

The
**New Zealand
Medical Journal**

Journal of the New Zealand Medical Association

Vol 131 | No 1470 | 23 February 2018

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E-cigarettes—peering into the mist of uncertainty

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E-cigarette use in New Zealand—a systematic review and narrative synthesis

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Publication Information

published by the New Zealand Medical Association

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Erratum

An audit of risk assessments for suicide and attempted suicide in ED: a retrospective review of quality

Wayne de Beer, Bernard De Witt, Jules Schofield, Helen Clark, Veronique Gibbons

This study evaluated how Mental Health & Addiction Services staff members, working in a busy emergency department service, adhere to the New Zealand Ministry of Health's Clinical Practice Guidelines for DSH. This study identifies the importance of the individualised, tailored assessment. It also outlines weaknesses of the assessment and treatment of patients following a suicide attempt and makes recommendations for improving assessment of patients following attempted suicide.

Acceptability of electronic cigarettes as an option to replace tobacco smoking for alcoholics admitted to hospital for detoxification

Penelope Truman, Moira Gilmour, Geoffrey Robinson

Alcoholics who were also smokers, admitted to Kenepuru Hospital for detoxification, were offered the option of using an electronic cigarette as well as, or instead of, conventional nicotine replacement therapy nicotine (patches or gum) to help them to stop smoking while in hospital. The electronic cigarettes proved more popular than standard nicotine replacement therapy and were at least as effective. Using electronic cigarettes for smoking substitution/reduction while in hospital is an option for improved patient management that should be explored further.

Limiting complication rates in implant-based breast reconstruction

Michelle B Locke, William LE Malins, Jia Le See, John Kenealy

The Department of Plastic Surgery at Middlemore Hospital has found that the complication rate of patients having implant-based breast reconstruction after radiotherapy for breast cancer treatment have a high complication rate. We now encourage patients to use their own tissue (for example, from their abdomen) to reconstruct their breast(s) if they have had radiotherapy. We have shown a lower complication rate in women who use their own tissue rather than implants for reconstruction following radiotherapy.

E-cigarette use in New Zealand—a systematic review and narrative synthesis

Sarah Merry, Christopher Bullen

This study summarises current research on the use of e-cigarettes in New Zealand. The study found that the number of people who have ever used an e-cigarette has increased over time. However, the number of New Zealanders who regularly use e-cigarettes remains low. Most people who use e-cigarettes are smokers or ex-smokers. While people commonly first try an e-cigarette because they are curious, many hope to reduce the number of tobacco cigarettes they smoke, or quit smoking. Further research is needed to monitor the use of e-cigarettes in New Zealand and any impact this may have on smoking rates.

Ethnic- and sex-related differences in pain characteristics, psychological distress and pain-related disability in patients attending a New Zealand teaching hospital pain service

Andrea Burri, David Rice, Nicola Kluger, Michal Kluger

The study assessed demographic and pain characteristics of patients attending a multi-disciplinary pain service in Auckland. Overall, women report a significantly higher number of pain sites in the whole body compared to men, whereas men tend to cope worse with pain by showing less pain acceptance. The study further found significant differences in pain expression and coping, with Māori patients reporting highest pain levels, highest number of pain sites, highest pain interference, as well as highest levels of psychological distress, depression, stress and anxiety compared to all other ethnicities. This finding is particularly important for healthcare providers who should tailor their treatment according to the patient's individual sociodemographic background.

Liver abscess: contemporary presentation and management in a Western population

Kareem Osman, Sanket Srinivasa, Jonathan Koea

Liver abscesses are a common acute condition that affect previously healthy patients. Percutaneous rather than surgical drainage is the standard of care but hospital stays can be significant and readmission is common.

Monitoring pre-hospital transport of severely injured patients in the Midland Region of New Zealand

Jesse Whitehead, Matt Roskrug, Colin Tan, Alistair Smith, Grant Christey

This study evaluates the geospatial movement of major trauma patients from pre-hospital locations to hospitals in the Midland region and compares the actual destination to the optimal destination defined for patients meeting clinical criteria defined in the national major trauma triage policy. This study has been conducted prior to implementation of the Midland Pre-Hospital Major Trauma Destination Matrix and will be repeated in 2019 to evaluate change in processes resulting from the "Midland Matrix".

