same ASH condition	41/96 (42.7)	15/53 (28.3)

*Percentages presented use the total number of participants who provided a response to the question as the denominator.
†Includes visits to a GP and practice nurse.
‡Prefer to visit their GP first rather than visiting a hospital or other health provider if they are unwell, need a check-up or health advice.
§When seen in primary care, participants would usually see the same GP or GP nurse.
‖Reported always or almost always being given easy-to-understand instructions from their GP or GP nurse about taking care of their illness/child's illness.
**Excludes participants with dental conditions.

before admission (adults 41.1%, children 38.2%, excludes dental admissions). Many adults (47.4%) and children (41.5%) reported being unwell for less than one week before admission (Table 2).

There was evidence of barriers to timely access to a GP with 32% of adults reporting they were unable to see a GP within 24 hours. Lack of available appointments was the main reason given by adults (48.4%) for being unable to access a GP within 24 hours. Telephone and email communications were used less often to access GP advice (adults 27.8%, children 11.3%) (Table 2).

In the week prior to admission, 41.5% of children and 58.8% of adults reported seeing a GP or practice nurse. Adult readmissions for the ASH condition were seen across the spectrum of ASH conditions, whereas asthma accounted for 73.3% of paediatric ASH readmissions.

General practice not being open when needed or lack of after-hours provision were the main reasons given for children delaying or not seeing a GP before going to hospital. Other factors included lack of transport, no available appointment and financial barriers. For adults, financial barriers, including being unable to afford to see the GP, being unable to pay for prescriptions and pre-existing debts with the GP, were the main reason for delaying or not seeing a GP. Other reasons given were general practice not being open or not having after-hours provision, lack of transport and no available appointments. Key enablers, reported by caregivers that would make accessing a GP easier for children, were enhanced affordability and availability of after-hours care. Other facilitators included having transport to see the GP and free or low cost GP care. For adults, reducing financial barriers to both general practice and after-hours care was the most important measure to make seeing a GP easier. Other facilitators included having transport and GPs being open after-hours (Table 3).

Table 3: Summary of barriers and enablers to accessing a GP.

Barriers to accessing a GP	**Adults N=95 (%)***	**Children N=53(%)***
GP not open or it was after-hours	12 (12.6)	20 (37.7)
Lack of transport	13 (13.7)	11 (20.8)
No appointments available	7 (7.4)	9 (17.0)
Unable to afford to see a GP	14 (14.7)	3 (5.7)
Unable to afford prescriptions†	7 (7.4)	1 (1.9)
Owe the GP money	3 (3.2)	4 (7.5)
Waiting times too long	3 (3.2)	2 (3.8)
Negative experience with a GP in the past	4 (4.2)	4 (7.5)
Could not get childcare	1 (1.1)	0 (0.0)
Could not get in touch with the doctor	0 (0.0)	2 (3.8)
Thought I would not be respected	0 (0.0)	0 (0.0)
Thought the GP would not want to help me	0 (0.0)	1 (1.9)
Do not trust GPs	0 (0.0)	0 (0.0)
Enablers to accessing a GP	**Adults N=94 (%)**	**Children N=52 (%)**
Free or low cost after-hours‡	31 (32.9)	43 (82.7)
GP practice open after-hours	27 (28.7)	42 (80.8)
Having transport to the GP	30 (31.3)	37 (71.2)
Free or low cost GP care‡	50 (53.1)	34 (65.4)
Feeling welcome at GP practice	3 (3.2)	1 (1.9)
Feeling that the GP respects me	2 (2.1)	1 (1.9)
More appointments	2 (2.1)	0 (0.0)
Shorter waiting times	2 (2.1)	0 (0.0)
Having childcare	1 (1.1)	0 (0.0)

*Percentages presented use the total number of participants who provided a response to the question as the denominator.
†Could not afford to pay for medication if the GP was to give them a prescription.
‡Sub-analysis of enablers to accessing primary care reported by caregivers demonstrated no significant differences in responses for children aged <6 or ≥6 reporting that free or low cost GP (<6 years: 18/27, ≥6 years 16/26, p=0.70) or free or low cost after-hours care (<6 years: 21/27, ≥6 years 22/26, p=0.53) would make it easier to see a GP.

Discussion

Māori patient and whānau experience presented in this study provides a counter narrative to the deficit focus often taken in reports on ASH. Many participants demonstrated appropriate health-seeking behaviour, pertinent use of secondary care services and accurate recall of diagnoses. Of interest in this survey was the high proportion of un-contactable patients. This raises concerns regarding the ability of hospital services to contact patients post-discharge and the accuracy of contact details included on discharge summaries.

Local work on diabetes clinic 'Did Not Attend' rates has also demonstrated a high proportion of un-contactable patients. The importance of accurate patient contact details has been recognised nationally with the Ministry of Health undertaking a National Enrolment Service (NES). The NES will allow primary care to update the NHI health identity data with contact details; hospital services will then be able to access more accurate data.[27] Introduction of a DHB caller ID to identify incoming calls as being from the DHB could be investigated as a way of improving telephone call pick-up rates and contactability of patients post-discharge.

The study demonstrates several key areas for intervention to reduce high Māori ASH rates. Inconsistencies between self-reported enrolment and presence of a GP recorded in hospital data may reflect incomplete recording of GP details or patients incorrectly assuming they are enrolled. However, the majority of participants had seen their GP in the last 12 months. These inconsistencies raise the possibility that discharge communications for some participants are not reaching their GP which may be contributing to ASH readmissions.

Lower rates of Primary Health Organisation (PHO) reported enrolment for Māori are compounded by known ethnicity misclassification, which underestimates PHO enrolment for Māori.[20] Structured discharge planning has been shown to reduce ASH admission.[14,22] Recommendations to improve this include steps to increase Māori enrolment through the Multi-Enrolment Project to enrol newborns into a range of services including primary care and oral health services. Multi-enrolment of newborns has been employed by the Porirua Social Sector Trial, successfully contributing to an increase in children enrolled in oral health services.[28] Other recommended activities include ensuring GP details are checked and updated with each admission and active follow up and facilitated enrolment of ASH patients with no GP identified.Despite high levels of utilisation of primary care services in the previous year, many adults and children did not see a GP or practice nurse in the week before admission. Given that 47.4% of adults and 41.5% of children were unwell for less than one week, lack of GP contact in the week prior to admission represents a lost opportunity to prevent an admission. Timely access to a GP and lack of available appointments was a recurrent issue for many adults. Similar findings have been found nationally with 21% of Māori adults and 16% of Māori children being unable to get an appointment at their usual medical centre within 24 hours in the last 12 months.[4] Given the potential to mitigate ASH with primary care interventions, improving timely access to primary care is an important step in reducing ASH.

Greater use of electronic communications between patients and primary care through services such as the Electronic Health Record and Patient Portal could improve timely access to GP advice and management for chronic conditions. Telemedicine including regular contact by telephone has been shown to reduce ASH for chronic conditions including heart failure and diabetes.[14] Ensuring that these enhanced systems work for Māori and do not increase ethnic inequities is important.

Free or low cost GP care and after-hours care were identified by adults as key enablers for accessing a GP. Having GP practices open after-hours and low cost or free after-hours care were key enablers identified to improve children's access to a GP. Given the acute nature of many paediatric ASH and the strong preference from caregivers to see a GP, steps to extend GP opening hours and free or low cost after-hours care could reduce ASH. At the time of the ASH survey coverage for free after-hours care for children under six years old was 98% and 96% for Auckland and Waitemata DHBs respectively. Extension of free after-hours care to include children aged under thirteen may further reduce financial barriers to after-hours care. While financial barriers to accessing primary care were reported by many participants, non-financial barriers including appointment availability, after-hours care and transport also featured in participant responses.

Comparisons between participants and non-participants indicate there were no significant differences with regard to age, gender, deprivation, record of a GP at admission, length of stay and ASH condition. However, the high number of un-contactable people and subsequent low response rate of eligible participants means the study is exploratory and limits generalisability of results.

Areas of further research

Lack of transport was identified as preventing or delaying adults and children from seeing a GP. Findings from the NZHS support the importance of transport as a barrier to accessing primary care for Māori.[4] The NZHS reported Māori adults and children were more likely to experience unmet need for a GP due to lack of transport than non-Māori with rate ratios of two and

three respectively.[4] Lack of transport may be due to lack of access to a car, being unable to drive due to medical or licencing restraints, lack of access to public transport or inability to fund transport. Further research into the nature of transport barriers and enablers for Māori accessing primary care is required to support future interventions.

Despite high levels of contact with primary care, participants were still admitted with an ASH condition. This suggests steps to mitigate some ASH admissions were not being fully realised. Ensuring consistent, best practice management of ASH conditions in general practice through clinical pathways could prevent some of these ASH admissions. Admission with an ASH condition despite GP contact in the week prior may reflect referral being necessary at the point of presentation, limiting timely effective intervention in primary care. A more detailed case review would be needed to understand this further.

High rates of paediatric asthma readmissions suggest a recurrent failure to mitigate potentially preventable admissions, despite cases being seen repeatedly by primary and secondary care. The underlying cause of these readmissions is unclear and could relate to access and quality of GP services, quality of hospital management, discharge planning, health literacy[29] and environmental factors such as crowded and poor quality housing.[10,15,29] Again, a more detailed case review would be needed to understand this further. Further research to assess the impact on ASH following subsidised GP visits for children aged under six and more recently, children aged under thirteen would further clarify the influence of financial barriers on ASH.

Strengths and limitations

Strengths of this research include the focus on patient and whānau experience to inform relevant interventions for Māori. The survey was comprehensive in its enquiry across pathways to ASH with questions relating to social determinants of health, access to primary care and quality of care received. Quantitative and qualitative data allowed for both breadth and depth of enquiry. The use of validated questions previously included in the NZHS allowed regional findings to be compared with the national context.

Study limitations include the low response rate limiting generalisability of results and potential for selection bias as patients were not randomly selected. However, there were no significant differences between these two groups, suggesting the impact of selection bias is likely to have been low. Recall bias may have arisen due to delay between hospital admission and survey completion which was 2–17 weeks (average 10 weeks) following discharge. Questions relating to events 12 months before admission add to the potential for recall bias. Pathways to dental ASH, a leading ASH condition for children, are likely to be affected by utilisation, access and quality of oral health services which were not specifically covered in this survey.

Conclusion

This study demonstrated many positive findings including appropriate health-seeking behaviour, accurate recall of diagnoses and high rates of self-reported enrolment, utilisation and preference for primary care. Financial barriers to accessing primary care were reported, as well as non-financial barriers including appointment availability and lack of transport. Measures to reduce the high ASH rates for Māori include: timely access to primary care through electronic communications, increased appointment availability, extended opening hours and low cost or free after-hours care, consistent best management of ASH conditions through clinical pathways and addressing transportation barriers.

Competing interests:
Dale Bramley is the CEO of Waitemata DHB.
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Appendices

Appendix 1: Pathways to Ambulatory Sensitive Hospitalisations: Adult Survey

Survey Instructions

Answer each question by marking the box to the left of your answer.

You are sometimes asked to skip over some questions in this survey. When this happens you will see an arrow with a note that tells you what question to answer next, like this:

☐ Yes → **If Yes, go to #1 on page 1**
☐ No

Your child's health

1. What illness did you come into hospital for?

2. How long have you had this illness?
☐ 1 day–1 week (7 days)
☐ Between 1 week and 1 month
☐ Between 1 month and 3 months
☐ Between 3 months and 12 months
☐ More than 12 months
☐ I don't remember

3. Do you need or take medicine prescribed by a doctor for this illness?
☐ Yes
☐ No

4. Have you been admitted to hospital with this illness before?
☐ Yes
☐ No
☐ I don't know/remember

7. When was the last time you saw a health professional for the illness you were admitted to hospital with?
☐ Never → **If Never, go to #21 on page 5**
☐ The day I went to hospital
☐ 2 days–1 week (7 days) ago
☐ Between 1 week and 1 month ago
☐ Between 1 month and 3 months ago
☐ Between 3 months and 12 months ago
☐ More than 12 months ago
☐ I don't remember

8. What health professional/s did you see for this illness before you went to hospital?
☐ None
☐ GP
☐ GP nurse
☐ Other

9. Was this the health professional/s you usually see if you need a check-up, want advice about a health problem, or get sick or hurt?
☐ Yes
☐ No

10. What care did you receive from the health professional?
☐ Referral to hospital
☐ Advice or instructions
☐ Pamphlet or written information

Your care from health professionals

5. Do you have a GP or a GP practice that you visit if you need a check-up, want advice about a health problem, or get sick or hurt?

- ☐ Yes
- ☐ No

6. Are you enrolled with a GP?

- ☐ Yes
- ☐ No
- ☐ I don't know

- ☐ Medication script
- ☐ Medication administered by a GP or nurse
- ☐ Wound care
- ☐ I don't know
- ☐ Other

11. In the last 12 months, how many times did you visit a GP or GP nurse to get care for yourself?

- ☐ 1 time
- ☐ 2
- ☐ 3
- ☐ 4
- ☐ 5 to 9
- ☐ 10 or more times

12. When you went to see a GP or GP nurse, would the same GP or GP practice nurse usually see you?

- ☐ Yes
- ☐ No
- ☐ I don't know

13. In the last 12 months, how often did this GP or GP nurse give you easy to understand instructions about taking care of your illness?

- ☐ Never
- ☐ Almost never
- ☐ Sometimes
- ☐ Usually
- ☐ Almost always
- ☐ Always

16. The last time you couldn't be seen by a GP within 24 hours, why was that?

- ☐ There weren't any appointments
- ☐ The time offered didn't suit me
- ☐ The appointment was with a GP I didn't want to see
- ☐ I could have seen a nurse but I wanted to see a GP
- ☐ I don't know
- ☐ Another reason:

14. In the past 12 months, has there been a time when you wanted to see a GP, within the next 24 hours, but they were unable to see you?

- ☐ Yes
- ☐ No
- ☐ I don't know

15. How many times has this happened in the past 12 months?

- ☐ 1 time
- ☐ 2
- ☐ 3 or more times
- ☐ I don't know

17. In the past 12 months, did you phone a GP practice with a medical question during regular office hours or email the practice with a medical question? A medical question includes test results.

- ☐ Yes
- ☐ No
- ☐ I don't know/remember

18. In the past 12 months, when you phoned the GP practice during normal office hours or emailed the GP practice, how often did you get an answer to your medical question the same day?

- ☐ Always
- ☐ Usually
- ☐ Sometimes
- ☐ Never
- ☐ I don't know/remember

19. In the last 7 days, how many times did you visit a GP or GP nurse to get care for yourself?

- ☐ Never → **If Never, go to #21 on page 5**
- ☐ 1 time
- ☐ 2
- ☐ 3 or more times

20. In the last 7 days, how often did this GP or GP nurse give you easy to understand instructions about taking care of your illness?

- ☐ Never
- ☐ Almost never
- ☐ Sometimes
- ☐ Usually

22. Did any of these reasons about accessing a GP make you choose **not** to see a GP before going to hospital, or delay you seeing a GP?

- ☐ My GP wasn't open when I needed to see them, or it was after hours
- ☐ I couldn't get in touch with the doctor
- ☐ There were no appointments available

- ☐ Almost always
- ☐ Always

21. Did any of these reasons <u>about a GP's or GP practice's behaviour</u> make you choose **not** to see a GP before going to hospital or delay you seeing a GP?

- ☐ I thought I would not be respected
- ☐ I thought the GP would not want to help me
- ☐ I do not trust GPs
- ☐ I have had a negative experience with a GP in the past

- ☐ Other
- Please tell us more about this:

- ☐ I couldn't get transport to see the GP
- ☐ I couldn't get childcare
- ☐ I couldn't afford to see the GP
- ☐ I couldn't afford to pay for medication if the GP was to give me a prescription
- ☐ I owe the GP money

- ☐ Other
- Please tell us more about this:

23. When you need a check-up, want advice about a health problem, or get sick or hurt, where would you prefer to go first? (Choose one only)

- ☐ GP
- ☐ Hospital

- ☐ Other
- Please tell us more about this:

About you

26. What is your age?

- ☐ 0–4
- ☐ 5–9
- ☐ 10–14
- ☐ 15–19
- ☐ 20–24
- ☐ 25–29
- ☐ 30–34
- ☐ 35–39
- ☐ 40–44
- ☐ 45–49
- ☐ 50–54
- ☐ 55–59
- ☐ 60–64
- ☐ 65–69
- ☐ 70–74

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24. When you went to the hospital did you think you would be admitted to hospital?

☐ Yes
☐ No

25. What would make it easier for you to see a GP?

☐ Having transport to the GP
☐ Free or low cost GP care
☐ GP practice open after hours
☐ Free or low cost after hours care
☐ Feeling welcome at the GP practice
☐ Feeling that the GP respects me

☐ Other

- Please tell us more about this:

27. Are you?

☐ Male
☐ Female

28. What is your highest level of education?

☐ Primary school / Kura kaupapa
☐ Secondary school / Kura kaupapa (High School/College)
☐ Tertiary / Wananga (University or Polytechnic)
☐ No formal education

29. What is your hospital number (NHI)?

(This might be on your hospital wrist band, or the kaiatawhai may be able to help you find it)

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Appendix 2: Pathways to Ambulatory Sensitive Hospitalisations: Child (caregivers) Survey

Survey Instructions

Answer each question by marking the box to the left of your answer.

You are sometimes asked to skip over some questions in this survey. When this happens you will see an arrow with a note that tells you what question to answer next, like this:

☐ Yes → **If Yes, go to #1 on page 1**
☐ No

Your child's health

1. What illness did your child come into hospital for?

2. How long has your child had this illness?
☐ 1 day–1 week (7 days)
☐ Between 1 week and 1 month
☐ Between 1 month and 3 months
☐ Between 3 months and 12 months
☐ More than 12 months
☐ I don't remember

3. Does your child need or take medicine prescribed by a doctor for this illness?
☐ Yes
☐ No

4. Has your child been admitted to hospital with this illness before?
☐ Yes
☐ No
☐ I don't know/remember

7. When was the last time your child saw a health professional for the illness they were admitted to hospital with?
☐ Never → **If Never, go to #21 on page 5**
☐ The day I went to hospital
☐ 2 days–1 week (7 days) ago
☐ Between 1 week and 1 month ago
☐ Between 1 month and 3 months ago
☐ Between 3 months and 12 months ago
☐ More than 12 months ago
☐ I don't remember

8. What health professional/s did your child see for this illness before they went to hospital?
☐ None
☐ GP
☐ GP nurse
☐ Other

9. Was this the health professional/s your child usually sees if they need a check-up, get sick or hurt or you want advice about a health problem?
☐ Yes
☐ No

10. What care did your child receive from the health professional?
☐ Referral to hospital
☐ Advice or instructions
☐ Pamphlet or written information

Your child's care from health professionals

5. Does your child have a GP or a GP practice that you visit if they need a check-up, get sick or hurt or you want advice about a health problem?

- ☐ Yes
- ☐ No

6. Is your child enrolled with a GP?

- ☐ Yes
- ☐ No
- ☐ I don't know

- ☐ Medication script
- ☐ Medication administered by a GP or nurse
- ☐ Wound care
- ☐ I don't know
- ☐ Other

11. In the last 12 months, how many times did your child visit a GP or GP nurse to get care?

- ☐ 1 time
- ☐ 2
- ☐ 3
- ☐ 4
- ☐ 5 to 9
- ☐ 10 or more times

12. When you went to see a GP or GP nurse, would the same GP or GP practice nurse usually see your child?

- ☐ Yes
- ☐ No
- ☐ I don't know

13. In the last 12 months, how often did this GP or GP nurse give you easy to understand instructions about taking care of your child's illness?

- ☐ Never
- ☐ Almost never
- ☐ Sometimes
- ☐ Usually
- ☐ Almost always
- ☐ Always

16. The last time your child couldn't be seen by a GP within 24 hours, why was that?

- ☐ There weren't any appointments
- ☐ The time offered didn't suit me
- ☐ The appointment was with a GP I didn't want to see
- ☐ I could have seen a nurse but I wanted to see a GP
- ☐ I don't know
- ☐ Another reason:

14. In the past 12 months, has there been a time when you wanted your child to see a GP, within the next 24 hours, but the GP was unable to see them?

- ☐ Yes
- ☐ No
- ☐ I don't know

15. How many times has this happened in the past 12 months?

- ☐ 1 time
- ☐ 2
- ☐ 3 or more times
- ☐ I don't know

17. In the past 12 months, did you phone a GP practice with a medical question about your child during regular office hours, or email the practice with a medical question about your child? A medical question includes test results.

- ☐ Yes
- ☐ No
- ☐ I don't know/remember

18. In the past 12 months, when you phoned the GP practice during normal office hours or emailed the GP practice, how often did you get an answer to your medical question about your child the same day?

- ☐ Always
- ☐ Usually
- ☐ Sometimes
- ☐ Never
- ☐ I don't know/remember

19. In the last 7 days, how many times did your child visit a GP or GP nurse to get care?

- ☐ Never → **If Never, go to #21 on page 5**
- ☐ 1 time
- ☐ 2
- ☐ 3 or more times

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20. In the last 7 days, how often did this GP or GP nurse give you easy to understand instructions about taking care of your child's illness?

- ☐ Never
- ☐ Almost never
- ☐ Sometimes
- ☐ Usually
- ☐ Almost always
- ☐ Always

21. Did any of these reasons about a GP's or GP practice's behaviour make you choose **not** to take your child to a GP before going to hospital or delay you in taking your child to see a GP?

- ☐ I thought I would not be respected
- ☐ I thought the GP would not want to help me
- ☐ I do not trust GPs
- ☐ I have had a negative experience with a GP in the past

- ☐ Other
- Please tell us more about this

22. Did any of these reasons about accessing a GP make you choose **not** to take your child to a GP before going to hospital, or delay you in taking your child to see a GP?

- ☐ My GP wasn't open when I needed to see them, or it was after hours
- ☐ I couldn't get in touch with the doctor
- ☐ There were no appointments available
- ☐ I couldn't get transport to see the GP
- ☐ I couldn't get childcare
- ☐ I couldn't afford to see the GP
- ☐ I couldn't afford to pay for medication if the GP was to give my child a prescription
- ☐ I owe the GP money

- ☐ Other
- Please tell us more about this

23. When your child needs a check-up, gets sick or hurt or you want advice about a health problem, where would you prefer to take your child **first**? (Choose **one** only)

- ☐ GP
- ☐ Hospital
- ☐ Other
- Please tell us more about this

24. When you went to the hospital did you think your child would be admitted to hospital?

- ☐ Yes
- ☐ No

25. What would make it easier for you to take your child to a GP?

- ☐ Having transport to the GP
- ☐ Free or low cost GP care
- ☐ GP practice open after hours
- ☐ Free or low cost after hours care
- ☐ Feeling welcome at the GP prZactice
- ☐ Feeling that the GP respects me
- ☐ Other
- Please tell us more about this

About your child

26. What is your child's age?

- ☐ 0–4
- ☐ 5–9
- ☐ 10–14
- ☐ 15–19

27. Is your child?

- ☐ Male
- ☐ Female

28. What is your highest level of education? (parent or legal guardian)

- ☐ Primary school/Kura kaupapa
- ☐ Secondary school/Kura kaupapa (High School/College)
- ☐ Tertiary/Wananga (University or Polytechnic)
- ☐ No formal education

29. What is your child's hospital number (NHI)?
(This might be on your hospital wrist band, or the kaiatawhai may be able to help you find it)

Traditional Chinese medicine practitioners in New Zealand: differences associated with being a practitioner in New Zealand compared to China

Asmita Patel, Vahideh Toossi

ABSTRACT

AIMS: While New Zealand has experienced an increase in the use of traditional Chinese medicine (TCM) based acupuncture, very little is known about the practitioners who provide this type of treatment modality. Therefore, this study was designed to identify differences associated with being a TCM practitioner in New Zealand compared to China.

METHODS: Ten Auckland-based TCM practitioners were individually interviewed. The interview schedule comprised of questions that were designed to identify any potential differences in practising TCM in New Zealand compared to China. Data were analysed using an inductive thematic approach.

RESULTS: The main differences in practising between the two countries were related to the role and authority that a TCM practitioner had. This in turn resulted in differences between the conditions that were treated in these two countries. Differences in patient demography were also identified between the two countries.

CONCLUSIONS: TCM is used as a form of alternative healthcare treatment in New Zealand for non-Chinese individuals. Acupuncture is the most utilised form of TCM treatment in New Zealand, and is predominantly used for pain management purposes. TCM treatment has been utilised by individuals from a number of different ethnic groups, reflecting the ethnic diversity of the New Zealand population.

There has been a worldwide increase in the use of complementary and alternative medicine (CAM) including the use of traditional Chinese medicine (TCM).[1–5] TCM encompasses a number of treatment modalities, which include: acupuncture, Chinese herbal medicine, moxibustion, cupping, tuina and tai chi.[6] Acupuncture and Chinese herbal medicine are two of the most well-known TCM treatment modalities in many Western countries.[7]

In China, TCM has been practised for over 2,000 years.[8] TCM has been part of the Chinese culture for many centuries.[9] In 1950, alongside Western medicine (WM), TCM officially became part of the healthcare system in China.[9] In China it is common practice to combine WM and TCM.[10] Research indicates that Chinese herbal medicine represents between 30 to 50% of all medicines prescribed in China.[11] In 2006, there were 2,665 TCM hospitals and 211 combined TCM-WM hospitals in China.[10]

While TCM-based acupuncture originated in China over 2,000 years ago,[8] more recently Western medical acupuncture (WMA) has also been practised. WMA is an adaptation of TCM-based acupuncture. It differs from TCM-based acupuncture in two distinct ways. Firstly, it is not underpinned by TCM philosophy, but rather by a focus on nerve stimulation. Secondly, WMA is not viewed as an alternative medical system.[12] WMA is predominately practised by general practitioners and physiotherapists.[12–13]

TCM-based acupuncture is one of the most recognised and utilised CAM treatments.[1,3,4] In New Zealand, there has been an increase in the use of TCM-based acupuncture, as well as an increase in the number of individuals graduating with formal qualifications in acupuncture and Chinese herbal medicine.[2,14] A recent New Zealand-based study found that an almost equal proportion of individuals who identified as being either Chinese or New Zealand European chose to receive acupuncture and other TCM treatment during a four-month period at a TCM clinic in Auckland, the country's most populated city.[15] The Patel et al study[15] also reported that during this four-month period, 229 new patients attended the TCM clinic.

To date, limited research exists that has focused on TCM practice in New Zealand. With an increase in the use of TCM-based acupuncture and other TCM treatment modalities in New Zealand, more information is required that focuses on the actual practice of TCM in New Zealand. For example, information pertaining to the conditions for which TCM treatment is sought, including patient demographic information, could provide valuable information that can be used for future healthcare planning. Therefore, the present study was designed to identify differences associated with being a TCM practitioner in New Zealand compared to China.

Methods

Participants

Eight female and two male TCM practitioners took part in the present study. Participants were aged between 32 and 52 years of age (mean age = 44.7 years, SD = 10.4 years), and had been practising TCM between seven and 30 years (mean = 18.6 years, SD = 11.1 years). Participants had practised TCM in China between two and 19 years (mean = 8.0 years, SD = 5.8 years). Participants had been practicing TCM in New Zealand between one and 27 years (mean = 10.9 years, SD = 10.3 years). Eight participants identified as being Chinese and were born in China. One participant identified as being New Zealand European and was born in New Zealand. This participant also held a Western medical degree and worked as a combined general practitioner and TCM practitioner. One participant identified as being of Middle Eastern descent and was born in Persia. This participant also held a Western medical degree and was a former general practitioner. All 10 participants completed their TCM qualifications in China. Four participants were current full-time teaching and supervisory staff at New Zealand College of Chinese Medicine (NZCCM) in Auckland. Five participants held current part-time teaching and supervisory positions at the College and also had their own private practice. Only one participant did not currently teach or supervise at the College. This participant worked full time as a combined GP and TCM practitioner in her own practice.

Measure

An interview schedule was developed for this study by members of the research team. Questions were formulated based on the two main topic areas: (1) differences associated with practicing TCM in New Zealand compared to China, and (2) whether TCM was a first or alternative treatment option for individuals in New Zealand. The interview schedule comprised of three main parts. The two topic areas mentioned above comprised the first two sections, and the final section comprised questions relating to participant demographic information. The interview schedule ensured that all participants were asked the same questions. Questions were designed to be open-ended to allow for discussion and elaboration of responses. The interview schedule is documented in Table 1.

Procedure

Participant recruitment was based on convenience sampling. Potential participants had to be either current or former teaching, or clinical supervisory staff at New Zealand College of Chinese Medicine. There were a number of reasons for this requirement. Firstly, participants needed to have an adequate level of English fluency, as all interviews needed to be conducted in English. Time and expense were also factors that needed to be taken into account. Potential participants were invited to take part via an email invitation, which included a copy of the participant infor-

Table 1: Interview schedule.

Topic area	Questions
Topic area one: differences associated with practicing TCM in New Zealand compared to China	Are there any differences between practicing TCM in New Zealand compared to China? Can you please tell me what these differences are? Are there any differences in the conditions you treat here in New Zealand compared to China? Are the patients you treat in New Zealand different from the patients you treated in China in relation to ethnicity, gender and age?
Topic area two: whether TCM is a first or alternative treatment option for individuals in New Zealand	Are there any differences in patient knowledge regarding TCM between patients you have treated in New Zealand compared to China? Have any of the patients you have treated in New Zealand seen or consulted other healthcare practitioners prior to seeking treatment from you for their specific condition or complaint? If so, what type of healthcare practitioner(s) did they see or consult? Have you treated any patients who are concurrently seeking treatment from other healthcare practitioners at the same time they have been seeking treatment from you? If so, what other type of healthcare practitioner are they seeking treatment from?

mation sheet, consent form and interview schedule. To obtain 10 positive responders, 13 invitations were emailed to potential participants. Nine of the current clinical staff members and the one former clinical staff member took part in the present study. The remaining three potential participants were non-responders. They did not reply to the secondary email invitation that was sent out two weeks after the initial email invitation. Nine participants were individually interviewed at the College by the primary investigator, the College's Research Project Officer (AP). The former staff member was interviewed at her practice by the primary investigator. The primary investigator holds a doctorate in public health and has extensive experience in carrying out qualitative research. Interviews took between 30 and 50 minutes to complete. Informed written consent was obtained from each participant prior to the commencement of their interview. All interviews were audiotaped and later transcribed verbatim. Ethical approval for this study was obtained from the New Zealand College of Chinese Medicine Ethics Committee.

Data analysis

Data were analysed using an inductive thematic approach based on Auerbach and Silverstein's[16] approach to thematic analysis.[16] This process involved four main steps.

1. The first step involved reading and re-reading each transcript several times for each individual question within a topic area.
2. Identifying text in which participants used the same or similar words or experiences to convey the same idea (eg, repeating ideas).
3. Coding the segments of text that were identified in step 2 (the repeating ideas). From this process, themes emerged (eg, an organisation of repeating ideas that is given a name that communicates what participants are trying to convey).
4. Verifying the trustworthiness of the findings. This involved members of the research team individually reading the transcripts to verify or disqualify themes. This process was essential in reducing individual researcher bias.

Results

Data were examined under two main topic areas: (1) Differences associated between practising TCM in New Zealand compared to China, and (2) TCM as a first or alternative treatment option for individuals in New Zealand. A number of themes were identified under these topic areas. Themes

are discussed below and direct quotes are included that help illustrate participants' views and experiences of the associated topic area.

Topic: Differences associated between practising TCM in New Zealand compared to China

Theme: Differences in job description

The main difference in practising TCM between the two countries was that in China TCM treatment and Western medicine are integrated to treat certain conditions. In turn, this allowed TCM practitioners to prescribe certain Western medicine drug treatments. TCM practitioners also tend to work in hospitals (in the larger cities) and have the title of doctor, and are viewed as being mainstream healthcare practitioners. The following quotes demonstrate this:

"The job description is different. In China I'm a doctor. We practice both Chinese and Western medicine together. We work in a hospital. It's combined (TCM and Western medicine)*."* Practitioner 3.

"In China we are doctors and we can also prescribe certain types of Western medicine drug treatment. But in New Zealand we can only practice TCM, we cannot prescribe Western medicine." Practitioner 2.

Theme: Pain management versus internal conditions

The main difference in terms of conditions treated between the two countries was related to being able to treat internal conditions in China, whereas in New Zealand, treatment was sought more for pain management purposes. The following quotes convey this:

"In New Zealand, maybe the most common condition treated by TCM is pain. It's usually related to shoulder, joint or knee pain. In China, besides pain we also treat internal diseases. We treat heart disease, digestive conditions and all kinds of diseases." Practitioner 1.

"In China we can treat stroke patients and patients with other neurological disorders. Here in New Zealand, most patients are ACC patients. They come for pain related problems. Like neck pain and shoulder pain, lower back pain and ankle pain. It's more of a focus on the skeletal muscular system." Practitioner 2.

Theme: Ethnic diversity for TCM treatment in New Zealand

This theme involved practitioners discussing the ethnic diversity of the patients they treated in New Zealand. It highlighted that individuals from a number of different ethnic groups were seeking TCM based treatment. The following quotes convey this:

"In New Zealand, I'm treating Asians, Europeans, Maori and Pacific Islanders." Practitioner 7.

"I see Asian, Samoan and other Pacific patients. I also have Eastern European patients, Dutch patients, British patients and Australian patients." Practitioner 8.

Theme: Age differences between the two countries

Two practitioners mentioned that in China it was common practice to treat children compared to New Zealand, where patients were predominately adults. One practitioner did give an account of treating Chinese children in New Zealand, though she mentioned that she did not treat European children in New Zealand. The following quotes demonstrate this:

"In China you have children as patients." Practitioner 4.

"Here, I have treated Chinese children, but I have not treated European children." Practitioner 10.

Theme: Gender similarities across both countries

A number of practitioners discussed how the majority of their patients were female regardless of the country they were practising in. The following quotes demonstrate this:

"Gender is similar to China; more females than males coming to the clinic." Practitioner 2.

"I think it's very similar; more females." Practitioner 4.

Topic: TCM as a first or alternative treatment option for individuals in New Zealand

Theme: TCM Knowledge

This theme involved practitioners discussing how TCM knowledge in China is passed down from each generation. Hence, Chinese people have an understanding of the underlying components of

TCM philosophy in contrast to non-Chinese individuals, such as New Zealand Europeans, who need to be educated about the philosophical underpinnings of TCM. The following quotes demonstrate this:

"Chinese people have the knowledge and understanding of Chinese medicine because of their cultural background. We don't need to educate them like we have to with Kiwi patients." Practitioner 3.

"In China, Chinese medicine is very popular. So you don't need to give an explanation. But here (in New Zealand) the TCM philosophy is quite unusual for Europeans." Practitioner 6.

Theme: TCM as an alternative treatment choice in New Zealand

In the following quotes, a number of practitioners discussed how some Chinese individuals were more likely to seek TCM treatment as a first choice of treatment compared to New Zealand Europeans, who appeared to use TCM as an alternative form of treatment after having consulted a Western medicine healthcare practitioner. In most cases this was a general practitioner (GP). The following quotes illustrate this:

"Most Chinese people accept Chinese medicine as their first treatment choice. But here (in New Zealand)*, Western people would not choose Chinese medicine as their first treatment choice. In New Zealand most people will use TCM as an alternative. Some have already got a diagnosis from their GP and they come to our clinic for alternative treatment."* Practitioner 1.

"For Kiwi people, maybe a second choice, but for Asian people a first choice. I think for Chinese people, because they know Chinese medicine well, if they have any pain related problem, going to the acupuncturist will be their first option. But for Kiwi people many will be referred to an acupuncturist." Practitioner 2.

"They have either been referred by hospital clinics or they've been referred by other general practitioners. Many of the people who come here have already seen an orthopedic surgeon or two or three physicians." Practitioner 8.

Theme: Acceptance of acupuncture

Compared to Chinese herbal medicine, acupuncture appeared to be an acceptable and more utilised form of treatment for New Zealand European and other non-Chinese patients in New Zealand. Also discussed was the observation that an individual was more likely to seek acupuncture-based treatment in the future if they had a successful experience of their initial acupuncture treatment. The following quotes convey this:

"Kiwis are quite interested in acupuncture, more than herbal medicine." Practitioner 10.

"In New Zealand, most practitioners and patients will focus on acupuncture unlike in China where we focus on Chinese herbal treatment first." Practitioner 1.

"In New Zealand, once a patient has been treated with acupuncture, the next time the patient has a similar problem they may think about acupuncture as their first choice of treatment." Practitioner 2.

Discussion

This study was designed to identify differences associated with being a TCM practitioner in New Zealand compared to China. The main differences were associated with how TCM treatment (predominately acupuncture) was viewed and utilised by the larger New Zealand population. CAM treatments in general, including TCM treatment are viewed by the general New Zealand population as alternative forms of healthcare treatment. There were also differences in the type of conditions treated between the two countries, as well demographic differences relating to the type of patients treated.

Western medicine and TCM are the two mainstream medical practices used in China.[10] In China, TCM treatment is integrated with Western medicine and TCM practitioners can treat a range of conditions, including internal conditions (eg, cardiovascular conditions, stroke recovery, diabetes and cancer). TCM practitioners can also prescribe certain Western medicine drug treatments for a number of conditions. One main reason for this is that biomedicine is part of the TCM degree structure in China.[11] A TCM practitioner is part of the mainstream healthcare system. TCM practitioners work in a number of medical settings, including hospitals and clinics.[10]

In comparison, TCM practitioners in New Zealand are viewed by most individuals as being alternative healthcare practitioners.

In New Zealand, TCM practitioners predominantly work in their own private practice or as an employee in a TCM-based clinic which generally offers acupuncture, Chinese herbal medicine and Chinese massage treatment. In some cases, TCM practitioners work exclusively as acupuncturists. TCM practitioners in New Zealand cannot prescribe Western medicine drug treatments.

The TCM practitioners in the present study conveyed that the majority of their non-Chinese patients sought TCM treatment as an alternative form of treatment after they had consulted with another healthcare practitioner, predominantly a general practitioner (GP). A number of practitioners discussed how the majority of patients they had treated in New Zealand sought treatment for pain related complaints and conditions (ie, muscular problems related to both the upper and lower body). A New Zealand study that examined both the demographic profile and the complaints and conditions for which patients sought treatment at a TCM clinic, reported that patients tended to seek treatment for pain management purposes more than any other complaint or condition.[15] A number of studies have reported that acupuncture appears to be utilised more for pain relief purposes in regard to the management of chronic conditions or acute injuries (eg, back pain and joint pain).[1,3,17–20]

Research indicates that individuals tend to seek CAM treatment, such as acupuncture, when conventional Western medicine cannot help treat or manage their condition.[2,4,15,19] Data from a New Zealand health survey reported that 53% of respondents had a condition that Western medicine healthcare practitioners could not treat.[21] The Patel et al study[15] reported that the majority of patients who took part in their study had consulted another healthcare practitioner, namely a GP, prior to seeking acupuncture or other TCM-related treatment.

The practitioners in the present study gave accounts of how a number of their non-Chinese patients seek treatment for pain-related complaints and conditions. This may be associated with the fact that since the 1990s in New Zealand, the Accident Compensation Corporation (ACC) has funded acupuncture treatment for injury-related conditions. ACC fund acupuncture treatment for these conditions based on the efficacy of acupuncture in the management of musculoskeletal pain.[22]

In 2015, 900 acupuncturists were registered as ACC treatment providers. In 2015, ACC spent almost 27 million dollars funding acupuncture treatment. Almost 20 million of this was spent in the Auckland region. In 2015, ACC received 58,681 claims that resulted in acupuncture treatment. The majority of claims were lodged by a GP (53%) followed by a physiotherapist (24%). The five most common conditions seen by ACC-registered acupuncturists are: lumbar sprain, sprain of shoulder and upper arm, neck sprain, ankle sprain and thoracic sprain.[23]

A number of practitioners discussed how knowledge of TCM is generationally passed down in China, resulting in TCM being a popular form of treatment for many Chinese people regardless of age. This knowledge of TCM may have appeared to extend to Chinese individuals living in New Zealand, as accounts were given where practitioners treated Chinese children but not New Zealand European children. Age differences in relation to patients treated in New Zealand were one of the main demographic differences that were identified in the present study.

In relation to ethnicity and TCM use, the results of the present study indicate that some TCM practitioners have encountered some of the ethnic diversity that reflects the current New Zealand population.[24] While a number of different ethnic groups fall within the Asian category, those who identify as being Chinese make up the largest ethnic group within the Asian category. Auckland also hosts the largest Chinese population in the country.[24] Between 2001 and 2013, the Asian population in New Zealand has almost doubled in size.[24] In line with these findings, a changing Asian demographic in New Zealand, particularly in the Auckland region may result in a growing demand for TCM. Especially if some Chinese individuals want to combine WM with TCM.

A growing demand for TCM (especially acupuncture) may also be influenced by previous experience of acupuncture. For example, one participant discussed how non-Chinese individuals who have

had a successful initial experience of acupuncture treatment are more likely to seek acupuncture in the future for similar conditions. In line with this, one Auckland-based TCM clinic reported that almost one half of all new patients enrolled during a fourth-month period identified as being New Zealand European.[15]

The one demographic similarity between the two countries was related to gender. Practitioners in the present study gave accounts of treating more female patients compared to male patients across both countries. Both New Zealand and international data indicate that compared to males, females are more likely to seek CAM (and other healthcare) treatment.[2,15,19,25]

A major strength of this study is that a qualitative methodology using an interview approach was employed. This allowed practitioners to discuss in detail their views and experiences. A potential limitation of the study is that a small number of TCM practitioners were interviewed, all of whom practised in a major city in New Zealand. TCM practitioners practising in other parts of New Zealand may have encountered other differences; likewise, the same could be said about their experience of TCM practice in China. In China, these practitioners had predominately practiced TCM in TCM hospitals in major cities. Hence, generalising findings to the larger TCM practitioner population in both New Zealand and in China should be done with caution. In regard to our sample, it is possible that participants may have felt obligated to participate in the present study as they were all predominately current staff members at NZCCM. However, the Participant Information Sheet did state that participation was voluntary and that participation or non-participation would not influence their employment status.

Conclusions

The present study identified a number of differences associated with being a TCM practitioner in New Zealand compared to China. In New Zealand, TCM practitioners are viewed as alternative healthcare practitioners. Acupuncture is the most utilised form of TCM treatment by non-Chinese individuals in New Zealand, and it appears to be predominately used for pain management purposes. Future research in this area will focus on the professional development of TCM practitioners in New Zealand, including promotion of one's own practice.

Competing interests:
Nil.

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Medical students' experiences of practising medical procedures on patients, other students and themselves

Michelle Bai, Helen Nicholson, Kelby Smith-Han

ABSTRACT

AIM: Development of proficient procedural skills is vital to the training of young doctors. The aim of this project was to investigate the prevalence of different ways that medical students practise clinical procedures and the relationship with professional development.

METHODS: A survey was made available online to the cohort of years 4–6 medical students at the Otago Medical School, University of Otago. Quantitative and qualitative data were collected and analysed. Statistical methods and qualitative content analysis were employed in order to categorise and infer student responses.

RESULTS: Two hundred and eighty-four of 816 (35%) students responded to the survey. A total of 23 categories of procedural skills were reported, demonstrating procedures with varying complexity and degrees of invasiveness. A small proportion, 5%, indicated they had performed invasive procedures on themselves, with a majority of these reported to be unsupervised. 77% of students reported being directly observed when performing procedures on patients for the first time, while 32% reported being supervised when practising on peers.

CONCLUSION: Students practise clinical procedures on patients, peers and in some cases themselves. Our findings suggest a need for clearer guidelines in the support and management of the safe practice of students, be it on patients, other students or on themselves.

Establishment of procedural clinical skill proficiency is a vital component of the education of medical students. In clinical attachments throughout their training, students engage in practising non-invasive and invasive procedures that range in complexity. These procedural skills are developed through repeated, longitudinal exposure to patients, are often supplemented by practice on fellow medical students and are, furthermore, aided by additional means such as simulation.[1] Practice through repetition and exposure allows for successful mastery of a repertoire of procedural skills and forms a large component of student professional development.[2]

Despite the importance of procedural skills development, there is limited literature describing medical students' personal experiences and approaches to practising skills in the clinical environment. Many studies explore interventions to improve clinical skill acquisition and competency—the quality and adequacy of skill proficiency in graduates—while others reflect on current pedagogical styles in medical education.[3–5] To the best of our knowledge, the autonomous practice of procedural skills by students has not been described.

This study was developed as a result of information gathered from student interviews undertaken during the production of the television documentary, *Practising Medicine*,[6] which followed students from Otago Medical School during their clinical attachments. It became apparent in the making of the documentary that a few medical students were practising certain invasive techniques on themselves. This raised concerns regarding professional

behaviour, specifically safety and practising personal self-care. Part of the mastery of skills is the ability to conduct them competently and safely. Facilitation of this process is optimised by the presence of supervision and guidance, at least initially, which allows the student to refine their technique while ensuring both student and patient safety. The aim of this study was to investigate the prevalence of different ways that students practise invasive medical procedures, and their reflections of performing these procedures.

Method

The medical programme at the Otago Medical School is six years long. It includes a competitive Health Sciences First Year (HSFY), two years of Early Learning in Medicine (ELM) followed by three clinical years of Advanced Learning in Medicine (ALM). ALM is taught at three schools: Christchurch, Dunedin and Wellington. The Otago Medical School accepts both undergraduate and postgraduate students. Approximately 70% of students enter the program from HSFY and do so usually directly from secondary education.[7] Another ~25% of students enter into year two following completion of an undergraduate degree. The remaining ~5% 'Alternative' category entrants comprise older applicants from a diverse range of backgrounds; including graduates from other health related professions.[7]

Medical students begin their basic clinical skills learning in ELM and gain practice on patients in ALM. The Medical School has a Code of Professional Conduct for Medical Students at the University of Otago which includes a section regarding clinical skills: "As a medical student I will: Make the most of educational and clinical opportunities to extend my knowledge and further my skills with appropriate support and supervision."[8(p.4)]

Study design and recruitment

Medical students currently undergoing the three years of ALM were invited to participate in an online survey regarding their clinical experiences of practising medical procedures. The survey was launched in August/September 2015 through SurveyMonkey® (surveymonkey.com) and provided to all 816 students currently enrolled in ALM (years four–six of medical study) via their student university email address. The questionnaire remained open for a period of six weeks. The sample did not exclude any ALM students, however, ELM students were excluded.

The questionnaire addressed demographic information including age, gender and ethnicity. Open questions were asked in regard to which medical procedures students had performed on patients, their peers and themselves. Students were also asked whether or not they were supervised and to indicate any difficulties and ethical concerns experienced during the practice of procedures on any persons. The meaning of 'invasive medical procedure' used in this survey was defined as a procedure that contains some intrusiveness to the body. For example: IV lines, wound suturing, mole removal, venepuncture, catheterisation etc. The full questionnaire can be found in Appendix A.

Data analysis

Quantitative survey results were explored and analysed using GraphPad Prism version 5.00 for Windows (GraphPad Software Inc, San Diego, CA, USA). Qualitative information was analysed using qualitative content analysis.[9] This involved identifying the main themes from the responses and then calculating the frequency and proportions of procedures performed on patients, other medical students and the medical students themselves. Procedures indicated by the respondents were categorised and where appropriate, grouped, ie minor surgical procedures such as cryotherapy and lesion excisions were grouped together. Reporting of synonyms for procedures such as phlebotomy (taking blood, venesection and venepuncture) were also collapsed under one heading. A similar procedure was also applied to difficulties and ethical concerns reported by students—relevant categories were inferred from replies and the frequency of each calculated.

Results

Of the 816 students emailed, 284 completed the survey, a response rate of 35%. Total survey respondents were representative of the demographic of Otago

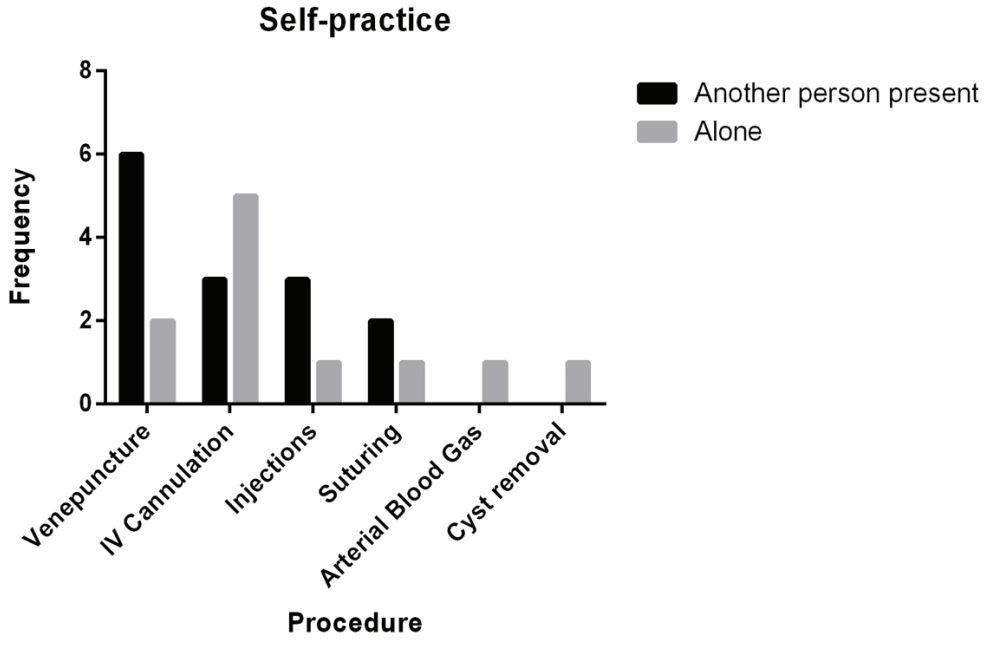
Table 1: Demographic data from study participants.