Putting action into the revised Australian Medical Council standards on Aboriginal and Torres Strait Islander and Māori health

Shannon Springer, Suzanne Pitama, Kate Leslie, Shaun Ewen

The Australian Medical Council (AMC) sets the standard that specialty medical professionals should achieve to ensure that the community has safe doctors that meet the needs of the public. Due to the health differences between Indigenous and non-Indigenous peoples, the AMC has changed the standards to ensure medical colleges respond to this inequity. This paper helps colleges deliver on these standards in a practical way.

E-cigarettes—peering into the mist of uncertainty

Lutz Beckert, Stuart Jones

Nothing creates greater debate in medicine than a lack of hard evidence. Lack of evidence creates a void that is filled with personal opinion and conviction, often swathed in emotion and rhetoric. At the moment, the role of e-cigarettes in providing a healthier future for New Zealanders is one such good example, and it is into this void that, in this edition of the *Journal*, Dr Truman and colleagues tread.¹

Dr Truman and colleagues must be congratulated on their feasibility study exploring the acceptance of e-cigarettes in a population with multiple long-term addictions by comparing e-cigarettes to standard nicotine replacement therapy during their inpatient stay. A group of drug- and alcohol-dependent patients is notoriously hard to study, and it would certainly be challenging to run this study within the constraints of an inpatient setting for medically supported alcohol withdrawal. The main finding of the study was one of patient perception; both treatment groups were positive about the endeavours of health professionals in supporting them to stop smoking, but comments from the group using the e-cigarettes were more positive.

The finding of higher participant satisfaction with e-cigarettes should not surprise us. Most forms of nicotine replacement therapy provide a slow peak background level of nicotine. In contrast, the vapour from e-cigarettes, much like the smoke of combustible cigarettes, is designed to allow rapid absorption and peak levels of nicotine in the CNS, thereby providing positive feedback to the user. Depending on the reader's bias, this rapid nicotine hit may be seen as something to assist smokers to stop smoking or at least reduce combustible smoking and so to hopefully reduce harm. Alternatively, the pleasure created by the rapid nicotine hit can be seen as a concern if the e-cigarettes were to be used by non-smokers; it is likely to be habit forming

and with a strong addictive potential, exposing these people to greater harm.

The study also found that the impression of the nursing staff was that patients using e-cigarettes were easier to manage on the ward, even though nurses encountered some new technical issues with charging batteries and supply of e-cigarette fluid. The ease of patient management is obviously of importance, particularly in this difficult patient group. However, it needs to be balanced with the knowledge that e-cigarettes do create increased concentrations of particulate matter, and that the resultant effects of second-hand exposure is still uncertain. Although this is likely to not be as bad as combustible smoking, it should be remembered that the association of second-hand smoke on health outcomes was not seen until many years after smoking was initially implicated in disease. This finding raises a new plethora of debate as to the safety of second-hand e-cigarette exposure on healthcare workers and other patients if patients were to use them indoors. Where should they do it and what precautions should be in place? How would you do it to minimise risk? How can it be done in a way to ensure that smoking does not become 'normalised' again?

Our challenge to all health professionals

Dr Truman and colleagues make a constructive and positive contribution to the debate of e-cigarettes as part of smoking cessation. The e-cigarette debate has the recipe for a perfect public health storm. Evidence is weak or lacking, opinions are strong and the financial stakes are high—the e-cigarette market is currently valued at US\$ 10 billion, and estimated to increase to US\$ 34 billion by 2021. Most distressing is the discord among scientists, public health physicians, physicians and smoke-free advocates. This is out of the playbook of the unhealthy commodity industries, alcohol,

fast food, smoking, gambling and sugar beverages.² And, while none of us will have all the facts, all of us probably need to build an opinion on e-cigarettes. Our opinions may still be biased; however, they should be better informed than the local store owner currently selling the attractive e-cigarette flavours.

Fortunately for us, the most comprehensive, balanced, authoritative and independent review of evidence has just been published in January 2018 by the National Academic of Sciences, Health and Medicine Division: “*Public Health Consequences of e-cigarettes*”.³ We strongly encourage the interested reader to explore this document. The take-home message of the review is that overall e-cigarettes are likely to cause less harm than combustible tobacco smoke, but a lot more work needs to be done in the field. The report states that there is conclusive evidence that substituting e-cigarettes for combustible smoke reduces users’ exposure to numerous toxins and carcinogens present in combustible tobacco smoke. However, the report also highlights that e-cigarettes are not without their harmful effects on the airways, and the consequences of these on long-term respiratory disease are simply unknown. In terms of smoking cessation, it reports that there is limited evidence that e-cigarettes may be effective aids in smoking cessation, but there is also worrying substantial evidence that e-cigarette use increases risk of ever-using combustible tobacco cigarettes among youth and young adults—potentially to a more intense degree.