Variable	Response	Respondents (%)
Age (years)	20–24 25–27 28+	211 (74) 51 (18) 22 (8)
Gender	Female Male Unspecified	174 (61) 107 (38) 3 (1)
Year level	4th 5th 6th Unspecified	92 (32) 123 (43) 68 (24) 1 (0)
Ethnicity	NZ European Other Chinese Māori Pacific Islander **NZ European & other ethnicity indicated** NZ Euro + Māori NZ Euro + Other	215 (76) 39 (14) 25 (9) 3 (1) 2 (1) 26 (12) 13 (6)

Medical School students (Table 1) and reflected cohort age, year level and locational distribution with the average age of respondents 24.0±3.4 (Mean ± SD).

Of the responses, 61% (n=174) of students surveyed were female compared with the total female cohort of 57.4%. A Chi square test indicated that our sample differed from the total cohort (p=0.005) in terms of the representation of the years. More responses were received from 5th year students compared to 4th year and 6th year—with final year students being a smaller cohort overall in the total population of 816 (4th year n=274, 5th = n=292, 6th n=250). Sample size did not allow for any statistical analysis between responses from clinical schools and year level.

Figure 1: Procedures performed by students on self, unsupervised and supervised.



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Of the 284 students surveyed, 15 students (5%, seven male and eight female) had performed procedures on themselves (Figure 1). Of these procedures, 11 were unsupervised and included: cyst removal, venepuncture, cannulation, arterial blood gas sampling and suturing. The technical aspect of performing the procedure on oneself was reported to be the most difficult aspect of self-practice, followed by pain from the procedure and anxiety performing it. When asked about ethical issues around self-practice, use of hospital supplies and safety of the procedure were the major concerns. One student reported no ethical concerns, commenting:

"[The procedure] was done at home with non-medical instruments outside of the hospital context, with no others involved, no equipment was taken from the hospital. Thus I see no ethical issues".

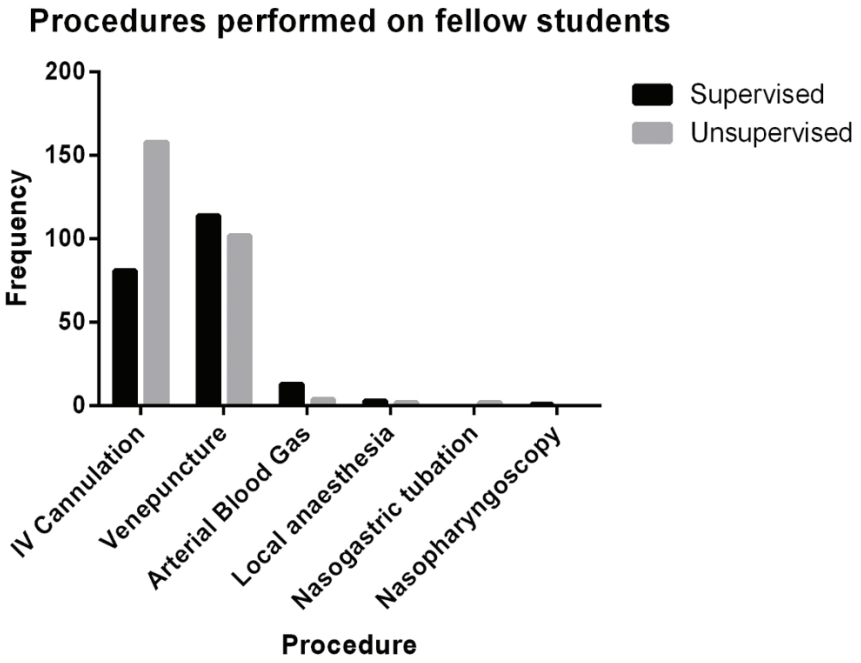
Most students (92%; n=264) surveyed had practised medical procedures on their peers. Peer-practised procedures included: IV cannulation, venepuncture, arterial blood sampling and nasogastric tube insertion. Of the 264 students who reported practising on peers, 173 indicated they were unsupervised (with no other person present) on some of these occasions (Figure 2).

Of the difficulties experienced during the practice on fellow students (n=189), inflicting unnecessary harm or pain on peers was cited as an issue by 38% (n=71) whereas 25% (n=48) indicated procedural difficulties such as issues with technique, equipment and skill as a large barrier to their practice. Other concerns noted were lack of supervision and guidance, particularly if practising alone 12% (n=23), judgement by peers, effect on social relationship if there was failure during practice 11% (n=21), limited resources to practise with and also being expected to reciprocate to their peers 6% (n=11). Furthermore, practising on fellow students was considered not an authentic experience by 4% (n=8), as young, healthy individuals with good veins were uncommon on the wards. Other comments included one student who expressed guilt for pilfering resources:

"We felt bad taking IV lines from a nursing station once. They had four. We took all four. I'm so sorry".

Of the 284 students, 278 reported that they had practised medical procedures on patients (Table 2). Procedures most commonly performed were intravenous cannulation performed by 94% and venepuncture performed by 92% of students. Less commonly performed procedures included general anaesthesia (1%) and lumbar puncture (2%). Table 2 shows a selection of invasive medical procedures

Figure 2: Reported procedures performed on fellow students with an indication of supervisory states.



NZMJ 28 October 2016, Vol 129 No 1444
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Table 2: A selection of reported procedures performed on patients by students, with gender and year level identified. Two respondents that did not specify gender were not included in this table. For unsupervised procedures only, see Figure 3.

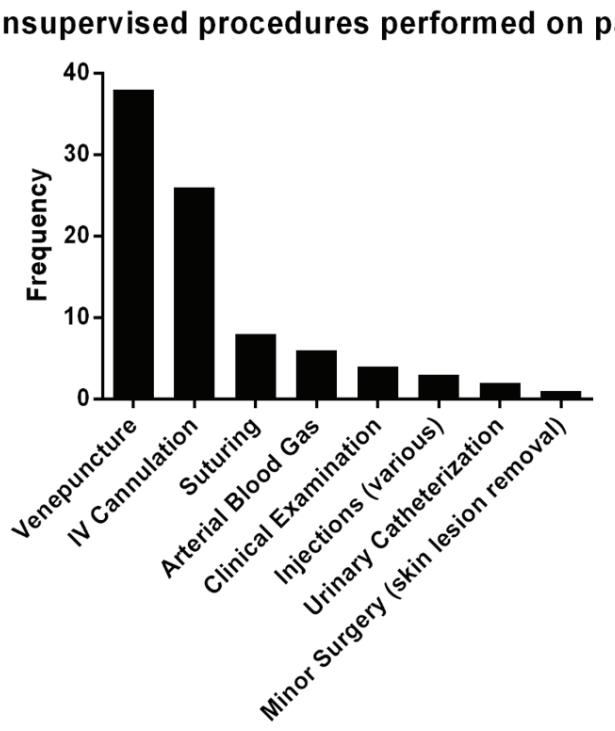
Procedure	Total (%)	4th Year (%)	5th Year (%)	6th Year (%)	Male (%)	Female (%)
Intravenous cannulation	267 (94)	84 (91)	116 (94)	67 (99)	103 (96)	162 (93)
Venepuncture	261 (92)	83 (90)	115 (94)	63 (93)	99 (93)	160 (92)
Suturing	176 (62)	42 (46)	77 (63)	57 (84)	64 (60)	110 (63)
Urinary catheterisation	121 (43)	34 (37)	41 (33)	46 (68)	41 (38)	79 (45)
Minor surgery (biopsy, excision of skin lesion)	87 (31)	12 (13)	30 (24)	45 (66)	28 (26)	58 (33)
Arterial blood gas sampling	59 (21)	5 (5)	21 (17)	33 (49)	24 (22)	35 (20)
Airway intubation/nasogastric intubation	50 (18)	6 (7)	17 (14)	27 (40)	21 (20)	29 (17)
Vaginal or rectal examinations	41 (14)	8 (9)	19 (15)	14 (21)	14 (13)	27 (16)
Injections (medication, unspecified)	41 (14)	6 (7)	23 (19)	12 (18)	15 (14)	26 (15)
Local anaesthetic	39 (14)	11 (12)	13 (11)	16 (24)	13 (12)	25 (14)
Assisting in surgery	27 (10)	8 (9)	13 (11)	6 (9)	13 (12)	14 (8)
STI/cervical smear	27 (10)	2 (2)	15 (12)	11 (16)	5 (5)	22 (13)

practised as reported by students. A full summary can be found in Appendix B.

Procedural skills performed on patients increased in complexity as the students advanced through each year. Junior students had a lower reported frequency of performing skills such as ABGs, and minor surgery such as lesion excisions. With seniority, the frequency of these skills increased, ie ABGs in 4th year were reported by 5.5% of students, with the rate increasing to 48.5% of students by 6th year. Lumbar punctures were also performed by 7% of 6th year students.

Students were asked if they were supervised on the first attempt of any procedure on a patient. All 284 students responded to this question, of whom, 77% (n=220) reported that they were supervised during one or more first-time skills performed on a patient. Of 22% of students (n=63) reporting being unsupervised during these procedures, the most commonly performed were venepuncture and IV cannulation (Figure 3).

Figure 3: Reported unsupervised procedures performed first time on patients by students.



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The main difficulties raised by students when performing procedures on patients were: fear of causing pain or failing the task 33% (n=91), lack of confidence, nervousness or shakiness 16% (n=45) and lack of skill/practice opportunities before attempting on a patient 13% (n=37). Less commonly reported concerns included lack of or perceived poor supervision 5% (n=15), the patient lacking confidence in the student 7% (n=19) and the student being unsure of how to deal with sequelae resulting from the procedure 2% (n=6).

Overall, 49% (n=139) of respondents perceived some ethical issues when performing invasive procedures on patients. The most common (n=77) was the perception that the patient may not have given informed consent for the student to perform the procedure. Some students felt that the patient may have been unaware that they were practising certain procedures on them (eg, when performing relevant procedures on them while anaesthetised), or was not explicitly informed of the student's level of experience, for example when introduced as a junior doctor or colleague. It was reported that sometimes supervising doctors did not explain to patients that the student was, indeed, a student. The dilemma between gaining clinical competency and causing the patient unnecessary harm was also indicated, with 34% (n=47) of students raising this concern, while 21% (n=29) of students believed that their performing the procedure resulted in a reduction of quality of care for the patient, as there were more capable staff members available. Some (8%, n=12) students perceived inappropriate supervision, ie by a senior student, or reported no supervision available at all when they practised skills.

When asked for further comments on students' experience when practising clinical procedures, 50 students responded with a variety of perceived issues with the clinical curriculum. Of these, 39 students mentioned that there were not enough opportunities to gain practical experience before and during the clinical (ALM) years. They cited insufficient resources and safe, designated facilities for students to practice (n=4). Several students commented on reconciling the need for practice opportunities and surmounting the courage to ask patients for permission and potentially causing them harm. Inconsistency of training and experiences were also mentioned (n=9).

Discussion

The ability to perform basic clinical procedures is one of many graduate outcomes to be achieved by students by the completion of the medical programme.[10,11] Our data show that students practise clinical procedures on patients, their peers and in some circumstances, themselves.

Practising on oneself

This study confirms earlier data obtained during the production of the television documentary *Practising Medicine* and identified a small proportion of medical students (5%) who had practised an invasive procedure on themselves. Part of the development of appropriate professional behaviour is self-care, where the practitioner is aware of their limitations and the need to address and maintain their wellbeing through appropriate methods, such as utilising health care services. Limited literature is available that describes the experience of self-practice, particularly in regard to students. Existing research describes extreme circumstances where individuals perform surgery on themselves, such as situations in remote conditions where the person operating is the only physician at hand,[12] or in historical cases of surgery performed to pioneer research.[13] A relationship between self-surgery and mental illness has also been described.[14,15]

On the other hand, there is a body of literature investigating self-prescribing behaviour among doctors.[16,17] Inappropriate self-treatment behaviours have many implications in regard to the poor health and self-care behaviours of doctors, and potential damage to patient and public trust.[16] Physicians have been described as being poor patients as a result of having high-pressure work within an existing culture of neglecting one's wellbeing.[17,18] A plethora of factors contribute to the physician's willingness to self-treat such as a perceived lack of privacy as a result of seeking treatment, and fear of professional and academic repercussions.[17] A major concern when doctors (or medical students) self-treat is the lack of surveillance which

may prove detrimental to the individual, particularly if the self-prescribed drugs have addictive potential, or if the mole the doctor excises from their leg is cancerous, but is not sent to pathology.

It is unclear from our survey data why students decided to practice on themselves and further studies are required to explore this. In regards to self-motivated behaviours, it is evident that attitudes in medical students are cultivated from an early age.[16] There are examples of teachers modelling invasive procedures on themselves in both the clinical and classroom setting.[19] Demonstrations of self-surgery can be praised as good teaching, as seen in comments on the 'Awake Endotracheal Intubation' video,[19] but students could also pick up messages such as 'self-practice is acceptable among doctors', that are not included in formal teaching, but rather form part of the hidden curriculum.[20] With self-treatment attitudes shaped early on by the culture of the medical school, incidence of such self-motivated behaviours while a student may be correlated with increasing likelihood of self-treatment once graduated. As Krall states, "*not all who self-medicate abuse medications, but many of those who abuse started by self-medicating*".[17(p281)]

Perhaps of more concern is that while students who practised on themselves expressed technical difficulties and issues around obtaining resources, they did not describe any problems around professional behaviour. The implications for safety of the student and the possible formation of accepting attitudes to self-treatment behaviours are a concern. Addressing this at a professional development level (ie before and during students' clinical years) would seem important to promote self-reflective attitudes and appropriate self-care.

Practising on peers

Anecdotally, students practising procedures on peers is common in order to learn a variety of skills and techniques and our data support this. Peer-assisted learning (PAL) has been observed to be an effective method for learning some procedural skills.[21,22] PAL provides a comfortable learning environment that allows for mutual goal sharing between partners.[21,22,23] Performing and experiencing what the procedure feels like through this mode of practice is beneficial to the development of professional attributes, eg empathy. Supporting this method of learning is beneficial to students. Yet, there may be challenges in PAL in informal settings without staff member involvement, as was the case for 173 of the students in this study. Risks may be related to a lack of oversight and of appropriate facilities and resources to safely conduct procedures. Several students cited the difficulty of ethically finding and using resources to practice, for example, using hospital cannulae and needles and locating disposal units such as sharps bins. Though simulation clinics are available, and their use is promoted, the opportunistic nature of the clinical education setting may not always allow easy use of these teaching facilities.

Practising on patients

The majority of students reported practising clinical procedures on patients and felt that they were adequately supervised. However, 22% of students perceived that they received inappropriate (not by a licenced practitioner) or no supervision. The most common procedures performed unsupervised by students were venepuncture and IV cannulation, which are among the most commonly performed procedures in hospitals.[4,24,25] The reported lack of supervision should be treated with caution, as it may not equate to not knowing how to do the procedure; they may have practiced it before in another context, eg through simulation or with a fellow medical student prior to entering ALM. Perceived lack of supervision with such procedures may be due to many reasons, such as an assumed competence of students by staff. Other reasons for unsupervised practice may include students' reticence to seek help, or conversely, they may feel that they are already competent; potentially causing them to disregard the risks involved in the process.[26,27]

Students integrate theoretical learning with authentic patient encounters to facilitate their learning of professional behaviours,[28] with competency in clinical skills characterised by the ability to perform safely to minimise harm to both student and patient. This learning process calls for appropriate mentorship and in particular, supervision.[29,30] Direct observation of

medical students with actual patients by an appropriately experienced health professional is considered an important element for teaching clinical skills.[30,31] This provides the student and patient with a safe learning environment should any adverse events were to occur, along with appropriate feedback for the procedure from a more experienced individual which is crucial for skill development.[31,32] Without appropriate supervision and feedback the quality of education is not optimal and the likelihood of the production of professionals sufficiently prepared for clinical practice is reduced.

The survey addressed supervision of students during the first attempt on an actual patient because the authors believe this is the most appropriate time to be supervised. Our notion of supervising medical students the first time they conduct an invasive procedure is supported by Yale School of Medicine, as outlined in their "Guidelines for Performance of Invasive Procedures by Medical Students".[33] These guidelines outline the need for supervision of medical students for their first invasive procedures conducted on patients, and categorise commonly performed procedures by medical students by degree of risk (low to high) and suggest appropriate supervision for each level (eg for a low-level risk procedure such as phlebotomy, a nurse is an appropriate supervisor).[33] This maybe a useful starting point to provide some clarity around what is expected from students and staff regarding supervision of procedures.

Patient participation is vital for learning. However, some students were concerned that patients may not always have given informed consent for the student to practice on them. The process of obtaining informed consent should provide patients with the necessary information about the training status of the student to help them decide if they want to have a student perform the procedure.[34] Consent gives students confidence while performing the procedure, as they are aware that the patient has an accurate understanding of their status. It is routine practice that patients are informed when attending a teaching hospital that there may be students involved in their care, but it was less clear whether students were always aware of this.

Limitations of study

Our low response rate of 35% and small study size (n=284) were the main weaknesses of our study. It being a purposive, non-probabilistic sample of a pre-existing cohort furthermore limits the statistical power of the study. As the study design is a survey, at the point in time when the responses were compiled, students may not have completed certain rotations and thus altogether clinical exposure is not uniform between respondents. Furthermore, the recall of procedures and experiences may be inaccurate.

Findings from this study require further validation but also pose further questions for research. These include: adverse outcomes associated with appropriate supervision in the student setting (from students not seeking supervision or from staff unavailability), students' perceived confidence and competence while performing techniques. There may also be correlations between self-treatment behaviour and attitudes in medical school and the incidence of self-treating once in the workforce.

Conclusion

In conclusion, the survey indicates that medical students practice procedures on patients, peers and, in a small group of students, on themselves. Approximately 5% of the students who responded reported that they had practised an invasive procedure on themselves. Further studies are required to validate our data and understand why students practice on themselves. We suggest that these behaviours need to be discussed at a formal, educational level before students incorporate such acts into their professional way of life. Peer practice commonly occurs but appropriate support and resources were not always perceived to be available for students.

Our findings indicate many positive responses in regard to the clinical experience of students and the learning of procedural skills. However, they also suggest a need for clearer guidelines in the support and management of the safe practice of students, be it on patients, in peer-assisted learning, or on themselves.

Competing interests:
Nil.

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Appendix A: Survey of medical students regarding their practice of invasive procedures

Q1. Have you read the information sheet associated with this project (provided in the email as an attachment, if not please read this before continuing)?

Y N

Q2. Have you read and do you give your consent to participate in this project?

Y N

Demographic information:

Q3. Age:

Q4. Are you male or female?

Male Female

Q5. Ethnicity (question taken from the 2013 Census):

Which ethnic group do you belong to?

Tick the box or write in the spaces which apply to you

- ☐ New Zealand European
- ☐ Māori
- ☐ Samoan
- ☐ Cook Island Māori
- ☐ Tongan
- ☐ Niuean
- ☐ Chinese
- ☐ Indian
- ☐ Other such as *DUTCH, JAPANESE, TOKELAUAN*. Please state: _____

Q6. What year of the medical programme are you in?

4th 5th 6th (TI)

Q7. Which School of Medicine are you attending?

Dunedin Christchurch Wellington

Q8. Please list any previous health professional occupations you have had: (eg nurse, physiotherapist, medical laboratory scientist, etc.):

There are five main questions below. Please read through the questions and answer them accordingly.

The term 'medical procedure' used in this survey is defined as a procedure that contains some invasiveness to the body. For example: IV lines; wound suturing, mole removal, phlebotomy, etc.

Given the definition above, if you are still unsure about what counts as a medical procedure, please include it anyway.

Q9. Have you practised medical procedures on patients?

Y N

Q10. If yes, please list what medical procedures you have practised on patients (if no go to question 14):

Q11. Thinking of when you first conducted the procedure(s) listed in question 10, for each procedure, please indicate if you were supervised by a staff member or not (use the format in the example below):

Example:

IV line—supervised

Phlebotomy—not supervised

Q12. Please describe what you found to be the most difficult aspect of practicing the procedure(s) listed on patients:

ISSN 1175-8716

Q13. Please describe any ethical issues that you had (if any) when practicing medical procedures on patients:

Q14. Have you practiced (invasive) medical procedures on other medical students?

Y N

Q15. If yes, please list what medical procedures you have practised on other medical students (if no, go to question 19):

Q16. Please list any procedures that you practised on another medical student where there was no other person present (type NA if not applicable):

Q17. Please describe what you found to be the most difficult aspect of practising these procedure(s) on another medical student:

Q18. Please describe any ethical issues that you had (if any) when practising medical procedures on another medical student:

Q19. Have you practised (invasive) medical procedures on yourself?

Y N

Q20. If you answered yes to question 19, please list what medical procedures you have practised on yourself (if no go to question 24):

Q21. Please list any procedures that you practised on yourself when there was no one else present (type NA if not applicable):

Q22. Please describe what you found to be the most difficult aspect of practicing these procedure(s) on yourself:

Q23. Please describe any ethical issues that you had or considered (if any) when practising medical procedures on yourself:

Q24. Would you be interested in being involved in an interview talking about your experience of practicing medical procedures (all participants interviewed go into a draw to win a $100 New World gift card).

Y N

If you would be willing to be interviewed, we will contact you via email, please type your student email address and your preferred personal email address below:

Q25. If you have anything else you would like to comment on regarding practising medical procedures please write it here:

Thank you very much for taking the time out to complete this survey and be part of this research study!

Appendix B: Summary of total reported types of procedures performed on patients by students, with gender and year level identified. For unsupervised procedures only, see Figure 3.

Procedure	Total (%)	4th Year (%)	5th Year (%)	6th Year (%)	Male (%)	Female (%)
Intravenous cannulation	267 (94)	84 (91)	116 (94)	67 (99)	103 (96)	162 (93)
Venepuncture	261 (92)	83 (90)	115 (94)	63 (93)	99 (93)	160 (92)
Suturing	176 (62)	42 (46)	77 (63)	57 (84)	64 (60)	110 (63)
Urinary catheterisation	121 (43)	34 (37)	41 (33)	46 (68)	41 (38)	79 (45)
Minor surgery (biopsy, excision of skin lesion)	87 (31)	12 (13)	30 (24)	45 (66)	28 (26)	58 (33)
Arterial blood gas sampling	59 (21)	5 (5)	21 (17)	33 (49)	24 (22)	35 (20)
Airway intubation/nasogastric intubation	50 (18)	6 (7)	17 (14)	27 (40)	21 (20)	29 (17)
Vaginal or rectal examinations	41 (14)	8 (9)	19 (15)	14 (21)	14 (13)	27 (16)
Injections (medication, unspecified)	41 (14)	6 (7)	23 (19)	12 (18)	15 (14)	26 (15)
Local anaesthetic	39 (14)	11 (12)	13 (11)	16 (24)	13 (12)	25 (14)
Assisting in surgery	27 (10)	8 (9)	13 (11)	6 (9)	13 (12)	14 (8)
STI/cervical smear	27 (10)	2 (2)	15 (12)	11 (16)	5 (5)	22 (13)
Surgical drainage	25 (9)	4 (4)	9 (7)	12 (18)	13 (12)	12 (7)
Vaccination	12 (4)	2 (2)	7 (6)	3 (4)	5 (5)	7 (4)
Centesis/aspiration	11 (4)	1 (1)	6 (5)	4 (6)	3 (3)	8 (5)
Surgical stapling	7 (2)	1 (1)	3 (2)	3 (4)	2 (2)	5 (3)
Lumbar puncture	6 (2)	0 (0)	1 (1)	5 (7)	0 (0)	6 (3)
Spinal/epidural anaesthesia	4 (1)	0 (0)	1 (1)	3 (4)	2 (2)	2 (1)
Endoscopy	3 (1)	0 (0)	0 (0)	1 (1)	2 (2)	1 (1)
Contraceptive implant	3 (1)	1 (1)	1 (0)	2 (3)	2 (2)	1 (1)
Uterine device insertion	2 (1)	0 (0)	1 (1)	1 (1)	0 (0)	2 (1)
General anaesthetic administration	2 (1)	0 (0)	0 (0)	2 (3)	0 (0)	2 (1)
Swab for culture (not sexual health)	2 (1)	0 (0)	1 (1)	1 (1)	1 (1)	1 (1)
Defibrillation	1 (0)	0 (0)	0 (0)	1 (1)	0 (0)	1 (1)
Total respondents	**284**	**92**	**123**	**68**	**107**	**174**

Prevalence of contraceptive use in New Zealand women

Jacqueline Chesang, Ann Richardson, John Potter, Mary Jane Sneyd, Pat Coope

ABSTRACT

AIMS: To estimate the prevalence of contraceptive use among New Zealand women and to measure changes in contraceptive use since the last population-based prevalence estimates were published in 1988.