Every country in the world is currently struggling to apply existing regulations to e-cigarettes or write new regulations. On one hand, Singapore has imposed a complete ban because the Health Ministry considers them gateway products that

get users addicted to nicotine, which then leads to cigarette use.⁴ This is similar to the current state of play in our neighbour, Australia. On the other hand, the regulations in the US and UK are generally more liberal, because e-cigarettes are seen to be assisting smokers to stop smoking tobacco or at least reduce harm.

Here in New Zealand we are observing a rapidly changing e-cigarette landscape. The Ministry of Health website published a position statement in October 2017 believing that e-cigarettes have the potential to contribute to the Smokefree 2025 goal,⁵ but to achieve this they need to find their way into the hands of current smokers. We are disturbed how the argument “e-cigarettes will probably assist smokers to become smoke free”, metamorphoses to the marketing of e-cigarettes to the whole population in a range of different flavours like Old Fashioned Apple Pie, Smurf Berries, Strawberry Kream or Vanilla Custard.⁶ It is anticipated that nicotine containing e-cigarettes will become available for sale in New Zealand during 2018. The Ministry of Health position statement states that they should come with safety standards, have R18 sale restrictions, have limited commercial advertising and will be prohibited in the workplace or areas where smoking is not permitted under the Smokefree Environments Act. The position statement is a good start; however, this needs to be put into operation. For this to be meaningful we need an ongoing debate on how to find the optimal balance to enable smokers to stop smoking or switch to potentially less harmful nicotine products, while at the same time protecting our young and non-smoking New Zealanders from taking up e-cigarettes with the misconception that it is safe.

Please take up our challenge to become informed and to become involved.

Competing interests:

Nil.

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How comprehensive is suicide risk assessment in the emergency department?

Christopher Gale, Paul Glue

Suicide is a tragic, but rare event. In 2012, the most recent year with firm data, Statistics New Zealand recorded 550 deaths by suicide, a rate of 12.3 per 100,000 population.¹ The rareness and difficulties in classification of a complex and multivariate behaviour,² and difficulties with the methodologies in psychological autopsies³ mean that much of the research is carried out with those who self harm or survive suicide attempts.^{4,5} In 2013, there were 7,267 intentional self-harm hospitalisations in New Zealand, a rate of 176.7 per 100,000 population.⁶ Although the demographics of completed suicide and DSH have some similarities (both are more common in younger than older people, in Māori compared with non-Māori), however completed suicide is more common in males and DSH in females.^{1,6}

The best predictors of completed suicide are self-injurious thoughts and behaviors. A meta-analysis of 172 studies reported the overall accuracy of these variables was poor. Sensitivity was estimated at 10–26%, specificity 86–87% and a pooled diagnostic Odd Ratio was 1.76 (1.45–2.15).⁷ Other risk factors for completed suicide are being a patient of a mental health or psychiatric service. A Danish study followed all patients admitted for DSH for eight years and estimated that 3% completed suicide over that period, but that the highest risk was in the first year.⁸ A recent meta-analysis of unassisted clinician risk classification found eight studies (N=22,499), and gave pooled estimates for sensitivity 0.31 (95% CI: 0.18–0.50), specificity 0.85 (0.75–0.92), positive predictive value 0.22 (0.21–0.23), and negative predictive value 0.89 (0.86–0.92). They concluded that clinician classification was too inaccurate to have utility.⁹ This reinforces the advice that risk assessment, particularly structured risk assessment,

adds little to this, and that services should concentrate on therapeutic engagement.^{4,10} The Ministry of Health (MoH) suicide risk assessment guidelines recommend comprehensive assessments for patients presenting with DSH.¹¹ The Royal Australian and New Zealand College of Psychiatrists recommend either brief contact interventions or intensive CBT for people who present to hospital with DSH.⁴

This issue contains an audit of risk assessment in patients presenting with DSH to a large hospital in the North Island.¹² The authors used the 2003 MoH guidelines¹¹ to develop a 16-item risk assessment checklist, and reviewed 376 electronic medical records of patients who were given a DSH diagnostic code after presenting to the emergency department in that hospital.