METHODS: Nine hundred and four women, aged 35–69 years were randomly selected from the electoral roll. A postal questionnaire was used to gather information on contraceptive use, socio-demographic characteristics and risk factors for ovarian cancer. Data were collected in 2013–2015. Estimates of current and ever-use of contraceptives were made and compared with the findings of the 1988 study by Paul et al. In both studies, participants were members of the control arm of case-control studies.

RESULTS: The study by Paul et al had a response proportion of 84%, whereas that of the current study was 47%. Oral contraceptives had the highest prevalence of ever-use among women aged 35–69 years (89% [347/389]), followed by condom use (54% [211/389]) and vasectomy (44% [170/389]). Compared to the previous study, there has been an increase in ever-use of condoms (24% [185/767] to 64% [148/231]), vasectomy (26% [202/767] to 40% [92/231]) and oral contraceptives (75% [575/767] to 89% [205/231]) among women aged 35–54 years. In contrast, a lower prevalence of tubal ligation (22% [168/767] to 8% [19/231]) was observed.

CONCLUSION: The study demonstrates a change in patterns of contraceptive use among women aged 35–54 years. The prevalence of ever-use of oral contraceptives and vasectomy remains high in New Zealand compared with other countries.

Since the introduction of oral contraceptives (OCs) in the 1960s,[1] there have been substantial advances in the development of contraceptive methods, including transition from high-dose to low-dose OCs, and from inert to copper-bearing and levonorgestrel-releasing intrauterine contraceptive devices.[2] Currently, there is a wide range of safe and effective contraceptive methods available. From a public health perspective, up-to-date knowledge of patterns of contraceptive use is important, as contraceptives exert effects that could be beneficial or harmful to some users.

There has also been a significant change in age at first delivery among New Zealand women, which may have affected patterns of contraceptive use. Among women born in the 1960s, 42% had their first child before the age of 25 years, compared with 60% of women born before 1950.[3] In 1962, women in their twenties had the highest fertility rates, while in 2014 the highest fertility rates were in women in their thirties. These changes were accompanied by a decrease in fertility rates across all age groups.[4]

A population-based study on patterns of contraceptive use in New Zealand by Paul et al was published in 1988.[5] Women aged 25–54 years were randomly selected from the New Zealand electoral roll. The participants, who were part of the control arm of a population-based case-control study of breast cancer and hormonal contraception, were recruited during 1983 to 1986. A more recent study,[6] which recruited participants from North Waikato and Auckland City only, was restricted to women who had ever had sexual intercourse, and did not report age-specific contraceptive use.

The estimates reported in this paper are derived from a recent population-based case-control study designed to assess the association between ovarian cancer and use of contraceptives. The availability of information on contraceptive use among controls offered an opportunity to assess current and recent contraceptive practice in women over 35 years of age. Current patterns of contraceptive use in New Zealand women aged 35–69 years are presented, and comparisons with the previous population-based study for women aged 35–54 years are made.

Methods

Study participants were members of the control arm of a nationwide population-based case-control study on the association between contraceptive use and ovarian cancer. Women were recruited into this study between April 2013 and September 2015. A random sample stratified by five year age-groups of women aged 35 to 69 years was obtained from the electoral roll. All New Zealand citizens and permanent residents 18 years of age and above are required by law to register on the electoral roll. Access to electronic data from the electoral roll for the purposes of health research is allowed under section 112(3) of the Electoral Act 1993. The choice of the age limits 35 to 69 years was constrained by the ovarian cancer and contraception study. Ovarian cancer is generally a disease of post-menopausal women, with the highest incidence at ages 65 to 74 years. The age range 35 to 69 years includes the population that is most affected by ovarian cancer and at the same time allows for recall of contraceptive usage. Approval to conduct the study was obtained from the Southern Health and Disability Ethics Committee (13/STH/26) and the University of Canterbury Human Ethics Committee (HEC2013/08).

Each potential participant was sent a letter on University of Canterbury letterhead, signed by two members of the research team. The letter was accompanied by an information and consent form, a copy of the study questionnaire, and a post-paid addressed envelope for returning the questionnaire and signed consent form. To facilitate the responses, women who did not respond to the initial questionnaire and consent form within three weeks from the date of dispatch, were sent a second study pack. Women who did not respond to the second mail-out were contacted and asked to complete the questionnaire by telephone. If they were willing to do this, a telephone interview was done, using the same questionnaire. All questionnaires were checked for completeness; where necessary, participants were contacted to obtain missing data.

Participants were asked about ever-use, age at first use, time since last use and duration of use of oral contraceptives, DMPA, contraceptive implants and IUDs. History of and age (if applicable) at menopause, hysterectomy, tubal ligation and bilateral oophorectomy were also asked. Information on ever-use and duration of reliance on condoms and vasectomy or other contraceptives was sought. In addition, information on socio-demographic characteristics of the participants and risk factors for ovarian cancer was also gathered. Participants were provided with a calendar of major life events to assist in recall and to record their use of contraceptives.

Age of participants was calculated in two ways. For the purpose of comparing with the New Zealand 2013 census population, age was calculated as the difference between each participant's date of birth and the date she was selected from the electoral roll. For prevalence estimations, the difference between date of birth and date of questionnaire completion was used to calculate age. Level of education was classified by the highest qualification attained using the 2013 census categories. Income was based on the total personal pre-tax income in the last year. Menopause was defined as the age periods stopped, women with natural menopause and those with iatrogenic menopause were classified as postmenopausal. Analysis of current contraceptive use was restricted to women aged 35–54 years. This is because those above 54 years were most probably postmenopausal and would therefore have no need for contraception. Those who were postmenopausal but within 35–54 years of age were included as currently not using a reversible contraceptive method in order to account for all the participants.

In the previous population-based study by Paul et al, study participants were members of the control arm of a nationwide population-based case-control study of breast cancer and hormonal contraception. Women aged 25–54 years were randomly selected from the New Zealand electoral rolls. Only those with traceable telephone numbers were included. Recruitment of participants was done from 1st November 1983 to 5th February 1986, and a response proportion of 84% was achieved.

The study by Paul et al[5] included women aged 25–54 years, whereas the current study included women aged 35–69 years. In comparing the two studies, the prevalence estimates were restricted to women

Table 1: Socio-demographic characteristics of women in the present study and the female usually resident population aged 35–69 years—2013 census.

Characteristic	Women in present study		Female usually resident population—2013 census	
	Number	(%)[1]	Number[2]	(%)[1]
Age (years)	*(n=389)*		*(n=969,111)*	
35–44	111	(29)	302,835	(31)
45–54	120	(31)	312,723	(32)
55–64	101	(26)	253,089	(26)
65–69	57	(14)	100,464	(10)
Ethnicity[3]	*(n=389)*		*(n= 921,423)*	
NZ European[4]	316	(81)	714,276	(78)
Māori	37	(10)	111,828	(12)
Others[5]	58	(15)	-	-
Parity	*(n=327)*		*(n = 783,810)*	
0	47	(14)	120,867	(15)
1	32	(10)	108,414	(14)
2	144	(44)	283,707	(36)
3	66	(20)	166,608	(21)
4	25	(8)	64,860	(8)
5	10	(3)	22,470	(3)
6 and Over	3	(1)	16,884	(2)
Education[6]	*(n=321)*		*(n=792,375)*	
No qualification	34	(11)	138,987	(18)
Overseas secondary school qualification	12	(4)	60,657	(8)
Level 1 or 2 certificate	76	(24)	202,962	(26)
Level 3 or 4 certificate	40	(13)	99,240	(13)
Level 5 or 6 diploma	57	(18)	93,669	(12)
Bachelor's degree and level 7 qualification	70	(22)	129,564	(16)
Postgraduate[7]	32	(10)	67,296	(8)

[1]Percentages are on the total stated.
[2]The total numbers of female usually resident population in the four categories differ because of values that were not stated.
[3]Some participants identified with more than one ethnicity, hence >100%.
[4]NZ European includes those who identify themselves as 'New Zealanders' as this option was not provided in the study questionnaire.
[5]'Others' could not be computed from the NZ 2013 census results.
[6]The estimates presented for parity and education are limited to 35–64 year old women. This is because the census data does not provide the level of education and parity for the 65–69 years age-group; instead this is given as 65 years and over.
[7]Postgraduate includes postgraduate honours degree, Master's degree and doctorate.

aged 35–54 years, the overlapping age-range for the two studies. In addition, proportions were weighted to account for the age structure of both samples. The age-groups used in comparing the two studies are similar to those used in the publication of the study by Paul et al. The lead author was also contacted to verify our accuracy in data extraction from their publication. In both studies, the purpose of examining ethnic groups was to compare the participants with the census population. In the study by Paul et al, prioritised ethnicity was used because this was used at that time by Statistics New Zealand. At the time of our study, prioritised ethnicity was no longer used by Statistics New Zealand. Therefore, in our study, ethnicity was classified according to the 2013 census categories. This was appropriate because we needed to compare the ethnic distribution of the participants with that of similarly aged New Zealand women in order to assess whether they were a representative sample.

Data were analysed using IBM Statistical Package for the Social Sciences (IBM SPSS statistics 22). Descriptive statistics were used to compute frequencies and percentages. The chi-square test was used to examine the associations between socio-demographic characteristics of the participants and the female usually resident population at the 2013 census. Differences in the age standardised prevalence of contraceptive use between the two studies and 95% confidence intervals were estimated in order to assess statistical significance.

Results

There were 904 women selected from the electoral roll. Of these, 59 were not currently residing at the address indicated on the electoral roll and 15 could not communicate in English. Of the remaining 830 women, 255 declined to participate and 184 could not be located. This left 389 women who were available for the analysis (response proportion = 47%).

The age profile of the sample population was representative of the 2013 census female population aged 35–69 years. Although participants had a higher level of education than the general population (χ^2=58.455, df=6, p<0.001), other socio-demographic characteristics of the participants were comparable to those of the female usually resident population aged 35–69 years (Table 1).

Contraceptive ever-use

The results of contraceptive ever-use are presented in Table 2. Oral contraceptives had the highest prevalence of use (89%), with almost uniform use across age-groups. This was followed by condom use (54%), with the proportion of users lower at higher ages. Implants had the lowest prevalence (1%); only four of the 389 women had used an implant. Overall, ever-use of reversible contraceptives declined with age. In contrast, prevalence of vasectomy, tubal ligation and hysterectomy increased with age. No participant had undergone tubal ligation reversal operation. More than half (52%) of the participants were post-menopausal.

Current contraceptive use

Of the 389 women who were available for analysis, 231 were aged 35–54 years. The results of the women currently practicing contraception are presented in Table 3. The method with the highest prevalence of current use was the oral contraceptives (9%), closely followed by the IUD (8%). As in ever-use, implants had the lowest prevalence of current use. An inverse relationship between age and prevalence of current use of reversible contraceptive methods was seen.

Among non-users of reversible contraceptive methods, 58% (101/175) were either sterilised (BTL/hysterectomy) or have, at some point, had a vasectomised partner (participants were not asked about current use of vasectomy therefore this cannot be reported). However, 13 women who were either sterilised or had a history of a relationship with a vasectomised partner were also on a reversible method of contraception.

Comparison with the 1983–86 estimates of contraceptive use

Contraceptive ever-use

In the study by Paul et al, 767 women were aged 35–54 years; there were 231 in the current study. Among women aged 35 to 54 years, over a span of 30 years, ever-use of condoms has more than doubled (24% to 64%). Increases in ever-use of OCs (75%

Table 2: Proportion of women who have ever-used various contraceptive methods according to age.

Contraceptive Type[2]	35–44		45–54		55–64		65–69		Total	
	No.	(%)[1]	No.	(%)[1]	No.	(%)[1]	No.	(%)[1]	No.	(%)[1]
Pills	86	(77)	119	(99)	91	(90)	51	(89)	347	(89)
DMPA[3]	19	(17)	16	(13)	11	(11)	7	(12)	53	(14)
Implants	3	(3)	1	(1)	-	-	-	-	4	(1)
IUDs[4]	17	(15)	30	(25)	27	(27)	11	(19)	85	(22)
Condoms	72	(65)	76	(63)	46	(46)	17	(30)	211	(54)
Other[5]	3	(3)	16	(13)	8	(8)	7	(12)	34	(9)
Tubal ligation	3	(3)	16	(13)	22	(22)	21	(37)	62	(16)
Vasectomy	27	(24)	65	(54)	51	(50)	27	(47)	170	(44)
Bilateral oophorectomy	-	-	4	(3)	8	(8)	5	(9)	17	(4)
Hysterectomy	2	(2)	19	(16)	21	(21)	20	(35)	62	(16)
Periods stopped[6]	6	(5)	48	(40)	88	(87)	53	(93)	195	(50)
Total number of women	111	(100)	120	(100)	101	(100)	57	(100)	389	(100)

[1]Percentages weighted to account for the age structure of the sample.
[2]Some women used more than one method.
[3]Depo medroxyprogesterone acetate.
[4]Intrauterine contraceptive devices.
[5]Other included—diaphragm, cervical cap, natural method, chemical methods and emergency contraceptive pills.
[6]Includes natural menopause and iatrogenic menopause.

Table 3: Proportion of women on different contraceptive types according to age.

	35–39		40–44		45–49		50–54		Total	
	No.	(%)[1]	No.	(%)[1]	No.	(%)[1]	No.	(%)[1]	No.	(%)[1]
Using a reversible method										
Pills	5	(11)	10	(15)	3	(5)	3		21	(9)
DMPA[2]	-	-	2	(3)	1	(2)	-	-	3	(1)
Implants	-	-	1	(2)	1	(2)	-	-	2	(1)
IUDs[3]	3	(7)	9	(14)	6	(10)	1		19	(8)
Not using a reversible method[4]										
Vasectomy	8	(17)	14	(22)	30	(48)	29	(50)	81	(35)
BTL[5]	-	-	3	(5)	7	(11)	7	(12)	17	(7)
Hysterectomy	-	-	2	(3)	4	(6)	15	(26)	21	(9)
Bilateral oophorectomy	-	-	-	-	1	(2)	3	(5)	4	(2)
Period stopped[6]	-	-	3	(5)	9	(15)	35	(60)	47	(20)
Total number of women	46	(100)	65	(100)	62	(100)	58	(100)	231	(100)

[1]Percentages weighted to account for the age structure of the sample.
[2]Depo medroxyprogesterone acetate.
[3]Intrauterine contraceptive devices.
4Although it is possible for vasectomy and BTL to be reversed, this rarely occurs, so they have been classified as not reversible.
[5]Bilateral tubal ligation.
[6]Includes natural menopause and surgically induced menopause.

Table 4: Comparison of contraceptive ever-use between the present and previous study in women aged 35–54 years.

	Paul et al: (1983–1986)						Current study (2013–2015)					
	35–44		45–54		Total		35–44		45–54		Total	
	No.	(%)	No.	(%)	No.	(%)	No.	(%)	No.	(%)	No.	(%)
Type of contraception												
Pill	352	(86)	223	(62)	575	(75)	86	(77)	119	(99)	205	(89)
Injection	52	(13)	28	(8)	80	(10)	19	(17)	16	(13)	35	(15)
IUDs	88	(22)	41	(11)	129	(17)	17	(15)	30	(25)	47	(20)
Condom	78	(19)	107	(30)	185	(24)	72	(65)	76	(63)	148	(64)
Tubal ligation	115	(28)	53	(15)	168	(22)	3	(3)	16	(13)	19	(8)
Vasectomy	120	(29)	82	(23)	202	(26)	27	(24)	65	(54)	92	(40)
Total number of women	408	(100)	359	(100)	767	(100)	111	(100)	120	(100)	231	(100)

Percentages weighted to account for the age structure of the sample.
Some women had used more than one contraceptive.

to 89%), vasectomy (26% to 40%) and DMPA (10% to 15%) were also observed. In contrast, the prevalence of tubal ligation declined from 22% to 8%. The increase in reversible contraceptive use was uniform across age-groups apart from IUDs in which a decline in ever-use was observed in the younger age-group (35 to 44 years). The fall in tubal ligation was largely due to lower prevalence among younger women (Table 4).

Differences in age standardised prevalence between the current and previous study were statistically significant for oral contraceptives (15.0%; 95% CI=10.1–19.9), condoms (39.4%; 95% CI=32.5–46.3), tubal ligation (13.0%; 95% CI=8.5–17.5) and vasectomy (13.8%; 95% CI=7.1–20.6). There was no significant change in use of DMPA (5.0%; 95% CI=-0.1–10.1) or IUDs (4.0%; 95% CI=-1.7–9.8).

Current contraceptive use

In both studies the most common currently used contraceptives were pills, followed by IUDs, and DMPA, albeit with an increase in the proportion of users from 5% to 9%, 3% to 8% and 0.3% to 1% respectively. In addition, a fall in female sterilisation and a rise in vasectomy were observed. In both studies, there was a consistent pattern of a higher prevalence of current use of reversible contraceptive methods among the 35–44 year olds compared to the 45–54 year olds. Overall, the prevalence of current use of reversible contraceptive methods was similar in both studies; 19% and 20%. The results are presented in Table 5.

In contrast to ever-use, the difference in age standardised prevalence of current use between the current and previous study was not statistically significant for oral contraceptives (4.6%; 95% CI=0.6–8.5), but was significant for IUDs (5.1%; 95% CI=1.3–8.8). Similar to ever-use, the change in use of DMPA was not statistically significant (1.0%; 95% CI=-0.5–2.5).

Paul et al reported differences in contraceptive use according to socio-economic groups. However, in the present study no association between contraceptive use and income levels was observed, nor was there any relationship with level of education (data not shown).

Discussion

In this population-based study of women aged 35–69 years, oral contraceptives had the highest proportion of ever-use (89%), followed by condom use (54%); implants had the lowest prevalence (1%). The prevalence of vasectomy, tubal ligation and hysterectomy showed a positive relationship with age. In contrast to ever-use, the most common currently-used reversible contraceptives were IUDs and OCs. Implants had the lowest prevalence of current use.

Estimates of prevalence of contraceptive use restricted to women aged 35–54 years were compared with the previous study.[5] A significant rise in ever-use of the pill (75% to 89%) and a more than two-fold increase in condom use (24% to 64%) were observed. There was a significant increase in ever-use

Table 5: Comparison of prevalence of current contraceptive use between the present and previous study in women aged 35–54 years.

	Paul et al: (1983–1986)						Current study (2013–2015)					
	35–44		45–54		Total		35–44		45–54		Total	
	No.	(%)	No.	(%)	No.	(%)	No.	(%)	No.	(%)	No.	(%)
Using a reversible method												
Oral contraceptives	26	(6)	10	(3)	36	(5)	15	(14)	6	(5)	21	(9)
DMPA injection	1	(0.2)	1	(0.3)	2	(0.3)	2	(2)	1	(1)	3	(1)
IUD	17	(4)	8	(2)	25	(3)	12	(11)	7	(6)	19	(8)
Not using a reversible method												
Sterilised												
Tubal Ligation	101	(25)	33	(9)	134	(17)	3	(3)	14	(12)	17	(7)
Vasectomy	103	(25)	50	(14)	153	(20)	22	(20)	59	(49)	81	(35)
Hysterectomy	64	(16)	75	(21)	139	(18)	2	(2)	19	(16)	21	(9)
Postmenopausal	66	(16)	185	(52)	251	(33)	3	(3)	44	(37)	47	(20)
Total number of women	408	(100)	359	(100)	767	(100)	111	(100)	120	(100)	231	(100)

Some women used more than one contraceptive method concurrently.
Percentages weighted to account for the age structure of the sample.
Although it is possible for vasectomy and BTL to be reversed, this rarely occurs, so they have been classified as not reversible.

of vasectomy (26% to 40%), accompanied by a fall in tubal ligation (22% to 8%). Only a slight increase in the use of DMPA and IUDs was observed.

Of participants currently not using reversible contraceptives, 58% had a tubal ligation or hysterectomy, or had, at some point, a vasectomised partner. This may explain their non-use of reversible contraceptives. However, 13 women in this group were also on a reversible method of contraception. A subsequent change of partner or the use of contraceptives for non-contraceptive reasons may explain this.

In a report on current contraceptive use in New Zealand women aged 35–49 years, a fall in sterilisation (both male and female sterilisation) and a rise in condom use were observed during 1976 to 2001, the latter being consistent with the current findings. Use of oral contraceptives remained relatively constant during this period. In contrast, a fall in current use of IUDs in younger women (35–39 years) and a rise in older women (40–49 years) were observed.[7]

The previous study[5] reported a positive association between current contraceptive use and socio-economic status. In the current study no relationship was observed between current use and income or level of education. The difference in findings may be attributed to a change in contraceptive use, or to use of different measures of socio-economic status. Paul et al used the Elley-Irving scale for categorising social class. This method uses occupation as the main determinant of social class and is no longer in use. Furthermore, for married women, the occupation of the husband was taken into consideration. In contrast, we used each participant's own annual income and highest level of education.

Similar to other studies,[1,8,9] oral contraceptives had the highest prevalence of ever-use. Oral contraceptives have been in use for longer than some other methods, and they are also used for the management of some medical conditions. In addition, a high level of satisfaction among users of oral contraceptives has been reported[8] and they may be more acceptable than DMPA which has been available for almost the same duration.[10] Contraceptive implants were only recently introduced[9] and this may partly explain the low uptake seen in the present study. The need for special training in insertion techniques, affordability, side-effects and awareness of availability of the method are additional factors that may contribute to low prevalence of use, however, reasons for discontinuation or choice of a method were

not sought in this study. Choice of method of contraception may also be influenced by health policy and funding such that changes in such policies may lead to changes in the prevalence of use of certain contraceptives.

The observed increase in the use of condoms has also been reported in other studies.[1,11] A US study attributed the increase in women currently using contraceptives from 56% in 1982 to 64% in 1995 to a rise in condom use.[11] With the advent of HIV/AIDs, public education has promoted the use of condoms as a way of reducing the risk of sexually transmitted infections; this may explain the increase in use of condoms.[1,8] The use of condoms in our study may have been under-reported because participants were asked about condom ever-use as a contraceptive and not as protection against sexually transmitted infections. Indeed, studies have reported a higher prevalence of condom use in combination with other contraceptives as compared to use of condoms as the primary method; one study reported a rise from 20% to 23% and another from 16% to 25%.[8, 11]

Over 30 years in New Zealand, an increase in ever-use of vasectomy (26% to 40%) was observed. In a study conducted during 1997 to 1999, men aged 40–74 years were asked about their personal history of vasectomy; a prevalence of 44% was reported.[12] The prevalence of vasectomy may have been under-reported in our study because women may not be aware of the vasectomy status of their partners. The increase in prevalence of sterilisation with increasing age is expected because younger women may still desire to have children.

From the findings of the current study, the prevalence of use of permanent methods of contraception (vasectomy and tubal ligation) in New Zealand has not changed in the last 30 years. What has changed is a couple's choice of sterilisation procedure, such that with the fall in the prevalence of tubal ligation there is a compensatory rise in the prevalence of ever-use of vasectomy. The shift to vasectomy may be due to ease of performing the procedure, lower risk of complications and change in men's attitude towards sterilisation.

A decline in hysterectomy by half (18% to 9%) in women aged 35 to 54 years was observed. This is consistent with estimates of the prevalence of hysterectomy made for setting outcome targets for the New Zealand National Cervical Screening Programme.[13]

Strengths of this study are the nationwide population-based design, and that it is representative of the age-distribution and ethnicity of New Zealand women in the 35 to 69 years age-range. Some potential limitations of this study should be considered. The low response proportion (47%) may have introduced selection bias. Women with higher levels of education were over-represented in this study, but response did not differ by age-group. When response by geographic region was assessed, a higher response proportion was noted in the South Island compared to the North Island. However, when only participants where contact was achieved were considered, excluding those who could not be located, participation was equal across regions. This difference may also be explained by high population mobility in the North Island. The Auckland region has the highest proportion of people who change residences between censuses, with some areas having only 10% of the population living at the same address between the 2001 and 2006 censuses.[4] Similar studies in New Zealand in the 1980s[5] and 1990s[12] had higher response proportions (84% and 85% respectively). In contrast to the current study, the inclusion criteria for those studies required participants to have traceable telephone numbers. Household access to a landline telephone has decreased in New Zealand accompanied by a rise in the use of cell phones.[4]

The study relied on self-reported exposures which were not verified by medical records. However, in previous New Zealand studies in which corroborative information was obtained from medical practitioners, information on contraceptive use provided by the participants was consistent with that on their medical records.[5, 12] In addition, it is expected that participants may forget patterns of use of a particular contraceptive (age of onset, duration of use and last age), but not the type of contraceptive used.

The changes observed in contraceptive practice in New Zealand are a marked increase in the prevalence of vasectomy and condom use, and a slight increase in ever-use of oral contraceptives. In contrast, there was a fall in female sterilisation. New Zealand has a high prevalence of

vasectomy and ever-use of oral contraceptives compared to other countries.[1, 8, 9] For example, in 2003, among women aged 15–49 years in five European countries (France, Germany, Italy, Spain and the UK), 85% were ever-users of oral contraceptives and 11% used sterilisation methods (both female and male sterilisation).[8] Patterns of contraceptive use may be changing; therefore monitoring is required in order to meet the contraceptive needs of the New Zealand population. Knowledge of this may influence public health policy. The use of permanent sterilisation and long-acting reversible contraceptives (LARCs) affect the rate of unintended pregnancy and abortion rates, which are of public health importance. Population-based estimates of the prevalence of contraceptive use are also useful for calculating population attributable fractions for diseases related to contraceptive use.[14]

Competing interests:
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A morbidity/mortality analysis of a tertiary level upper gastrointestinal/ hepatopancreaticobiliary surgical unit

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ABSTRACT

Internationally, regionalisation of major upper gastrointestinal/hepatopancreaticobiliary (UGI/HPB) surgery to a selected number of expert hospital centres has demonstrated that high hospital volume is associated with lower mortality and morbidity. The Wellington UGI/HPB unit compared to international institutions is a low volume unit, however within New Zealand we perform a high number of Upper GI/ HPB cases.

AIMS: The aim of this study was to evaluate the quality measures of morbidity and mortality of major upper gastrointestinal and hepatopancreatobiliary surgeries performed at the Wellington UGI/HPB unit.

METHODS: An analysis was conducted to evaluate the major UGI/HBP surgeries performed at Wellington over a six-year period. Patient demographics, and morbidity and mortality were stratified using the Clavien-Dindo classification of surgical complications.

RESULTS: Three hundred and twenty-nine major elective cases were performed at the Wellington UGI/ HPB unit over the six-year period. Sixty-five percent of patients experienced no morbidity, 19% of patients experienced mild morbidity, which had little effect on recovery, 14% of patients experienced major morbidity and 0.6% (two cases) progressed to mortality. When major UGI/HPB resections were specifically analysed, there were a total of 184 patients with 42 major morbidity (22.8%) and two mortalities (1.1%).

CONCLUSION: Compared with international standards, the Wellington UGI/HPB unit is a low volume centre but has delivered an acceptable quality of care with a low major morbidity and mortality for this type of surgery.

Quality in healthcare is a developing area and is rapidly becoming an important goal in the assessment and optimisation of surgical outcomes for patients.[1] Comparisons between high and low volume centres in the UK and US are often used to strengthen the movement for regionalisation of tertiary level specialities such as upper GI and HPB operations to a selected number of expert centres.[2,3] However, there is debate over the volume-outcome-quality relationship, ie the causation between hospital flow and morbidity and mortality.[4,5] A number of studies have found that there is a statistically significant association between high hospital volume and lower mortality risk with certain types of surgery such as oesophagectomy and pancreatic resection.[2,6–9] Although some studies have demonstrated a similar association for gastrectomy and hepatectomy,[10,11] other studies have not demonstrated such a trend.[2,6,12] Recently, there has also been scrutiny of the quality of these studies which calls into question the validity of their conclusions.[5,13] There appear to be discrepancies within this volume-outcome-quality relationship which are as yet not well defined. Specifically, the improvement in surgical outcome may not only be related to the volume of the centre but also to the volume of the surgeon,[14] the surgeon and

their respective training and expertise as well as the multidisciplinary infrastructural support within the institution.[15]

The Wellington Upper Gastrointestinal/Hepatopancreatobiliary (UGI/HPB) Surgical Unit was established in June 2006. It was set up as a specialist Multi-Disciplinary-Team (MDT) to select, support and evaluate eligible cases for surgical intervention in Wellington Hospital. This team is led by two consultant surgeons who, having completed their general surgical training, undertook specialist fellowship training in upper gastrointestinal and hepatobiliary surgery in the UK.

The Wellington UGI/HPB Unit performs regular peer review, radiology review and morbidity and mortality meetings with other surgical teams to assess and evaluate their performance. Case selection for elective surgery is based on initial assessment by the specialist staff, followed by formal discussion at a MDT meeting with input from other disciplines such as Radiology, Oncology, Gastroenterology and Pathology. Dietetic support is incorporated as a standard of care pre- and peri-operatively. Pre-operative assessment is undertaken at a dedicated pre-assessment anaesthetic clinic whereby surgical and anaesthetic teams assess the patient and optimise risk management. The cases referred are predominantly from the greater Wellington region, with some transfers or elective referrals from surrounding regions such as Whanganui, Blenheim and Nelson. This encompasses a total catchment population of approximately 500,000 people. Following case selection, appropriate cancer patients undergo a staging laparoscopy to determine whether the lesion is operable and to assess if there is any evidence of metastatic disease that may alter the care plan. Relevant additional procedures such as port-a-cath insertion are undertaken at the time of laparoscopy. All patients with oesophagogastric cancers are treated with conventional neoadjuvant chemotherapy prior to surgery, as are a number of patients with synchronous colorectal liver metastases.

During the time of operation, a team of surgeons, anaesthetists, intensive care unit (ICU) specialists, dietitians, physiotherapists and nurses are involved in the procedure and recovery. This includes pre-operative assessment and ward assessment prior to surgery, post-anaesthetic care and ward support following theatre. The majority of patients are routinely admitted to the high dependency unit (HDU) for the first 24 hours after surgery. Once discharged from the ward, follow up in the outpatient clinic is provided by the surgical team and further assessment and management is undertaken until the patient is deemed independent of any further medical assistance.

Due to the relative smaller population of New Zealand, the Wellington UGI/HBP unit is a low volume unit when compared to other units worldwide. However, within New Zealand, this unit performs a high number of UGI/HBP procedures.

The aim of this study was to evaluate the morbidity and mortality of major upper gastrointestinal and hepatopancreatobiliary operations performed by this unit since its inception in mid-2006. No formal, collaborative audit of performance outcomes has previously been conducted. Reviewing the literature, it can be postulated that this unit would expect to have a morbidity rate of 35–45% and mortality of 3–5%, in keeping with published international series for this type of surgery.[16–21]

Method

Since the inception of the Wellington UGI/HPB unit, patient data has been recorded on a computer spreadsheet file named “G drive”. Patient demographics and clinical parameters were collected in a prospective manner for all consecutive elective patients. The team, including surgeons and registrars have access to this database, which was updated weekly. Additionally, each case was investigated with the use of theatre information (ORSOS), ICU databases and the medical electronic recording system, Medical Application Portal (MAP). Furthermore, this data was cross referenced with a personal database kept by one of the surgeons (SKW) to improve accuracy. Additional information such as indications, co-morbidities, return to ICU, re-operations, hospital stay, intra-operative details, post-operative morbidity, mortality and blood transfusions were also sourced and recorded. If any disparities were found, there was discussion with the surgeons, and physical patient notes were obtained and reviewed.

Table 1: Clavien-Dindo surgical complication grading.

Grading	No	Percentage
0	214	No morbidity = 65%
1–2	65	Minor morbidity = 19%
3–4	48	Major morbidity = 14%
5	2	Death

Using this data, we performed a clinical audit of the major UGI/HPB operations conducted by this unit in Wellington Hospital. Theatre lists recorded by official hospital databases were obtained to assess overall numbers and included other operations such as laparoscopy, exploratory laparotomy, and biopsy and aborted procedures. Each case underwent inclusion/exclusion criteria. Major UGI/HPB surgeries were those involving tumour resection and/or anastomotic formation, repair of giant hiatus hernia 'plus' anti-reflux surgery and myotomy for achalasia. Although conventionally, anti-reflux surgery is not considered a specialist UGI procedure, it was included in this audit as it was performed as part of another major laparoscopic operation.

The outcome measure of major morbidity and mortality were stratified using the Clavien-Dindo classification of surgical complications[22] (Table 1). Complications were graded according to intervention required to treat morbidity. Complications that were not easily graded were compared to the examples provided by the Clavien-Dindo recommendations and stratified accordingly[22] (Appendix 1). Patients with multiple complications of differing severity were classified according to the morbidity with most intervention, thus the type of complications were recorded as events rather than the main event per patient to highlight the prevalence of complications following major surgery.

Table 2:

Laparoscopic	**Grade 3–4 morbidity**	**Mortality**
Nissen fundoplication + gastropexy or fundopexy + giant hiatus hernia repair (36)	3 (8%)	0
Hellers myotomy (17)	0	0
Other laparoscopic procedures (4)	0	1
UGI		
Oesophagogastric procedures (66)	17 (25%)	1
Bypass procedures (3)	1 (33.3%)	0
Other laparotomy procedures (11)	2 (18%)	0
HPB		
Liver—biliary (8)	0	0
Liver—resection/cyst (60)	9 (15%)	0
Pancreatic procedure (39)	14 (35%)	0
Pancreatic cystogastrostomy (4)	0	0
Splenectomy (13)	1 (7%)	0
Bariatric—sleeve gastrectomy (68)	1 (1%)	0
TOTAL (329)	48 (14%)	2 (0.6%)

Table 3: Patient demographics.

Age	Total	%	Grade 3/ Complic.	%	Mortality	%
≤60	197	59	19	5.7	0	0
61–70	87	26	21	6.4	0	0
≥71	45	13	8	2.4	2	0.6
Total	329		48	14.5	2	0.6

Crude case numbers were stratified into sex, age, ASA, operation, complication type and co-morbidities. Age stratification was selected from the options <61, 61–70, >70 years.

Results

A total of 329 elective cases were included in this clinical audit. Males accounted for 47%, and 53% were female. The mean age was 57 years. Nineteen aborted cases were excluded as they did not have measurable operative outcomes. Major morbidity was defined as a Clavien-Dindo complication score of Grade 3 or higher. In total, 65% of patients experienced no morbidity, 19% of patients experienced mild morbidity (which had little effect on recovery), 14% of patients experienced major morbidity and two cases progressed to mortality (0.6%) (Table 2).

There were 184 patients who underwent major UGI/HPB resections. In this subgroup, there were 42 major complications (22.8%) and two mortalities (1.1%). The majority (93%) of the major complications were classified as severity of grade 3 as per Clavien-Dindo criteria.

Major morbidity rates were variable between different operations. The single most common surgical procedure in this study was bariatric (68 cases), followed by oesophagogastric procedures: total gastrectomy, oesophagogastrectomy, subtotal gastrectomy (66 cases) and subsequently liver procedures (laparoscopic and open resections) (59 cases) and one deroofing of cyst. These operations are conventionally considered high-risk procedures and are usually associated with significant morbidity.

The highest major morbidity rates were associated with pancreatic procedures (Whipples, Distal Pancreatectomy, Enucleation) at 35%.

As expected, procedures with low morbidity were laparoscopic procedures Hellers Myotomy (0%); 17 cases and Nissen Fundoplications+Giant Hiatus Hernia repair (8%); 36 cases. “Other Laparotomy Procedures” included Gastrojejunostomy and Oversew of Aorto-Duodenal fistula (Table 2).

Demographically, patients in the age bracket ≥71 years were 1.73 times more likely to have a major complication compared to those aged ≤70. The two cases of mortality were both in the ≥71 age demographic (Table 3).

Patients’ physiological state prior to surgery described by the ASA score covered a range of 1–4. Most operations were performed on patients with ASA of 2 having mild systemic disease (70.2%). 25.2% of cases were ASA 3 and 0.3% of cases were ASA 4 (Table 4).

Table 4:

ASA	Number	%	+Morbidity	%total	Mortality	%total
1	14	4.2	2	7	0	0
2	231	70.2	31	13	2	0.8
3	83	25.2	15	18.1	0	0
4	1	0.3	0	0	0	0

Table 5:

COMORBIDITIES	Total	%	Grade 3/Complication	%
Cardiovascular Disease	77	23.4	17	5.1
Pulmonary Disease	30	9.1	3	0.9
Renal Disease	11	3.3	3	0.9
Diabetes Mellitus	52	15.8	10	3.0
Smoker – current or ex	36	10.9	10	3.0
Neurological	14	3.7	4	1.2

The major morbidity rate was 18.1% in the ASA 3 patient group and 13% in the ASA 2 patients. ASA 3 patients were 1.12 times more likely to have major complications compared to ASA 2 patients and 2.81 times more likely to have major complications compared to ASA 1 patients.

Two mortalities occurred in ASA 2 patients. One of the deaths occurred in a patient who had an initial procedure of total gastrectomy then three days later required an emergency laparotomy. The second patient died of a myocardial infarction after being discharged from the hospital.

Co-morbidities were concomitant in many cases of complication. Both patients that died had multiple co-morbidities. Incidentally, a major complication was prevalent in 27.7% of patients recorded as being a current or former smoker (Table 5).

Parameters such as smoking and past medical history were included in information collection as they were recorded, ie if they were not mentioned in information sources, it was assumed to be nil.

The specific complications according to the Clavien-Dindo classification were calculated as events due to patients often having multiple complications throughout their hospital stay. Grade 2 events have been included in a table to define minor morbidity accurately (Table 6).Rate of complication was calculated by number of events divided by number of those at risk of that complication. For example, only 39 patients were at risk of having a pancreatic leak. Expectedly, the lower grades of complication have higher frequency of occurrence. A total of 22 patients required blood transfusions, of note, eight of these patients underwent oesophagogastric operations, five underwent liver surgery and four had a splenectomy. Pulmonary issues such as pneumonia requiring antibiotic treatment and physiotherapy were common minor complications.

The most common grade 3a complications were pancreatic fistulae that did not require surgical intervention, but rather drainage, intravenous antibiotics and supportive care. Lymphatic leaks occurred in five cases, three requiring operative repair thus graded 3 and the other two were minor, effectively managed conservatively.

Re-admissions to the ward, following hospital discharge, are those requiring surgical care which is considered imperative to recovery. Examples include JJ feeding tube detachment. There were 13 re-operations under general anaesthetic (Grade 3b), two of which were on the same patient who had a Whipples procedure. The most common cause for redo-surgery was for leaks of lymphatic nature. It should be noted when crude numbers for re-operation are compared to those at risk from that procedure, return to theatre rates are relatively low.

Of the 329 cases, there were two deaths—a 0.6% mortality rate. These cases both had ASA of 2 prior to their initial surgery and were 71 years or older. The first mortality was a 76 year-old male who initially underwent a total gastrectomy for adenocarcinoma of the stomach with an ASA of 2 and co-morbidities of hypertension and recent neoadjuvant chemotherapy. Following a 21-hour routine stay in ICU he was admitted to the ward. On day three, he developed oliguria, vomiting, oxygen desaturation and severe metabolic acidosis. The patient was returned to theatre for resection of ischaemic small bowel. His condition deteriorated in ICU following re-operation; oxygen saturation was not maintained and renal function declined further despite maximal fluids, dialysis and inotropic support. The

Table 6: Complication events.

	No.	%
Grade 2—pharmacological treatment (329)		
Pulmonary	15	4.5
Renal	2	0.6
GI	1	0.3
Wound Infxn	9	2.7
Surgical site Infxn	1	0.3
Blood transfusions	22	6.6
SVT	1	0.3
MI	2	0.6
PE	1	0.3
Lymphatic leak	1	0.3
Grade 3a—requiring further intervention not under GA (according to procedure)		
Wound dehiscence/vac dressing (329)	2	0.7
Anastomotic leak (67) oesophagus and gastric	4	5
Pancreatic leak (39)	5	12.8
Biliary leak (70) liver and biliary	4	5
Lymphatic leak (33) esophagus	5	18
DVT (329)	1	0.3
Site abscess requiring CT guided drainage (329)	3	0.8
Unplanned return to ICU (329)	2	0.6
Readmission to ward following D/C (329)	4	1.2
Grade 3b—requiring further intervention under GA		
Unplanned return to theatre for leak + ICU (329)	5	0.3
Unplanned return to theatre for bleed + ICU (329)	2	0.6
Unplanned laparotomy for Ischaemic bowel (329)	2	0.6
Unplanned laparoscopy (329)	2	0.6
Iatrogenic requiring additional surgical care(329)	2	0.6
Grade 4a—life threatening complication (329)		
Respiratory failure	3	0.9
Pancreatitis	1	0.3
Cardiovascular	1	0.3
Grade 4b		
Multi organ dysfunction	1	0.3
Grade 5—mortality	2	0.6

patient died in ICU 29 hours later from aspiration pneumonitis secondary to ischaemic bowel and multi-organ failure.

The second death was a 71 year-old man who underwent a laparoscopic resection of a neuro-endocrine tumour of the lesser omentum. A gastroscopy three months prior revealed a small sliding hiatus hernia, but otherwise he had minimal medical history. He had an ASA of 2 and underwent a laparoscopic resection of the gastric tumour. Post-operatively he had some mild discomfort with breathing troubles and was provided with chest physiotherapy and occupational therapy support. On day two post-operatively, he was well and discharged home. On day three, the patient died at home, a post mortem revealed cause of death as a myocardial infarction.

Discussion

Overall, the results of this study of major upper GI/HPB operations performed at this unit demonstrate that there was a 14% major morbidity and 0.6% mortality in this group of patients. When analysing the major UGI/HPB resections specifically, there was a 22.8% major morbidity and 1.1% mortality. This type of surgery is historically considered high risk but has been recently undertaken by a number of international units with a relatively low risk profile.[23–26] The reasons for the low morbidity and mortality figures in our unit are likely to be multifactorial. Patient selection clearly contributes to the low morbidity and mortality figures and the majority of the patients (70%) in this study were categorised as ASA 2. However, almost 25% of the patients were classed as ASA 3 but were only 1.12 times more likely to suffer major morbidity. It has been shown that pre-assessment clinic evaluation has contributed positively in minimising the complication profile in these types of surgeries and is standard practice in a number of specialist UGI/HPB Units.[27] The low morbidity in this latter group may be related to the careful evaluation of patients at the dedicated pre-assessment anaesthetic clinic and subsequent intervention and optimisation of their co-morbidities prior to surgery. If patients were clearly unsuitable for surgery following evaluation, they were declined. As expected, major morbidity was nearly twice as likely to occur in the elderly patient older than 70 years and both mortalities occurred in this age bracket. However, upper GI and HPB cancers have a higher incidence in the older population and a number of studies have demonstrated favourable outcomes with low morbidity and mortality even in the older age group.[28]

The Clavien-Dindo classification was used as an objective and comparable means of reporting surgical complications. Many reports, using the Clavien-Dindo classification for Upper GI or HPB surgeries, considered major or severe complications as Grade 3a or higher.[29–30] A Clavien-Dindo self-evaluation alluded to the variability in threshold for 'major complication' with one paper considering Grade 3a as moderate and 3b or higher as major complications.[31] This clear classification method proved applicable to this unit's surgical outcomes and the example table assisted in determining grading of questionable morbidities.

Although there are a number of reports from Upper GI/HPB units in the literature, the majority are historical and do not utilise the Clavien-Dindo classification scheme. These studies do, however, define the expected overall morbidity and mortality of these types of major upper GI/HPB surgeries as 30–45% and 3–5% respectively.[16–21] Intuitively, while it is acknowledged that direct comparison of the results of our unit with those of other published series is neither possible nor appropriate due to the heterogeneity of patient populations, cancer types, unit infrastructure and surgical expertise, it may be useful to make observations of other units which have reported results using the Clavien-Dindo classification system.

Prior to the inception of our UGI/HPB unit in Wellington, there had been a study by Omundsen et al in 2007 describing a series from Wellington assessing outcomes of oesophago-gastrectomies for oesophageal carcinoma over a 12-year period.[32] There were a total of 67 patients with a peri-operative mortality of 10% and anastomotic leak rate of 9%. A further local series by Al-Herz et al in 2012 from Palmerston North, a provincial hospital, reported on the results of 68 patients undergoing oesophagectomies over a 17-year period. In-hospital mortality was 4.4% with anastomotic leak rate of 10.3% and cardiopulmonary

morbidity of 50 %.[33] We were also interested in reviewing the results of larger international centres. Lerut et al showed a 34.7% major morbidity and 1.4% mortality in 138 cases of gastroesophageal cancer surgeries.[34] Another study on oesophageal surgery, by Montenovo et al, had a major morbidity rate of 6.0% and mortality of 1.4% (37 cases). When closely analysed, this paper had reported 13 anastomotic leaks which were classified as Grade 1 complications, as they were resolved with bedside opening of the wound and packing or drainage.[35] However, it could be argued that conventionally, anastomotic leaks are considered a serious and potentially life-threatening complication and could have been graded differently, thus changing the morbidity rate. A study by Lee et al on distal gastrectomy had a 5.4% major complication rate and 0.8% mortality in 629 patients.[30] This study only analysed patients undergoing distal gastrectomy which inherently has a lower risk profile when compared to total gastrectomy and oesophagogastrectomy. The Wellington UGI/HPB unit undertook 66 oesophagogastric procedures with a 25% major morbidity and 1.5% mortality. Lymphatic leaks occurred in five patients (18%) who underwent oesophagogastrectomy, and in three patients, this was of high volume requiring re-operation and repair, but in the other two patients the lymphatic leak was low volume and resolved with conservative management. In more recent times, in order to minimise lymphatic leaks, we have instituted the policy of infusing cream via the jejunostomy prior to thoracotomy and have had no further lymphatic leaks to date. Anastomotic leakage ensued in 4 patients (5%) but were all managed with drainage and parenteral nutrition, and subsequently resolved. The single mortality (1.5%) was in a patient who underwent a total gastrectomy and placement of feeding jejunostomy. Unfortunately, the jejunal feed resulted in small bowel necrosis necessitating relaparotomy and small bowel resection, but the patient never recovered from the physiological insult to the system. Small bowel necrosis is a rare complication of jejunal feeding tubes and is described in approximately 1% of cases but carries with it a high mortality.[36]

Breitenstein et al reported a series of 615 liver resections with a 26% major morbidity and 3% mortality.[23] Another study of 259 liver resections by Andres et al demonstrated a 14% major morbidity and 0.7% mortality.[24] Both of these studies were at high volume liver centres, where mortality rate of <1% is considered standard of care for liver resection in non-cirrhotic patients. The Wellington UGI/HPB unit performed 60 liver cases with a 15% major morbidity and 0% mortality. The most frequent complication was biliary fistula which occurred in four patients (5%) and was successfully managed with endoscopic retrograde cholangiopancreatography (ERCP) and stent placement. Interestingly, only five patients required peri-operative blood transfusion and there were no re-operations for bleeding. Importantly, there was no mortality.

Braga et al study reported on 700 pancreaticoduodenectomy cases, with a 16.7% major morbidity and 3.9% mortality.[25] Casadei and Ricci's study on 61 patients undergoing distal pancreatectomy reported a 11.4% morbidity and 0% mortality.[29] Samra et al reported on 178 consecutive pancreaticoduodenectomies with a 19% major morbidity and 0% mortality.[26] The Wellington UGI/HPB unit demonstrated 35% morbidity and 0% mortality in 39 pancreatic cases. Pancreatic fistula was the most common complication and arose in five patients (12.8%). The majority of these cases were managed effectively by drainage, nutritional support and antibiotics. One patient required embolisation and laparotomy for a pseudoaneurysmal bleed. There was no mortality.