The data presented are descriptive only and there was no attempt by the authors to perform any further analyses. The reported findings suggest that many aspects of the recommended clinical assessments were incomplete. In particular, only 18% of these patients had their attitude to current and personal safety explored, 24% had their access to further means of self-harm documented and 27% asked the family about their ability to keep the patient safe, while 36% noted family and caregiver concerns. When considering the MoH guidelines, 8% of Māori patients were offered cultural support, 13% were given a script with limited dispensing (or ‘close control’) and 25% were given written information about medication, treatment plan and key contents.

This audit has flaws. There was no attempt to consider confounding factors. There was no attempt to follow these patients over time. There was no comparison group. Despite the paper being descriptive and uncontrolled, the authors make a series

of recommendations: in particular that statements of risk alone are not, in their view, of an adequate standard and that all assessments should consider the factors that would increase the risk of suicide as well as protect from suicide.

There could be several explanations for these findings. As the authors note, patients' electronic files may not accurately reflect what was discussed during assessment. The development of a therapeutic bond and trust between assessing clinician and patients, particularly when in great distress, may be difficult to capture in an electronic note. Because some assessments were undertaken late at night in the emergency department, it may be that cultural support and other services were not available on an urgent basis at all times. Some patients may not have agreed to family or whanau being contacted, which requires the clinician to carefully negotiate a shared method of assessment, and at times that will not be according to the guidelines but acceptable to the patient, their family or both.

We would add that although paying attention to cultural competency is important, the development of a therapeutic and trusting relationship is more so.

The important questions the study poses cannot be addressed by retrospective review of electronic files. The study highlights

the potential for clinical documentation not complying with guidelines, no matter how well written and practical. However, documentation is but a precis of a therapeutic interaction. Given the current state of knowledge, ongoing contact is likely to make more difference to suicide death rates than a perfectly completed risk assessment tool. This requires adequate time to build a working relationship and develop a full formulation for the patient, which should, as the authors note, drive treatment. Realistically this is more likely to happen over a series of follow-up assessments by a community mental health team or in primary care rather than in an initial emergency department assessment.

Reliance on current suicide risk assessment tools to predict future suicide lacks evidential support. Development of a psychiatric formulation and building a therapeutic relationship may offer greater potential to recognise future suicidality, but involves greater duration and depth of contact with patients, and greater complexity than any assessment tool can provide. In the future, developing robust interventions for patients presenting with suicidal ideation and DSH might be a more appropriate focus for research than screening for suicide risk without such an intervention being readily available.

Competing interests:

Nil.

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<http://www.nzma.org.nz/journal/read-the-journal/all-issues/2010-2019/2018/vol-131-no-1470-23-february-2018/7490>

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An audit of risk assessments for suicide and attempted suicide in ED: a retrospective review of quality

Wayne de Beer, Bernard De Witt, Jules Schofield, Helen Clark, Veronique Gibbons

ABSTRACT

AIM: The primary aim of this audit was to determine the quality of psychiatric risk assessments conducted by Mental Health & Addiction Services clinicians for patients presenting to the emergency department, Waikato Hospital, Hamilton, New Zealand following an attempted suicide.

METHOD: A retrospective, randomised audit of 376 files of patients who had presented to the ED over a 12-month period from 1 July 2015 to 30 June 2016 was conducted, following the standards outlined in the present New Zealand Ministry of Health Clinical Practice Guideline for Deliberate Self Harm (DSH).

RESULTS: It was found that clinicians routinely focused on the historical features of the suicide attempt presentation while failing to record judgements about future suicidal behaviours. Interactions with family members were recorded in less than half of the cases. The guideline most poorly adhered to was checking whether Māori patients wanted culturally appropriate services during the assessment and treatment planning, with this recorded in less than 10% of the clinical records.

CONCLUSIONS: To improve the quality of the suicide risk assessments, and to better align with Clinical Practice Guidelines, the authors propose redevelopment of clinician training, including focus on cultural competence, and training in confidentiality and privacy relating to an attempted suicide episode.