A number of studies have evaluated the relationship between volume and outcome in upper gastrointestinal and hepatobiliary surgery. It seems intuitive and reasonable that better outcomes are achievable if this type of surgery is performed at high volume centres. It would therefore appear that the evidence is compelling to support the centralisation of these types of operations to larger institutions with high volumes.[26,3] However, it is becoming evident that interpretation of studies that attempt to define a relationship between volume and quality is challenging.[37,38] There is significant variability in patient populations and surgical expertise in these studies, with no evidence of adjustment for data collection or case mix, whereby patients are operated on by a

number of different surgeons with heterogeneous training and skills. This thereby begs the question: is surgical outcome tempered by the surgeon's training/expertise, individual surgical volume or institutional volume? Moreover, hospital resectional volume has been proposed as a marker of a centre of excellence,[39] however, there is no standardised "number" of what constitutes a high volume centre. Importantly, evidence is emerging which suggests that although volume may have an impact on outcome, only a small percentage of the variability in mortality between units is explained by volume alone.[5,13,38] Although patient volume may be used as a surrogate measure of a centre of excellence and an impetus for centralisation of these types of surgeries, there are clearly other variables which contribute equally to this definition; these include surgical expertise and infrastructural support within the institution.[14,15] Hence, it is possible that surgeons with suitable training and skill, practicing at lower volume centres, with a sufficient case volume and multidisciplinary infrastructure and support may deliver a reasonable standard of care.[37]

The design of this study meant that information provided was reliant on the accuracy of the recording methods. The "G Drive" database was regularly prospectively reviewed and correlated with other hospital databases and the surgeon's personal database (SKW) in order to minimise error and reduce bias. There were occasional disparities between the sources of information, whereby the original documents were sourced and reviewed by the surgeons for clarification.

In summary, as a tertiary level UGI/HPB centre, the Wellington Hospital UGI/HPB unit with its overall morbidity of 14%, and mortality rate of 0.6%, and 22.8 % major morbidity and 1.1% mortality for major UGI/HPB resections is delivering at an acceptable quality of care for these types of operations.

Competing interests:
Nil.

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Appendix

Classification of surgical complications.

Grade	Definition
Grade I	Any deviation from the normal postoperative course without the need for pharmacological treatment or surgical, endoscopic and radiological interventions. Allowed therapeutic regimens are: drugs as antiemetics, antipyretics, analgetics, diuretics, electrolytes and physiotherapy. This grade also includes wound infections opened at the bedside.
Grade II	Requiring pharmacological treatment with drugs other than such allowed for grade I complications. Blood transfusions and total parenteral nutrition are also included.
Grade III	Requiring surgical, endoscopic or radiological intervention.
Grade IIIa	Intervention not under general anaesthesia.
Grade IIIb	Intervention under general anaesthesia.
Grade IV	Life-threatening complication (including CNS complications)* requiring IC/ICU management.
Grade IVa	Single organ dysfunction (including dialysis).
Grade IVb	Multiorgan dysfunction.
Grade V	Death of a patient.
Suffix "d"	If the patient suffers from a complication at the time of discharge (see examples in Table 2), the suffix "d" (for "disability") is added to the respective grade of the complication. This label indicates the need for a follow-up to fully evaluate the complication.

*Brain haemorrhage, ischaemic stroke, subarrachnoidal bleeding, but excluding transient ischaemic attacks.
CNS, central nervous system; IC, intermediate care; ICU, intensive care unit.

Comparison of documentation of patient reported adverse drug reactions on both paper-based medication charts and electronic medication charts at a New Zealand hospital

Wilson Shen, Bernice Wong, Jessica Yi Ping Chin, Michael Lee, Carolyn Coulter, Rhiannon Braund

ABSTRACT

AIM: Known adverse drug reactions (ADRs) can have profound effects on disease states, as well as prescribing practice. Therefore, the correct and complete documentation of each individual patient's ADR history, upon hospital admission, is important in optimising that individual patient's pharmacotherapy. This study investigated the documentation of ADRs at a tertiary New Zealand hospital, on both paper-based medication charts and electronic medication charts to quantify both the number of ADRs patients self-report, as well as the differences between recording of that information in electronic and paper-based charting systems.

METHOD: Following ethical approval, inpatient medication charts on the general medical ward (electronic prescribing), or the general surgical ward (paper-based medication charts) were viewed for documented ADRs—as reported by each patient on admission. Consecutive patient charts (and electronic clinical management system) were viewed until 50 patients from each ward, each with at least one documented ADR, (in any of the information sources) were obtained. Patient demographic information, ADR history and discrepancies between information sources were determined.

RESULTS: In both wards 114 patients were reviewed in order to find 50 patients with documented ADRs. In the medical ward (electronic) 44 (90%) patients had discrepancies in ADR information between different information sources and in the surgical ward (paper) this occurred in 49 (98%) patients.

CONCLUSION: A large number of patients self-report ADRs. Full documentation of patient reported ADRs is required to adequately inform future prescribing decisions. Discrepancies between ADR information recorded in different information systems exist, but information sharing between electronic and non-electronic sources could be prioritised in order to allow full and complete information to be collected, stored and utilised; and reduce the current inadequacies.

The correct documentation of a history of true immune-mediated allergic reactions to medications can play an important role in the decision making process of prescribing for that patient's current condition. ADRs are defined by WHO as "a response to a drug that is noxious and unintended which occurs at doses normally used in man ... [for] therapy of disease"[1–2] and can span from mild annoyances, such as indigestion, to medical emergencies including anaphylaxis. ADRs are often poorly understood by patients leading to both over and under-reporting, and are often misdiagnosed and incompletely categorised by doctors and other healthcare professionals, both which

can lead to inaccurate and incomplete documentation. Inadequate reporting and documentation of ADRs can lead to greater morbidity and mortality, with increased patient suffering, predominantly due to limited prescribing choices potentially leading to poor therapeutic responses.[3] Deviations from first line treatments and international guidelines, largely due to possible adverse reactions, have been shown to lead to suboptimal therapy, additional expenditure and potentially additional medication errors.[3–5]

A previous study found that almost half of all patients, within the hospital setting, self-report some type of drug "allergy" with the majority being an ADR to penicillin or an opioid.[6] As patients may report expected acceptable adverse effects as "allergies", there is a disconnect between what a patient considers an "allergy" and an allergy that restricts prescribing choices. This may cause an acceptable first-line treatment to be withheld—one that would not actually have caused true harm to the patient, and an inferior alternative to be utilised.[7] The nature and severity of an ADR experienced will influence the decision of prescribing appropriateness on future occasions, however this decision can only be accurate when based on a reasonable minimum level of information. It is no longer acceptable practice to just record the name of the agent implicated, rather the advantages of documenting the drug thought to be implicated, type of reaction, severity and date of occurrence have been recognised.[1,4] The importance of documenting this information has been highlighted in publications from the American Medical Association[8] and locally in the Health Safety and Quality Commission documents[9] which reinforce this process by physicians as part of medicines reconciliation at points of transfer of care, given the significant implications for patient safety as well as appropriate patient therapy.

The increasing use of technology, and in particular electronic records, has the potential to assist in capturing more detailed ADR information. This may range from simple prompts (in stand-alone systems) to retained patient profiles—where information captured can pre-populate electronic prescribing records, including a real-time allergy alert when a potentially contraindicated medication is prescribed, as well as detailing severe intolerances, to aid appropriate prescribing. Within many health care settings, electronic systems are changing the way medications are prescribed, administered and dispensed. While illegibility errors have been almost eliminated by these systems there are still issues surrounding the completeness of information held, including ADR reporting.[10–11] A study conducted in a hospital with highly computerised information systems found that high rates of ADRs occurred, including where previous similar ADRs were recorded, despite the development and implementation of electronic systems, and found that this was due to factors that are still open to human error, such as drug selection and drug dosing.[12]

The aim of this study was to identify discrepancies in the recording of ADR information between electronic medication charts and paper-based medication charts to highlight if resources are required to minimise this potential problem; further to identify the number and type of medications implicated and to determine whether these varied between the ward type (general surgical versus general medical).

Method

Study context

The study hospital is a tertiary New Zealand hospital with approximately 400 beds. A number of electronic and paper-based systems are utilised within this hospital to manage patient information and medical notes. The central electronic integrated clinical management system (CMS), gathers information from other electronic systems and acts as the primary electronic tool for medical staff to monitor patient progress and retrieve medical notes. Patient information contained in the CMS may include history of admissions and discharges, laboratory tests, X-rays and ADR documentation.

Prescribing of medications at this hospital is split between traditional paper drug charts and an electronic prescribing software system (EPSS); the rollout of the EPSS is being conducted in a systematic manner with the addition of individual wards in turn. All patients have a file in the

CMS, irrespective of which ward they are admitted to and the prescribing system used.

There are several ways that ADRs may be recorded; 1) hand written onto the paper-based medication chart; 2) entered into the EPSS; 3) entered into the CMS system as part of patient notes; or 4) CMS can "import" ADR information from the EPSS—however, the synchronicity of information between these two electronic systems is not always complete. ADRs may be recorded from the patient self-reporting these at time of admission, or from clinicians accessing previous records (electronic and paper based).

Data collection

Following ethical approval, medication charts from patients on the two general surgical wards (that use paper-based prescribing charts) were viewed and medication charts from patients on the two general medical wards (that use electronic prescribing) were viewed. The ADR information from each patient chart was recorded and the ADR information for each patient was subsequently reviewed on the CMS.

If any of the information sources had one or more ADRs documented, the patient was included in the study, but if no information was documented in any of these sources or 'no known drug allergies' or 'NKDA' was documented, the patient was excluded. This process was continued until 50 patients from each specialty area (surgical or medical) were included in the study.

Demographic information such as gender, age and the number of documented ADRs for each patient was recorded. Where possible, the implicated drug or drug class was recorded, and where documented, the manifestation of the ADR. Additionally, the date of the ADR was recorded (if documented).

Identification of discrepancies occurred when agents and associated reactions were not the same in each information source. These discrepancies occurred because one information source may have stated the *agent*, whereas the other source may have had the *agent* and the level of *reaction* (or even the *date*). Discrepancies like these meant that completeness of information viewed depended on the information source used by the clinician. For patients who had discrepancies, the information source with the **highest quantity** of information was determined (by comparison of the information) and identification of the source that provided the **largest number** of reported ADRs. ADRs reported were not independently investigated and verified for accuracy during the study.

Figure 1: Age distribution of patients with ADRs from the medical (■) and surgical wards (■).

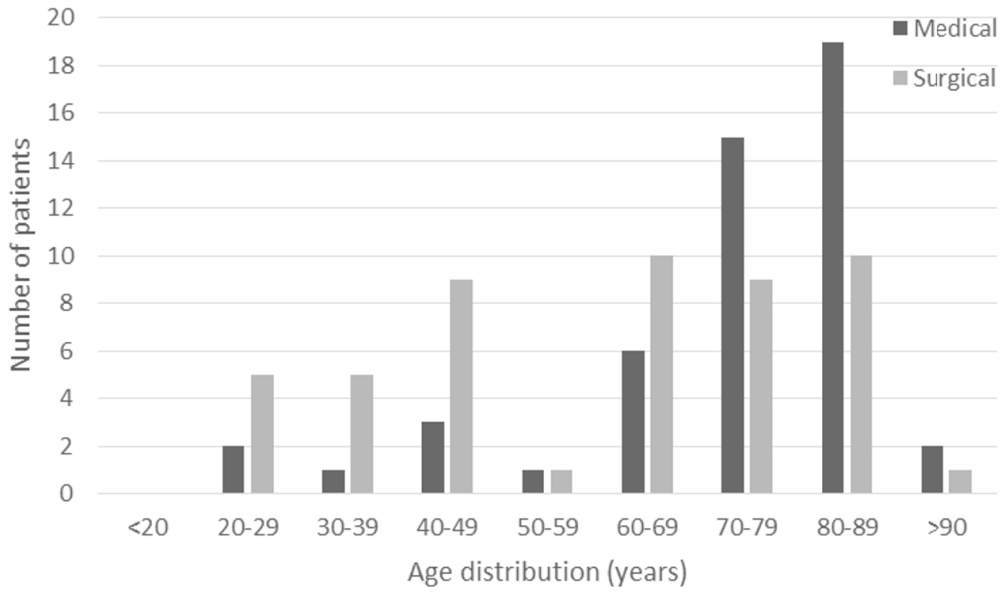

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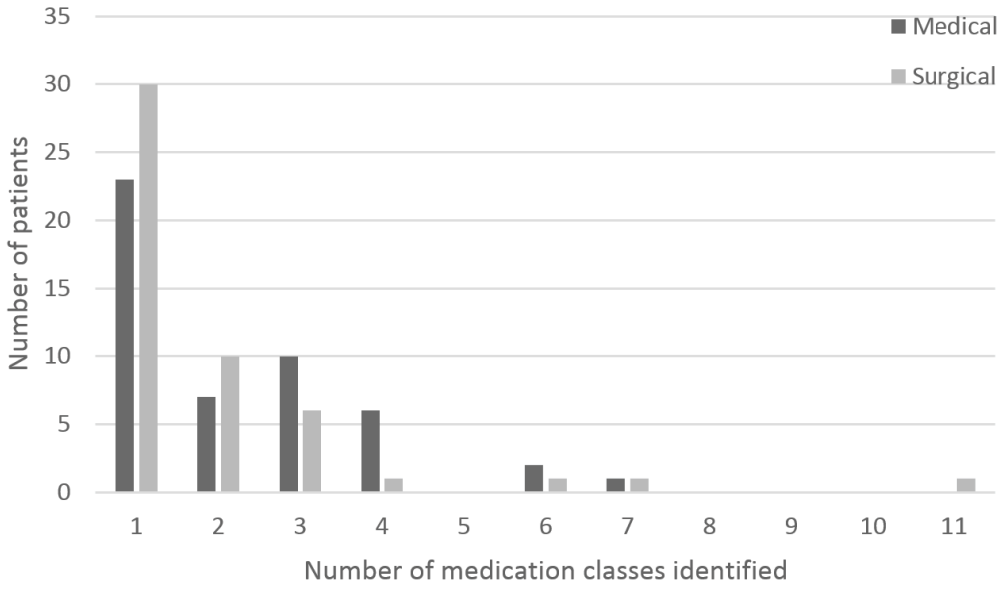
Figure 2: Number of medication classes implicated in ADRs from patients in the medical (■) and surgical wards (■).



Results

In both wards 114 patients were reviewed to find 50 patients with at least one documented ADR. However, upon revision of the data, one patient from the medical ward had been duplicated, bringing the number in this group to 49.

The gender split between the wards was very similar; the medical wards were 51% females and the surgical wards were 52% females. The age distribution is shown in Figure 1, the difference in the age distributions most likely reflects the ward specialty.

The number of documented ADRs to a specific drug class or substance is shown in Figure 2. These appear similar between the two types of wards where the majority of patients have only a few (one, two or three) documented ADRs. Of note is that one outlier had 11 documented ADRs to specific agents.

Where the specific ADR was documented, the agent responsible was tabulated (see Table 1) as well as the reaction being recorded (see Table 2).

Antibiotics represented the largest contributor with n=85 of the 197 agents (43%), followed by penicillins n=51 (26%) and opioids n=15 (8%). The 'other medicines' included predominantly single reports from many classes such as statins, beta-blockers, calcium channel blockers, antiemetics and other analgesics, as well isolated reports from varied agents such as allopurinol, alendronate, oxybutynin, metformin, digoxin, quinine and more.

In the medical wards, (EPSS) 44/49 (90%) patients had discrepancies identified between their chart and CMS regarding their ADR history. On the surgical wards, (paper chart) 49/50 (98%) patients had identified discrepancies. Of the 44 patients' documents in the medical wards, the electronic chart held the most information for 33 (75%) patients, CMS stated a more complete ADR history for 10 (23%) patients; and for one patient who had two different drug reactions, one appeared on the electronic chart and one on CMS. In the surgical wards, the paper drug chart held the most information 31/49 times (63%), CMS had the most information 15/49 times (31%) and the content differed but the volume was the same in 3/49 (6%) patient profiles.

Discussion

This study found that there are high numbers of ADRs reported and documented within the hospital setting, which is positive in that it indicates that prescribers (or other healthcare professionals) recognise the importance of this information and its documentation. This incidence is higher than reported in other studies—only 228

Table 1: Agent documented in recorded adverse drug reactions.

	Medical ward electronic	Surgical ward paper-based
Penicillins	25	26
Cephalosporins	7	1
Sulfur-containing antibiotics	5	1
Other antibiotics	9	11
Opioids	9	6
NSAIDs	7	9
ACE inhibitors	2	2
Diuretics	2	1
Other medicines	26	30
Iodine and contrast media	3	0
Non-drug allergy*	7	8
Total	102	95

*Includes foods, sticking plasters.

Table 2: Adverse drug reaction detail recorded.

	Medical ward electronic	Surgical ward paper-based
Rash and/or urticaria	19	21
Nausea and/or vomiting	10	6
Anaphylaxis	6	7
Misc GI upset*	3	8
Swelling or angioedema	6	
Headache	5	
GI bleed*	4	
Hypertension	4	
Fever		4
Flushing	2	2
Shortness of breath	3	
Cough	3	
'Unwell'		3
Diarrhoea		3
Palpitations/tachycardia	3	
Asthma/bronchospasm	2	
Tight chest	2	
Other	14	14
Total	86	68

*GI = gastrointestinal
*Misc = miscellaneous

patients needed to be screened in order to obtain a total of 100 participants, which is 44% of patients having a documented ADR. Previous studies have found that ADRs are present in 10–20% of hospitalised patients.[13] The medications implicated in these ADRs were similar between the two wards and are broadly representative of the medications known to be implicated in drug allergies due to their potential for allergic reaction and/or common usage eg opioids and β-lactams. The percentages reported differ slightly from other published literature;[6] this study found lower reports of ADRs to opioids (7.6% vs 19%), comparable reports to penicillin (26% vs 27%) and higher reports of ADRs to antibiotics overall (43% vs 37%). The lower rate to opioids may be due to practitioners recognising that mild type A ADRs, eg nausea, as well as mild itch, due to histamine release, are not a contraindication to rechallenge with these agents. There were differences noted in the types of reactions documented between the wards and this may be due to differences in the specialty demographics. For example, the medical wards had patients who were significantly older, as older people are less likely candidates for surgery; the impact of this may warrant further investigation. It was positive to see that the 'level' of reaction had been documented for many patients, showing that healthcare professionals recognised the implication of differential reactions. For example, the demarcation of an anaphylactic reaction from that of a simple rash can assist in deciding whether a patient can be rechallenged with caution or if there is a true contraindication.

There are some limitations to this study: firstly it is important to note that in this study there was no threshold limit on severity of ADR or confirmation of ADR, secondly the two wards represent different specialties as well as different systems which makes it difficult to compare directly and lastly the numbers of patients limit the ability to perform further statistical evaluation. However, this exploratory piece of work has highlighted the lack of adequacy of recording of ADR information and that discrepancies can occur.

The differences between the electronic charts and the electronic patient management systems should be able to be improved by better importing of one database into another. For example, all documented ADRs on CMS should automatically populate the electronic medication chart. In this way the patient management system is a permanent historical record of previously reported and witnessed ADRs. The option of a 'drop-down' or reminder box to check for ADRs when compiling the electronic medication chart should assist in keeping this information current and has the added advantage of date-stamping when the event was entered, as well the healthcare professional's name and their designation (eg pharmacist) is retained with the entered ADR. Additionally, the fact that the prescriber has to physically transcribe the ADR information held in the patient management system onto the paper chart is fraught with the potential for ADRs to be overlooked or mis-transcribed.

It is important to acknowledge that no system is perfect and that electronic entering of data is not always fool-proof, and with the implementation of electronic recording an erroneous ADR may be perpetuated. Physicians have identified that the fragmented nature of accessing electronically stored information causes details to be missed. Also, communication and coordination processes can lead to situations where information entered into the system is not accessed by other practitioners.[14] This fragmentation of information was seen when one information source reported one drug reaction and a different source reported another, which did occur with several patients.

Lastly, these electronic systems are only tools and healthcare professionals must use their professional clinical judgement when deciding on a treatment, particularly if the patient has had a previous reaction. Until electronic systems become better aligned with greater sharing of information, prescribers cannot simply use the patient's medicine chart as the information repository for noting ADRs and prescribing medications. This highlights the inefficiencies in having to check multiple patient information sources and the potential for patients to inadvertently receive medications that they have previously had an adverse reaction to.

Conclusion

Almost half of the patients in this study reported ADRs. However, for this information to translate into the decision to modify prescribing behaviour, full information regarding the nature and severity of the reaction is needed. The potential exists for more detailed information regarding the nature of the ADR to be recorded in a patient management system, but this is only of use if this information can be accessed at the time of prescribing. Discrepancies between ADR information stored in different systems exist, but information sharing between electronic and non-electronic sources could be prioritised in order to allow full and complete information to be collected, stored and utilised; and reduce the current inadequacies.

Competing interests:
Nil.

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An open-label six-month extension study to investigate the safety and efficacy of an extract of *Artemisia annua* for managing pain, stiffness and functional limitation associated with osteoarthritis of the hip and knee

Sheena Hunt, Debra McNamara, Simon Stebbings

ABSTRACT

AIMS: This six-month single-centre open-label extension study, conducted at the University of Otago, Dunedin, follows from a previously published 12-week pilot double-blind randomised placebo-controlled study of dietary supplement, Arthrem® (ART) in patients with osteoarthritis (OA) of the hip or knee. The pilot double-blind study showed that treatment with ART 150 mg twice-daily was associated with clinically relevant pain reduction. The extension study aims were to assess longer-term safety and efficacy during six months' treatment following the pilot trial.

METHOD: Patients who completed the pilot double-blind study had the option to continue on open-label treatment with ART for a further six months. Safety was assessed by adverse event monitoring and laboratory tests at three and six months. Efficacy was assessed at three and six months using the Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC®).

RESULTS: Thirty-four patients entered the optional extension and 28 completed six months' treatment. ART was well tolerated when taken for up to nine months. Improvements in WOMAC® efficacy parameters reported in the double-blind phase of the study were maintained over six months.

CONCLUSION: ART appears to be a safe and effective alternative for managing the symptoms of OA over an extended period.

A recent randomised controlled pilot trial was conducted to investigate the safety and efficacy of an extract of *Artemisia annua* as potential therapy for osteoarthritis (OA).[1] The study investigated the dietary supplement, Arthrem® (ART) which contains 150mg of standardised supercritical extract of *Artemisia annua* per capsule. Supplementation with ART (at a dose equivalent to one capsule of the dietary supplement twice-daily [BD]) showed benefits in patients with hip or knee OA over the 12-week study. The primary efficacy endpoint was reduction in Western Ontario and McMaster Universities Arthritis Index (WOMAC®) 3.1 index.[2] The published results of the study showed both statistically significant improvements from baseline in mean scores for the primary efficacy endpoint WOMAC® total, WOMAC® stiffness, WOMAC® physical function and VAS pain, and clinically relevant reductions in pain. There were no statistically significant changes from baseline in the placebo group for any parameter.[1] After the 12-week double-blind phase of the study, there was an optional, open-label safety extension study for an additional six months. This report presents the results of the extension study.

Method

Study design

ARTH01 was a phase 2 randomised placebo-controlled double-blind study with an optional open-label six-month extension (Australia and New Zealand Clinical Trials Registry: ACTRN12614000259640). The study was conducted at a single center; the Dunedin School of Medicine, University of Otago, Dunedin, New Zealand, and investigated the efficacy and safety of supplementation with ART on pain, stiffness and functional limitations associated with hip and knee OA. The study was conducted according to the principals of Good Clinical Practice, which protects the rights, safety and well-being of trial subjects in accordance with the principles of the Declaration of Helsinki. All patients provided written informed consent before any study-related procedures. The study received ethical approval from the Health and Disability Ethics Committee New Zealand (14/NTB/11). At the conclusion of the previously reported double-blind phase of the randomised controlled 12-week study,[1] patients who had completed the study were given the option to continue to take ART for an additional six months in an open-label extension study. All patients received one soft gelatin capsule of ART (containing 150 mg of standardised supercritical extract of *Artemisia annua* per capsule) twice-daily, regardless of the dose received during the double-blind phase of the study.

Efficacy and safety evaluation

Safety and efficacy in the open label extension study were assessed at baseline (conclusion of the double-blind phase of the trial) and at three months and six months afterwards. Safety outcomes included safety adverse events (AEs) (classified using the Medical Dictionary for Regulatory Activities [MedDRA] classification), laboratory data and vital signs measurements. Efficacy endpoints included WOMAC® total scores and individual WOMAC® components for pain, stiffness and physical function over the six-month extension study.

Statistical analysis

There was no formal statistical analysis of the open-label extension study and results are presented descriptively.

Results

Patients

The first patient was enrolled into the extension study on 28 August 2014 and the last patient completed on 18 September 2015. Of the 38 patients who completed the double-blind phase of the study,[1] 34 patients entered the optional extension study. Of these patients during the double-blind phase, 12 patients had taken ART 150 mg BD, nine had taken ART 300 mg BD and 13 had taken placebo. The extent of exposure was therefore between six and nine months. A total of 28 patients completed the extension study. Six patients withdrew: five patients due to AEs and one due to the patient's

Table 1: Summary of adverse events.

Patients, n (%)	N=34
Any AE	12 (35.3)
Serious AE	1 (2.9)[a]
Discontinuation due to AE	5 (14.7)[b]
Patients with treatment-related AEs[c]	3 (8.8)
Constipation and stomach pain	1 (2.9)
Flatulence	1 (2.9)
Diarrhea	1 (2.9)

[a]Serious AE was considered unrelated to treatment.
[b]Two AEs considered unlikely/unrelated to treatment; three possibly related to treatment.
[c]All considered possibly related to treatment.
AE, Adverse event.

Table 2: Changes in mean (SD) efficacy parameters.

	Mean WOMAC® parameter score			
	Total	Pain	Stiffness	Physical function
Baseline double-blind study	41.1 (15.8)	8.6 (3.0)	3.9 (1.6)	28.6 (21.2)
Baseline extension study	33.0 (18.4)	7.0 (3.9)	3.1 (2.0)	23.0 (13.6)
Week 24	33.8 (20.8)	6.3 (4.2)	3.3 (2.0)	24.3 (15.3)
Week 36	31.1 (20.3)	5.9 (4.0)	3.3 (7.2)	21.9 (15.1)

N=34.
SD, standard deviation; WOMAC®, Western Ontario and McMaster Universities Osteoarthritis Index.

wishes. Mean age was 62 years (range 45 to 75 years). Mean body mass index was 30.2 kg/m^2 (range 20.9 to 39.6kg/m^2). Eighteen of 34 patients (52.9%) were male.

Safety

AEs are summarised in Table 1. Overall, there were 16 treatment emergent AEs in 12 patients (35.3%). There were four AEs in three patients (8.8%) that were considered possibly related to treatment; all other AEs were considered unlikely related or unrelated to treatment. The AEs considered possibly related to treatment were stomach pain and flatulence (reported in the same patient), constipation and diarrhoea.

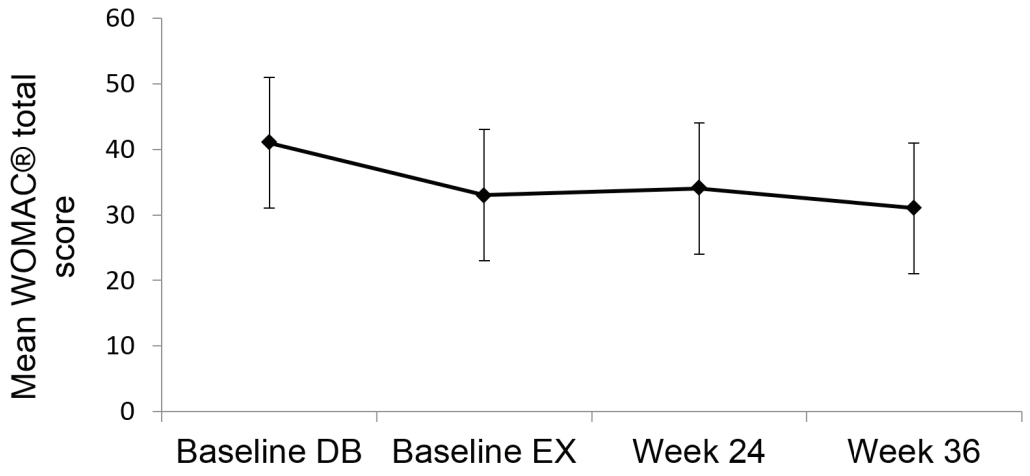
There was one serious AE (SAE) during the study (ovarian cancer), which was considered unrelated to treatment. There were AEs in five patients that lead to withdrawal during the study. Two of these AEs that led to withdrawal were ovarian cancer (considered unrelated to treatment) and elevated liver enzymes (considered unlikely related to treatment). Three patients withdrew due to AEs that were considered possibly related to treatment: stomach pain and flatulence (reported in the same patient), constipation and diarrhoea.

In general, clinical laboratory parameters were within normal limits with isolated results out of normal range. There were no laboratory changes that were considered clinically significant.

Efficacy

Table 2 summarises change in mean WOMAC® total scores and the individual WOMAC® components for pain, stiffness and physical function. During the six-month extension study, the reduction in WOMAC® efficacy parameters observed in the double-blind phase of the study[1] appeared to be maintained with WOMAC® total score and individual component mean scores remaining considerably below those of the baseline values of the double-blind study. Mean (standard deviation) WOMAC® total score was 41.1 (15.8) at the double-blind baseline, 33.0 (18.4) at the extension study baseline, 33.8 (20.8) at 24 weeks, 31.1 (20.3) at 36 weeks (Figure 1).

Figure 1: Mean WOMAC® total scores (± standard deviation) during extension study.



N=34.
DB, double-blind; EX, extension; WOMAC®, Western Ontario and McMaster Universities Osteoarthritis Index.

Discussion

ART appeared to be safe and well tolerated by patients with OA continuing treatment over six months. Three of 34 patients (8.8%) reported AEs (all gastrointestinal) that were considered possibly related to treatment. One patient developed abnormal liver function tests. It was not possible to exclude this as being related to ART, but since none of the other participants in the study developed any liver test abnormalities it was considered unlikely to be ART related.

Supplementation with ART (one capsule of the dietary supplement twice-daily) showed benefits in patients with hip or knee OA over the six-month extension study. There was no formal statistical analysis conducted in this open-label extension phase of the study. There were, however, improvements from the double-blind baseline in mean scores for WOMAC® total and individual WOMAC® components, which appeared to persist throughout the six-month study.

Pain is often poorly managed in patients with OA and therefore there is an urgent need to identify new compounds with anti-inflammatory and analgesic properties, given that current conventional therapies are associated with significant adverse effects.[3,4]

Artemisia annua, known as qinghao, has been used in Chinese traditional medicine for more than 2,000 years, and traditional medicinal uses include treatment for malaria, fever, hemorrhoids and as an anti-inflammatory.[5] *Artemisia annua* plants contain approximately 600 secondary metabolites including artemisinin, which is unique to this genus.[5] Artemisinin-based therapy is one of the most effective agents for the prevention and treatment of malaria[6–8] and has been used to treat millions of people worldwide.[9,10] Other antimalarial drugs, especially quinine derivatives, are standard therapies for the treatment for rheumatoid arthritis where they appear to have both disease-modifying and anti-inflammatory effects.[11]

Several studies in animal models have demonstrated anti-inflammatory and immunosuppressive activity in extracts from *Artemisia annua*.[12–14] It appears likely that the activity of *Artemisia annua* is not solely due to artemisinin and that other compounds within the plant may enhance bioavailability and/or bioactivity.[15–17]

Minimum clinically important differences (MCIDs) for the WOMAC questionnaire have been calculated and range from 0.67–0.75 for improvement (both total and subscale scores).[18] In one study of over 1,800 patients, the Multicenter Osteoarthritis Study (MOST),[19] several definitions of MCID were used to to calculate the frequency of clinically important improvement based on the WOMAC physical function subscale. These included the MCID26% and MCID17% (26% and 17% improvement from baseline, respectively). It is important to remember that MCID values need to be interpreted with caution since a wide range of different methodologies have been used to calculate them (including use of subscale components as noted above) so any value should not be seen as an absolute threshold. In the current study, the WOMAC physical function subscale improved by 23% from the double-blind baseline to end point, which achieves MCID17% but not MCID26%. This demonstrates a clinically significant improvement in physical function over the course of the follow-up period.

In summary, ART appears to be a safe and effective therapy with a sustained efficacy and clinically relevant improvements in function over a six-month period. As such it shows promise as a potential alternative to current pharmacotherapies used to manage OA symptoms. The results of this extension study are encouraging, and further investigation is warranted to investigate ART as a treatment for OA and as an anti-inflammatory/analgesic.

Competing interests:
The study was funded by Promisia Ltd, the manufacturer of Arthrem®. Sheena Hunt is an employee of Promisia Ltd.
Sheena Hunt provided assistance in the design. The interpretation of data and writing of the manuscript was performed by Dr Stebbings. All authors had input into the final manuscript. The final decision to publish lay solely with Dr Stebbings.
Simon Stebbings has no financial interests or other conflicts of interest in association with Promisia Ltd, including stock ownership, honoraria, paid expert testimony or personal relationships which may inappropriately influence the conduct of the trial.
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Antimicrobial resistance in New Zealand: the evidence and a call for action

Humphrey W Pullon, John Gommans, Mark G Thomas, Sarah Metcalf, Rebecca Grainger, Harriet Wild

ABSTRACT

AMR has been cited as the most significant health issue of the 21st century with potentially serious consequences for the health of global populations, including New Zealand, and its health system. Proactive approaches to combating AMR through better understanding of the causes will inform measures required to reduce potential threats.

The Royal Australasian College of Physicians (RACP) identifies three pathogens where increased resistance is of concern and recommends collaborative responses to prevent emerging threats to New Zealand populations. An international best practice AMR programme would include antimicrobial stewardship (AMS) building on evidence, policy, organisational support, multidisciplinary teams and patient experience.

The planned Ministry of Health-led collaborative approach to developing a national strategy and programme will provide sector direction. Implementation will require extensive engagement with the health sector and communities to develop joint solutions that prevent further increases in AMR.

Antimicrobials are effective in treating infections economically and achieve positive outcomes for patients. Antimicrobial resistance (AMR) results from infection-causing organisms surviving exposure to medicines that would normally eradicate or inhibit growth. Strains capable of surviving exposure to a particular drug and a lack of competition from other strains leads to increased resistance.[1]

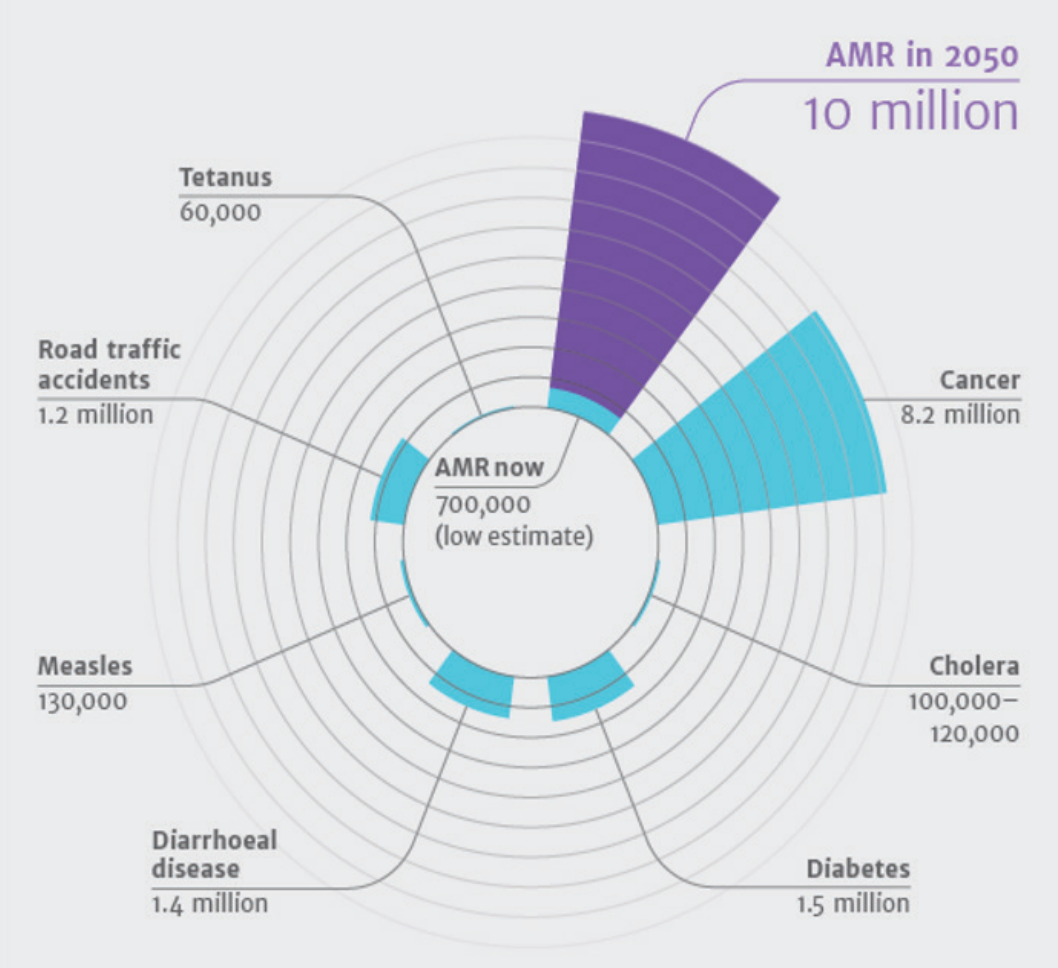
AMR has been cited as the most significant health issue of the 21st century with potentially serious consequences for the health of global populations, including New Zealand, and its health system.[1–3]

The RACP has released a policy paper highlighting three common pathogens that pose a risk to the health of New Zealanders. Although AMR is a complex and urgent public health concern, RACP identifies specific causes where improved understanding and action would reduce potential threats.[4]

This paper outlines the international context of AMR and its impact on New Zealand. The RACP believes there should be an increased focus on pathogens active in hospital and community settings that show resistance to antibiotics and pose a risk to the health of New Zealanders. A strategy to minimise the impact of multi-drug resistant organisms through antimicrobial stewardship (AMS) is essential. A combination of prescribing guidelines and infection prevention and control (IPC) practices within an AMS framework will set the parameters for change. Coordinated interventions are designed to improve and measure the appropriate use of antimicrobials and promote effective prescribing practices such as selection of appropriate agents, dose, duration and route of administration.[5]

Increasing use and misuse of antimicrobials needs tighter control. Inadequate IPC practices and the lack of programmes to develop new antimicrobials undermine the ability of prescribers to provide effective treatment for a growing number of infections. The projected effects on people and economies show spiralling costs. Without action, AMR could be attributed to 10 million deaths globally each year and cost 100 trillion USD to the global economy by 2050 (Figure 1).[1]

Figure 1: AMR-attributable deaths globally in 2050 compared to other major causes of mortality.[1]



International context

In 2001 the World Health Organization (WHO) announced a strategy for the containment of AMR, calling for an international response to position AMR at the forefront of health policy.[2] The strategy encouraged member states to introduce national frameworks and surveillance with a focus on quality and safety, as follows:

1. Adhere to a comprehensive, financed national plan with accountability and civil society engagement
2. Strengthen surveillance and laboratory capacity
3. Ensure uninterrupted access to essential medicines of assured quality
4. Regulate and promote the rational use of medicines, and ensure proper patient care
5. Enhance infection prevention and control
6. Foster innovation, research and new tools.[2]

A 2015 evaluation examined national responses to AMR within the WHO regions and assessed member states' ability to meet the strategy, and found that:

- Only 25% of member states had a comprehensive plan
- Public awareness of AMR remained limited, even among healthcare workers
- Few member states had national IPC programmes and fewer had programmes in all tertiary hospitals.[6]

AMR containment and control in New Zealand

In the WHO 2015 Report on the response to AMR, healthcare-associated infections (HAIs) and vaccine-preventable infections are identified as the most common public health threats in high-income countries in the Western Pacific region, including New Zealand.[6] Surveillance and monitoring data

for New Zealand is gathered by the Antibiotic Reference Laboratory at the Institute of Environmental Science and Research (ESR) to show prevalence and contributing factors for AMR, and where to target interventions.[7]

The release of the New Zealand Ministry of Health AMR Action Plan scheduled for May 2017 is welcomed. This is an important step forward. The RACP supports inclusion of a national antimicrobial prescribing guideline, and systematic measuring, monitoring and surveillance of AMR to include human and animal populations, as well as surveillance of antimicrobial consumption in District Health Boards (DHBs) and community settings. The New Zealand Veterinary Association's (NZVA) commitment to eliminating the use of antimicrobials to maintain wellbeing in healthy animals by 2030 has called for a multidisciplinary 'one world, one health' approach. This aims to raise awareness of the links between animals, humans and the environment and reduce the threat of AMR to human and animal health.[8]

Three common pathogens of concern in New Zealand

In 2015, the WHO identified nine bacterial pathogens of international concern, and reported on member states' monitoring and surveillance of resistant strains.[6] Three of these nine bacterial pathogens are of particular concern in community and hospital settings in New Zealand. They cause a range of common diseases, may be community or hospital-onset, pose challenges for prescribers to effectively treat infections and result in additional costs to the health system.[3,9] The three pathogens are:

1. Community-associated methicillin-resistant *Staphylococcus aureus* (CA-MRSA)
2. *Enterobacteriaceae*
3. *Neisseria gonorrhoeae* (*N. gonorroheae*).

Staphylococcus aureus (*S. aureus*), *Enterobacteriaceae* and *N. gonorrhoea* are medically important bacteria and increased resistance in these and other pathogens present a major threat to human health.[3] We have chosen to focus on resistance in these pathogens as these bacteria are common in community and hospital settings, present as a range of infections (for example, skin and soft tissue infections, urinary tract infections) and are increasingly resistant to major classes of antibiotics including penicillins, fluoroquinolones and third-generation cephalosporins.[3] We are concerned that the impact of resistance is driven by practices such as antimicrobial prescribing and consumption, the profile of infectious diseases in the community, population movement and IPC programmes.[3,9]

1. Community-associated methicillin-resistant *S. aureus*

New Zealand has a higher prevalence of *S. aureus* infections than comparable countries, including the UK and Australia. Although the majority of infections are attributed to community-associated methicillin-susceptible *S. aureus* (CA-MSSA), presentations of CA-MRSA have increased significantly since the early 1990s.[9,10]

This increase has been linked to high use of topical antibiotic treatments containing either mupirocin or fusidic acid to treat skin and soft tissue infections.[10,11] Between 1991 and 2000 topical antibiotics could be purchased without a prescription, contributing to further use of these medicines and to marked increases in resistance to mupirocin, the active ingredient in the topical antibiotic Bactroban©. By 2000 resistance to mupirocin was present in over 20% of *S. aureus* isolates, up from less than 5% of isolates in 1992.[10,11]

While topical antibiotics are commonly prescribed to treat several dermatological conditions, evidence-based guidelines support its use only for localised impetigo and eczema. Antibiotics for treatment of *S. aureus* should be as narrow-spectrum as possible; for example, flucloxacillin should be favoured over cephalexin or amoxicillin/clavulanate.[3,12]

2. *Enterobacteriaceae*

Rates of infection due to extended spectrum beta-lactamase (ESBL)-producing *Escherichia coli* (*E. coli*) have risen steadily in New Zealand, as they have in many regions globally.[6] In 2012, 4,000 cases of ESBL-producing *E. coli* and *Klebsiella pneumoniae* (*K. pneumoniae*) infections were observed in hospital and community settings.[3] In 2006–8 approximately 2.6% of

bloodstream isolates were ESBL-producers; by 2011, this figure had nearly doubled to 4.7%.[2,3] Reported prevalence of ESBL-producing isolates in *K. pneumoniae* are higher, at 10–15%.[9]

ESBL-producing *E. coli* and *K. pneumoniae* are typically resistant to all penicillins and most currently available cephalosporins.[2] People with serious ESBL-producing *Enterobacteriaceae* infections were commonly found to require hospital-based intravenous antibiotic therapy as the most effective treatment, because carbapenem antibiotics are not absorbed orally.[3]

Treatment in hospital for resistant infections has led to additional healthcare costs.[3,9] Increasing rates of resistance will put hospitals under greater pressure, and could undermine the viability of other interventions, including surgery, organ transplantation and chemotherapy.[1]

Infections due to carbapenem-resistant *Enterobacteriaceae* (CRE) have been detected in New Zealand. While the majority of these cases were contracted overseas, in 2015 a limited outbreak in two hospitals was reported in New Zealand.[13] We note there is a greater risk of pathogens spreading geographically as populations are increasingly mobile in a globalised society, through migration, trade and tourism.[14] The number of CREs has increased dramatically since 2009. In 2015 alone 41 isolates were identified, compared to 35 isolates in total between 2009 and 2014.[13]

There is a risk that CRE isolates may be resistant to all known antibiotics. Hospital IPC practices such as isolation and surveillance are known to be effective in preventing and minimising the risk of patient-to-patient spread, particularly for patients susceptible to CRE infection in areas such as intensive care or neonatal units.[1,5,9]

3. *Neisseria gonorrhoeae*

N. gonorrhoeae is the causal bacteria of gonorrhoea, the second most-prevalent STI, with approximately 62 million new cases globally each year.[15] Gonorrhoea is asymptomatic in up to 50% of infected women; as such it proves harder to treat in a timely and effective manner. Untreated it can lead to an increased risk of pelvic inflammatory disease and infertility.[16]

Increasing resistance in *N. gonorrhoea* has limited the efficacy of first-line antimicrobials, including penicillins, narrow-spectrum cephalosporins, tetracyclines and fluoroquinolones. Globally and in New Zealand, most people with gonorrhoea now receive combined treatment of an intramuscular injection of ceftriaxone, plus azithromycin orally.[9,17]

While there have been no isolates of ceftriaxone-resistant *N. gonorrhoeae* identified in New Zealand, isolates of decreased susceptibility have been reported as emerging in some geographical areas and this is raising concerns.[9,16] The emergence of infection resistant to ceftriaxone would raise the spectre of untreatable disease and there would be significant public health implications, particularly for disease control and an increased prevalence of disseminated gonococcal and neonatal infections.[2]

Antimicrobial governance and stewardship

Implementation of evidence-based treatment guidelines to reduce selective pressure on bacterial pathogens that drive the spread of resistance would be an important first step to preventing increases in AMR. This would guide change in the selection, dose and delivery of antimicrobials and minimise unnecessary use.[1,3,9]

The Ministry of Health's role in fostering a nationwide programme is essential to lead a whole of sector response for AMR. DHBs have a key coordinating role in responding to and engaging with their local health services, practitioners, local communities and populations and are well placed to develop and support AMS through their existing IPC programmes, which involve Primary Health Organisations and services within their communities.

AMS is a whole of sector responsibility and collaborative approaches to engage clinicians, services, and communities in the design of AMR solutions and interventions will improve sector participation; and uptake will increase the likelihood of clinical practice improvements.

We note that New Zealand DHBs that have implemented a centrally-driven

plan and provided funding for AMS programmes have achieved lower rates of antimicrobial use than hospitals in the UK and Australia.[18] Successful and sustained AMR initiatives were those that engaged clinical leaders in their AMS committees and IPC programmes.[19,20] These AMS teams worked collaboratively to create links between clinical teams, infectious disease physicians, clinical microbiologists and hospital pharmacists.[1,18,19]

We consider that New Zealand's best practice guidelines to prevent antimicrobial resistance would sit within a quality improvement programme to support organised implementation of measures by clinical and operational teams and integrate collaborative processes. The programme would include maintenance and implementation of a restricted antimicrobial formulary policy, IPC programmes and auditing against outcome measures to evaluate and inform change and improvement.[2,18]

Safe prescribing of antimicrobials

Community-based prescribing and consumption of antibiotics increased dramatically between 2005 and 2012 in New Zealand, when annual per capita consumption of antimicrobials rose an average of 6% per year. By 2012 the level of community antimicrobial consumption was higher than that of Spain and most other European countries.[9]

Despite the lack of evidence of significant benefit from antibiotic treatment, prescribers report that they are under pressure from patients to prescribe antibiotics, when symptom management may be more effective.[21,22]

Excessive use of antimicrobials in outpatient settings, over-the-counter purchasing and risky prescribing practices have also contributed to a rise in the incidence of AMR.[1,2,21] In high-income countries the majority of prescriptions for antibiotics for human health are prescribed in ambulatory care settings. Approximately half of these prescriptions are for self-limiting respiratory tract infections, which infrequently require antibiotic treatment.[22]

Given rates of community prescribing and increasing rates of AMR in pathogens of concern, we consider public health approaches would increase understanding of AMR in New Zealand.[1–3] Key messages focused on consumption, prescribing and the links between human, animal and environmental health would mitigate local and regional variation. Potential factors that may influence prescribing practices and attitudes include prescriber and patient education; access to healthcare; actions to reduce the incidence of infectious diseases within the community (for example, acute rheumatic fever and skin infections); and socioeconomic conditions and cultural beliefs.[23]

We note that increasing best practice prescribing through good clinical governance and clinical guidelines is known to be effective.[2,3,20] We support the uptake of New Zealand-specific guidance, such as the *Antibiotics: Choices for Common Infections Guideline* developed by the Best Practice Advocacy Centre, which provides guidance for antimicrobial prescribing in community settings and primary care; PHARMAC's Hospital Medicine List; and the New Zealand Formulary, which are available for prescribers practicing in all settings.[24–26]

Infection prevention and control practices in healthcare settings

Preventing the spread of harmful bacteria to reduce reliance on antimicrobials is proven to reduce subsequent infections. Health systems that invested in hygiene programmes have shown a reduction in the risk of infection both in community and in hospital settings.[20,28] Education and professional development programmes are vital to maintain IPC practices.[19,20]

Hand hygiene is the single most effective practice proven to prevent transmission of infection.[1] Compliance with hand hygiene guidelines in New Zealand is improving, with the rate at or above 80% across all observed interactions between patients and their health practitioner, in the audits conducted by the New Zealand Health Quality and Safety Commission between November 2015 and March 2016.[29] Improvements in hand hygiene have resulted in lower rates of HAIs, which reduces the use of antimicrobials needed to treat these infections.[19,20]

IPC programmes provide guidance on interventions to reduce the incidence and prevalence of HAIs, which cause significant mortality in hospital settings.[1,9] In New Zealand, health workforce buy-in, education and compliance with best practice hand hygiene has minimised transmission of pathogens between health practitioners, patients, staff, visitors and surfaces. The widespread availability of alcohol-based hand rub in hospitals and clinics has also contributed to the broad adoption and acceptance of hand hygiene practices by health practitioners, patients and their families/whānau.[28,29]

Effective hand hygiene practices reduce harm to patients, and subsequent costs to the healthcare system.[28] To be effective, comprehensive hand hygiene requires full health workforce understanding of hand hygiene practices to effect a safer environment for health practitioners, patients and their families/whānau.

Recommendations for action

Action by the Ministry of Health in collaboration with the Ministry of Primary Industries and other stakeholders to develop a national plan must be consistent with global approaches. We recommend that action is based on the WHO Strategy to ensure changes can be measured and compared to understand the effectiveness of global efforts.

We recommend that a national stewardship programme incorporates quality improvement processes and supports clinicians to maintain knowledge and currency on the patterns and management of resistance in key pathogens in New Zealand.

To provide consistency and reduce duplication, we recommend that the New Zealand antimicrobial strategy incorporates a single national prescribing guideline and plan informed by infectious diseases physicians and paediatricians, microbiologists, general practitioners and pharmacologists to ensure relevance in hospital and community settings. Implementation through clinical networks and a public awareness campaign will increase understanding of the use of antimicrobials and the risks of resistance.

AMS and multidisciplinary teams are an essential component of an effective system. We recommend approaches that are evidence-based and support systematic improvements in practice, and recognise the skills and experience of clinical leaders as a key resource for contributing to improvements in AMS.

As an example of successful professionally-led practice, the RACP is collaborating with specialty societies in New Zealand and Australia through its EVOLVE initiative. The process encourages each medical specialty to think about the clinical circumstances in which some of the practices, whether medical tests, procedures or interventions—should have their indication or value questioned and discussed by physicians. These may be overused, inappropriate or of limited clinical effectiveness in a given clinical context. The RACP is facilitating the development of top-five lists of low value practices, including that of the Australasian Society for Infectious Diseases (ASID). Three of the five ASID recommendations discourage antibiotics, stating that use of therapies are not indicated, increase the risk of resistance and may pose additional costs.[30] Consideration should be given to developing a similar approach involving health practitioners, services, patients, families/whānau to reduce AMR.

We encourage all health practitioners to remain informed and up to date on the patterns of resistance for pathogens in New Zealand and engage in stewardship activities in their workplaces and communities. Health practitioners have a responsibility to inform patients and their family/whānau when symptom management will have greater efficacy for viruses. Effective communication through public health campaigns will also reinforce appropriate use of antimicrobial therapies.

Finally, we support increased collaboration within and across the human health, scientific and agricultural sectors led by central government agencies, will enable New Zealand to respond effectively to AMR.

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Nil.
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Ciguatera fish poisoning

Patrick Armstrong, Peter Murray, Annette Nesdale, Brad Peckler

ABSTRACT

Ciguatera fish poisoning (CFP) is the most common cause of seafood-toxin poisoning in the world and is most prevalent in tropical and subtropical areas. It causes gastroenteritis but also myriad neurological and cardiovascular symptoms. We present a cluster of CFP that occurred in Wellington Hospital, New Zealand. It resulted in three patients with life threatening cardiotoxicity and a fourth case with severe gastro-intestinal symptoms. The epidemiology, clinical manifestations, diagnosis, treatment and public health issues are discussed.

Ciguatera fish poisoning (CFP) is the most common cause of seafood-toxin poisoning in the world and is most prevalent in tropical and subtropical areas.[1] It causes myriad neurological, gastrointestinal and cardiovascular symptoms, the latter of which can be life threatening.[1] Though a well recognised condition in prevalent regions such as the Pacific Islands, CFP is likely to be under-reported or go unrecognised in non-prevalent countries like New Zealand.[2] However, due to New Zealand's large Pacific population and the popularity of the Pacific Islands as a holiday destination,[2] CFP is an important differential diagnosis for emergency physicians to be aware of.

We would like to report a cluster of CFP that occurred in Wellington Hospital, New Zealand. It resulted in three patients, presenting during a night shift in the emergency department (ED) with life threatening cardiotoxicity, and a fourth case with severe gastro-intestinal symptoms.

Case history

Case 1

At 1:00am on a busy night shift in the ED, a previously healthy 67 year-old lady was brought in by ambulance, with vomiting and dizziness. On arrival she was bradycardic (HR 32 bpm) and hypotensive (BP 72/35 mm Hg); her other vital signs were normal. She was lightheaded but alert; denied chest pain or shortness of breath and stated she was previously well before starting to vomit. Her electrocardiograph showed sinus bradycardia.

She was treated immediately with 600 mcg atropine and her vital signs normalised. A cardiological cause of her bradycardia was investigated and ruled out. Whilst in ED she developed paraesthesia of the lips, tongue and a metallic taste in her mouth. She reported she had eaten eel at 7:00pm with friends the previous evening and had started vomiting soon after.

Case 2

One hour later, a 67 year-old man self-presented with vomiting and diarrhoea. He collapsed in triage and was taken to a resuscitation bay. He was found to be profoundly bradycardic (HR 30 bpm) and hypotensive (BP 72/35 mm Hg). His vital signs improved with atropine. He stated that prior to developing symptoms he had eaten eel, alongside his wife, son and a family friend, and stated his wife was also unwell with vomiting at home.

Case 3

Forty minutes later the 41 year-old son of Case 2 who had registered to be seen for diarrhoea and vomiting, collapsed in the waiting room. He was also found to be bradycardic (HR 31 bpm) and hypotensive (BP 61/42 mm Hg), and was taken to the resuscitation bay. His vital signs immediately normalised with atropine. At this stage it was not known that cases 1, 2 and 3 had eaten together. Preparations were made in case of a further influx of symptomatic patients.

Case 4

The 58 year-old wife of Case 2 was contacted and advised to come to the ED for

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review as she had also consumed the same eel. She ate the eel earlier than Cases 1–3, and complained of diarrhoea and vomiting throughout the previous day. On arrival, her vitals and ECG were normal. However, she subsequently developed a fever of 39.5 C and her lab results showed an acute kidney injury.

Provisional diagnosis—CFP

It became clear from the cases' respective histories that they had eaten the same eel and were displaying features suggestive of CFP. In light of this provisional diagnosis, the Regional Public Health was notified. Cases 1, 2 and 3 were admitted to the high dependency unit where they required 4–6 hourly atropine doses to maintain adequate heart rate and blood pressure. Their diarrhoea and vomiting settled in the first 24 hours, however, the cardiotoxicity persisted for 3–4 days. Case 4 was admitted to the medical ward, where she received IV rehydration and was discharged the following day.

Post discharge follow-up

All four cases were followed up two months after being discharged. All described lethargy and fatigue that persisted for a number of weeks. Cases 1–3 further described chronic symptoms of cold allodynia that developed two weeks following initial illness.

Public health management

Following the notification of a probable CFP outbreak, Health Protection Officers from Regional Public Health interviewed the ill people to ascertain a full food and risk factor history, the origin of the eel and to identify if other people were exposed and if any of the eel remained.

The common source of the CFP outbreak was identified as moray eel that had been purchased in Samoa and brought back into New Zealand by one of the cases. The eel was cooked prior to consumption. A sample of the implicated eel was eventually obtained and sent for ciguatoxin testing, which was initially negative. However, subsequent testing was strongly positive for ciguatoxin-1B (CTX-1B), thereby confirming the diagnosis of CFP.[1] All the cases were provided with information about CFP including ways to prevent symptom recurrence and future exposure.

Ciguatera fish poisoning

CFP is a common fish-related food borne illness in tropical and sub-tropical regions.[1,2] It results from the consumption of certain tropical reef fish species (eg moray eel, barracuda and amberjack) that bioaccumulate toxins of the naturally occurring *Gambierdiscus* spp.[1–3] The toxins produced by these microalgae—ciguatoxins—are heat-stable, so are not inactivated by cooking or freezing.[1] New Zealand fish species are not known to cause CFP.[4]

Epidemiology—New Zealand

CFP cases and outbreaks are notifiable if they cause acute gastroenteritis.[5] Accordingly, cases without gastrointestinal features or those with delayed presentations (ie after consuming affected fish whilst in the Pacific Islands) may not be notified.[2]

Surveillance of CFP in New Zealand occurs through the EpiSurv notification database or hospitalisation records.[6–14] From 2006–2014, there were 17 notifications and 54 hospitalisations of CFP (Table 1).[6–14] The disparity between hospitalised and notified cases highlights the under-reporting of CFP to public health units. Over this period there have been four CFP outbreaks recorded, with each involving two to six cases.[6–14] Some of these outbreaks have been linked to tropical reef fish being brought into New Zealand by travelers returning from the Pacific.

Clinical manifestations

The clinical features of CFP usually develop within 6–12 hours of ingestion of fish contaminated with ciguatoxins.[1] Gastrointestinal features such as nausea, vomiting, abdominal pain and diarrhoea are common and occur soon following ingestion. However, not all patients will present with gastrointestinal features.[1,3]

Neurological symptoms present as paraesthesia, pruritus, myalgia and classically, reversal of temperature perception ("hot/cold" reversal, cold allodynia) where cold sensation is experienced as painful burning. Neuropsychiatric conditions also can occur with anxiety, depression, memoryless, delirium, ataxia and coma all being reported. These symptoms can last for weeks to months and rarely years. Symptoms can also recur when eating any

Table 1: New Zealand CFP notifications and hospitalisation by year.[6–14]

Report year	Notifications	Hospitalisations
2006	0	5
2007	0	3
2008	2	8
2009	8	2
2010	0	2
2011	2	7
2012	1	15
2013	1	5
2014	3	7
Total	17	54

type of fish, alcohol, nuts, caffeine, chicken, pork or physical exertion.[1,2] These features are more common in Pacific cases.[1]

Cardiac toxicity from ciguatoxins, hypotension and bradycardia are the most severe and potentially life-threatening consequence of CFP.[1] These features can present soon after ingestion of contaminated fish and require immediate medical attention.[1,15]

Following the acute illness, the clinical manifestations of CFP can reoccur when triggered by certain precipitants, such as eating any type of fish, alcohol, nuts, caffeine, chicken, pork or on physical exertion.[1]

Diagnosis

Diagnosis of CFP is primarily clinical, as no biomarkers are currently available to confirm exposure in patients.[1,16] A history of fish ingestion in a patient with cardiovascular, gastrointestinal or neurological symptoms should prompt suspicion of CFP.[1,16] CFP is confirmed when ciguatoxins are detected in the implicated fish.[1]

Treatment and management

Treatment of CFP is primarily supportive.[1] Symptomatic bradycardia can be treated with atropine or temporary cardiac pacing.[15] Hypotension can be managed with intravenous hydration. Very rarely patients develop respiratory failure and assisted ventilation may be required.[15,17]

IV mannitol was previously recommended in CFP treatment, given within 48–72 hours of ingestion to reduce acute—and prevent chronic—neurological symptoms.[1,2] It was thought to act by reducing neuronal oedema and scavenge free radicals created by the CTX molecule. However, a double-blind randomised controlled trial found no benefit compared with placebo.[18] Gabapentin and amitriptyline were used to treat pain, and paraesthesias and fluoxetine for neuropsychiatric conditions such as anxiety and chronic fatigue following ciguatera poisoning.[19,20]

Notification of suspected CFP to the local public health unit is important and is a legal requirement under the Health Act 1956.[5] Early notification can facilitate case finding, acquisition of implicated fish samples, testing of samples, and also provide education on ciguatera, how to prevent future exposure and reduce recurrent symptoms.[1]

Conclusion

This case report highlights the importance of recognising CFP in the ED. It shows even small outbreaks can put significant strain on resources both in the ED and in the inpatient setting. This case was unusual, given the predominance of cardiotoxicity in three of the cases. It also demonstrates that early public health notification can facilitate the acquisition and testing of implicated seafood. Given the large Pacific population in New Zealand and the large number of tourists frequenting the Pacific islands, it is important to consider and notify CFP in patients presenting with clinically compatible symptoms.

Competing interests:
Nil.

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Junior doctors: towards a solution?

John Scott Werry

The current industrial dispute between junior doctors and their employers is but the latest in a long running saga. The last one resulted in the Hunn report of 2009,[1] commissioned two years earlier. While there were a number of specific recommendations, the central leitmotif was that junior doctors should be regarded primarily as trainees rather than a pair of hands, with some of the employer powers to be transferred to an independent national body. It is also clear that the commissioners saw the junior doctors as victims.

Seven years later, one of the members[2] says that almost none of the recommendations have been enacted. The reasons he gives are primarily the implacable opposition of the DHBs and, to lesser degrees, of the profession, the Ministry of Health and the Medical Council; no one seemed in favour. The incoming National Government did not see this as their report and so let it die. To sum up, it appears that the employers and other authorities over the lives of junior doctors are unwilling to cede power, so the only recourse the junior doctors have is industrial action.

As far as I can see, conspicuous by their absence were the two Medical Schools—despite the fact that this was framed by the Hunn report as an educational issue. Yet in my view they could be the white knights in this impasse. For this to happen, two things are necessary—to use research rather than rhetoric and to think in a scholarly way about medical education.

In the first instance there needs to be a properly designed study to test two hypotheses: that some of what junior doctors do is wasted effort and, second, that some of what junior doctors do could be done by less highly-trained, expensive staff such as nurses or technicians. It seems sad that a profession of applied scientists has not done this fundamental research adequately to allow some relief for junior doctors.

Then the whole structure of medical education, which is basically unchanged since Otago Medical school opened its doors in 1875,[3] needs a thorough review as to its fitness for the 21st century. The current structure is that of a six-year double Bachelor's degree followed now by an apprenticeship training governed by the guilds and Medical Council, not the universities.

Looking now at the pathways of non-medical students, there has been a massive shift toward graduate programmes in masters and doctoral programmes. Why could medical education not follow suit?

This would require following the Hunn report's recommendations to regard junior doctors not as trainees but as university graduate students. There could be two streams; MD for practitioners and the other, PhD for academics. This would of course return the MD as the qualifying degree as it was in the 13th century and for five centuries thereafter when the guilds emerged as omnipotent.

To accommodate the usual doctoral stream of five years, the undergraduate medical course could be cut to four years and the graduate phase to five years, or nine years in all.

The implication that is likely to stick in the craw of junior doctors and students is that they would have to pay, not be paid. This would free up monies for employing substitutes for the current junior doctors, which could include some senior doctors as well as nurses etc. Also why should doctors think they are entitled to a more lucrative path than other doctoral students? Our neophyte doctors and students are likely to live and practise for 40 to 50 years and recoup a thousand-fold any costs of the unpaid graduate training.

I am not suggesting that this would be easy or could be done in short time, but

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as a profession we need to put aside unresearched medical education and practice and think creatively for a change instead of being caught between the Scylla of the licensing bodies and the Charybdis of the DHBs. Medical schools are supposed to be like the University—a community of scholars not what Flexner[4] so deplored: "trade schools".

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Nil.

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Apixaban versus enoxaparin in the prevention of venous thromboembolism following total knee arthroplasty

Apixaban is an oral factor Xa inhibitor, producing predictable, dose-related anticoagulant effects. Unlike other anticoagulants there is no need for laboratory tests to monitor its efficacy and safety.

In this paper an Australian surgeon reports upon his experience in the use of apixaban in comparison with enoxaparin. His retrospective analysis involves 506 consecutive patients who underwent a total knee arthroplasty between 2009 and 2015. Half were treated for 14 days after surgery with apixaban and half with enoxaparin, also for 14 days.

Compared with enoxaparin, thromboprophylaxis with apixaban resulted in a lower venothromboembolism incidence and fewer haemorrhagic complications.

Internal Medicine Journal 2016; 46:1030–37

Tumour necrosis factor inhibition versus rituximab for patients with rheumatoid arthritis who require biological treatment

Biological disease modifying anti-rheumatic drugs (DMARDs) are used in the treatment of moderate-to-severe rheumatoid arthritis after an insufficient response to conventional DMARDs or methotrexate.

This randomised controlled non-inferiority trial compares the safety, efficacy and cost-effectiveness of adalimumab, a TNF inhibitor, and rituximab, an anti-CD_{20} monoclonal antibody.

Two hundred and ninety-five patients were randomised to receive either adalimumab or rituximab. The researchers report that treatment with rituximab was non-inferior to adalimumab and there was no difference in the incidence of serious adverse events. The health-related costs after a 12-month course of rituximab were significantly lower than the costs of treatment with adalimumab (£9,405 vs £11,523 per patient).

***Lancet* 2016; 388:239–47**

Antibiotics for respiratory tract infections in primary care

Overuse of antibiotics is considered to be the main cause of the development of bacterial antibiotic resistance. In this study the authors review whether it is safe to reduce antibiotic prescribing for self-limiting respiratory tract infections (RTIs) in primary care.

Their cohort study reviews data from 610 UK general practices. Outcomes sought were new cases of pneumonia, peritonsillar abscess, mastoiditis, empyema, meningitis, intracranial abscess and Lemierre's syndrome. They divided the practices into fourths and compared the incidence of serious infections between the highest and lowest fourths in terms of antibiotic prescribing.

They concluded that reducing antibiotic prescriptions by 10% would see one more case of pneumonia each year and one more case of peritonsillar abscess each decade in the average practice.

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A Case of Leprosy in a Trooper of the 1st (N.Z.) Expeditionary Force (ex Samoa)

By J. T. Bowie, M.B., D.P.H., D.T.M., Clinical Registrar Otago University Medical School.

G.P., a returned trooper, age 28, came to the hospital outpatient department, 31st January 1916, complaining of a skin disease of some eleven months' duration. His history was quite straightforward. He was born in Bombay, India, where he lived until he was 15 years of age. He then went to Edinburgh, and after 7½ years' residence there came to New Zealand. He joined the First Expeditionary Force and was sent to Samoa. He gave a history of an "eruption and sores" all over his body when a child in India. This probably was framboesia. He also had malaria. He denied ever having syphilis and there was no evidence to the contrary.

HISTORY OF PRESENT ILLNESS.

Two months after arrival in Samoa he complained of swelling in his left foot. His toes "turned green," and he was sent to the main hospital, where his toes were lanced and hot fomentations applied. He was in hospital six weeks and was discharged fit for duty. He remained on duty one month when both big toes "broke out." He was again admitted to hospital where he remained for five days. He was then sent back to New Zealand. On arrival at Wellington he was able to walk to headquarters. He was allowed two weeks' sick leave. At the end of that time his foot was healed and he was discharged as medically unfit. He had a holiday for two months, at the end of which time he went back to work as plumber in the Post and Telegraph Department. After a fortnight, one foot ulcerated and he consulted a medical man. He was subsequently treated by medical men in various parts of the Dominion. The case was evidently diagnosed as chronic lead poisoning.

EXAMINATION.

There was no frontal headache, nasal discharge, nor epistaxis; no history of chills nor undue localised or general perspirations. The facial appearance, however, was arresting. Although he said he did not feel ill, his eyes looked heavy and tired. The skin over his superciliary ridges appeared very slightly nodular with a suspicion of erythematous blush. The lobes of both ears were faintly pigmented. Over the trunk were numerous areas of eruption very like a seborrhoea, but not raised above the level of the surrounding skin. There was a little pigmentation towards the periphery of each circle or segment of circle of eruption while the centre was lighter. A history of exacerbations of erythematous eruption was given. These gradually faded away but always left the skin in the condition described above. There was no itching.

On the extensor surface of the right elbow there was a patch of pigmented skin of a light port wine colour with two distinct nodules. On palpation the skin in this region was found to be distinctly thickened. His tongue was moist and slightly coated. Two small nodules were seen in the right margin of the anterior half.

NERVOUS SYSTEM.

Reflexes were normal. Epicritic sensations were normal but there were distinct patches of anaesthesia to pain over the middle third of the forearm on the radial side of both arms. There was also anaesthesia over both elbows, lobes of both ears, and also a like anaesthesia to pain over the dorsa of both feet, but especially the right.

Blood examination showed a relative lymphocytosis—no excess of white cells—no poikilocytosis, no polychromasia, no punctate basophilia, no nucleated reds. Blood examination excluded lead poisoning. Late framboesia was considered as well as fungoid diseases. Scrapings were taken from the skin and on microscopical examination were found negative.

Clinical symptoms and signs were those of an early leprosy. Smears of nasal mucus

were taken. Two small pieces of skin were excised—one from the left ear, the other from the right elbow—and these were reported on by Dr. Champtaloup.

The incubation period in this case is very interesting. Leprosy is endemic in India as well as in Samoa. If this patient contracted the disease in India the incubation period would be twelve years at least. In support of a long incubation period, Radcliffe Crocker, in "Diseases of Skin," 3rd edition, Vol. II., footnote page 835, says: "The longest interval I have met with is eleven years, but Hallopean relates the case of a man in whom the symptoms first appeared thirty-two years after a fifteen months' residence in Martinique." If on the other hand he contracted the disease in Samoa, the incubation period is very short, namely eight weeks. We have no proof, however, that the condition he was first treated for in Samoa was leprosy, but he evidently showed leprous symptoms soon afterwards, and the condition first treated may have been this disease. In support of the short incubation period theory, I quote from Dr. Dyer's paper in Osler and McOrae's "Modern Medicine," Vol. I., page 526. The period of incubation is too variable to admit of any accurate statement. This period varies from a few weeks to many years. "Castellani and Chamlers," 2nd edition, page 1157, quote the well-known experimental case of "Arning's inoculation of a Sandwich Island criminal in the arm with a leprous tubercle." "This man developed a neuritis of the ulnar and median nerves four weeks after the inoculation, a tubercle five months later, the full signs of leprosy two and a half years later, and died a leper six and a half years after inoculation. It is, however, to be noted that he lived in a leprous country, and that there was leprosy in his family—facts which decrease the importance of the experiment."

According to Hansen, the incubation period is three to five years. My opinion of this case is that the disease was contracted in India, and that the incubation period was about twelve years, although it is possible it might have been found before he went to Samoa had it been suspected and careful search been made. On the other hand, he was examined before going to Samoa and passed as fit for military service. His case I believe to be a mixed infection of nodular and anaesthetic types.

BACTERIOLOGICAL REPORT BY DR. CHAMPTALOUP.

NASAL SMEARS.

Several smears from the nasal mucus were stained by Ziehl Nielsen (10 per cent. H2.S04). In each of the smears examined a thorough search revealed here and there single short acid fast bacilli, which did not lie in relation to any of the cells. In two of the smears one or more globi, or masses of acid fast bacilli, were found. The bacilli composing these globi were granular. this appearance being well seen at the periphery of the globus.

SECTIONS FROM SKIN NODULES.

These were embedded in paraffin, and sections cut and stained with (1) haematoxylin and carbol fuchsin and decolorised by acid alcohol; by (2) haematoxylin and Van Giesen; by (3) Ziehl Nielsen.

The ear nodule consists of small areas of granulation tissue separated by a well defined fibrous stroma which extends beneath the epidermis laterally for 2.5 mm. by 1.5 mm. deep. At one part a few small groups of cells extend well into the subcutaneous tissue. There is no thinning of the epidermis and no evidence of endarteritis in the vessels. In sections, counter-stained by Van Giesen, a delicate stroma is seen passing in all directions between the cells of the granulation tissue. Numerous leprosy bacilli are seen throughout the preparation, many of which lie in close relation to the nucleus of the cells—the protoplasm being indifferently defined. The bacilli occur singly, in pairs, and in small groups, but even in the latter the individual bacilli can be identified.

ELBOW NODULE.

The granulation tissue is not so evident in the preparation, but is diffusely scattered in very small collections or as single cells, throughout a dense fibrous stroma, which extends deep into the subcutaneous tissue. Several capillaries in this preparation show evidence of endarteritis. The bacilli are less numerous than in the ear nodule, but lie in more· compact and denser masses. Isolated bacilli occur at intervals throughout the section extending to the prickle cell layer of the epidermis.

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