Suicide, the act of intentionally killing oneself (as determined by coronial ruling), is rare but remains a significant cause of mortality in 34 of the Organisation for Economic Co-operation and Development (OECD) affiliated countries.¹ In 2014, 504 people died by suicide in New Zealand (ie, 10.7 per 100,000 population).² In contrast, the number of intentional self-harm hospitalisation events in 2013 (including short stays in the emergency department) was 7,267 (ie, 176.7 per 100,000 population).² In 2009, New Zealand had the highest rate of suicide in the OECD.³

Self-harm includes broader classes of behaviours that includes non-suicidal self-injury (NSSI) where the intent to die is absent. Attempted suicide is a deliberate self-harm (DSH) event with the purpose of ending one's life but does not lead to death.⁴⁻⁵

Assessments following suicide attempts can be challenging evaluative exercises. However, society expects that it will be completed with some degree of accuracy.⁶ The strongest predictive factor for future suicide is a history of previous suicide attempts, especially if this occurred recently.⁷ Stressful life events or psychological distress (eg, relationships and financial difficulties) are frequent precipitating factors.⁸⁻⁹ Multiple psychiatric disorders (depression, anxiety, substance abuse disorders, personality disorders, etc.) have been associated with an increase in attempted suicide risk.¹⁰ In 2006, depression and anxiety were ranked as the second leading cause of health loss in children, adolescent and middle-aged people.¹¹ As the population ages, the presence of social isolation, lack of connectedness and chronic

medical conditions also contribute as risk factors for suicide.^{12–13}

When patients present to the hospital's emergency department (ED) following a suicide attempt, the psychiatric assessment typically occurs once clinicians have confirmed medical stability, and the patient is sufficiently alert to participate in an interview. Mental health clinicians conduct a comprehensive, individualised psychiatric assessment to help identify the high-risk group for repeat suicide attempts.⁷ Recent studies showed that between 1.6–2% of hospital-treated people, following an attempted suicide episode, will die by suicide in the next 12 months.^{14–15}

The focus of this audit was to determine the quality of the psychiatric risk assessments conducted by mental health clinicians. This would help indicate which components of the psychiatric risk assessment, recommended in the Ministry of Health's (MOH) Clinical Practice Guideline (CPGs), are routinely and satisfactorily completed, and which are neglected or do not adhere to CPG recommendations.

Methodology

This was a descriptive study. A retrospective review of the electronic medical records was performed for patients who had presented to Waikato Hospital ED with either active suicidal thoughts or a suicide attempt over a 12-month period (1 July 2015 to 30 June 2016). An additional inclusion criterion was a subsequent assessment by a mental health clinician.

Using the outlined criteria and relevant coding for the various DSH methodologies, over 900 medical records were obtained. The original pool of medical records was randomised (by way of using a random number generator formula process in Excel), and the first 376 files were reviewed.

The Royal Australian and New Zealand College of Psychiatrists (RANZCP) has published CPGs for the management of DSH; the most recent in 2016.¹⁴ The authors, however, selected the 2003 MOH CPG, "Assessment and Management of People at Risk of Suicide" as the 'gold standard' for risk assessment, as this was the standard against which ED and Mental Health Services in New Zealand are audited.¹⁶

Although the MOH has more recently published "Preventing Suicide; Guidance for emergency departments", it does not directly address the psychiatric risk assessment.¹⁷ The authors were not aware of any pre-existent key performance indicators in the Waikato region for psychiatric risk assessments for community DSH. While clinical practice guidelines exist, international reporting suggests that adherence to them is consistently poor.^{18–19}

A 10-item checklist of measurable, ED-based activities conducted by clinicians was developed from the MOH 2003 CPG (Table 1). Standards such as staff training in suicide, and the recommendation for staff to receive regular supervision identified in the CPG, were excluded. An additional 16-item risk assessment checklist was developed to address item 5, "Mental Health Staff conducted a comprehensive suicide assessment" (Table 2). This incorporated the central tenets of a standard psychiatric risk assessment as outlined in a standard psychiatry text.

In addition to collating de-identified sociodemographic data, three researchers systematically reviewed patient records and benchmarked MH&AS assessments against the two checklists. Statistical analysis was performed using SPSS and Excel. Ethics was sought from the New Zealand MOH's Health and Disability Ethics Committee (HDEC), but was deemed unnecessary for the audit process or publication of the results.

Results

During the 12-month audited period, 233 females (112.6 per 100,000—figures taken from the New Zealand Census population data 2013)²⁰ and 143 males (72.6 per 100,000) presented to ED (ratio 1.6:1). Patient age ranged from 12 to 84 years (M=30.8, SD 15.3). The highest rate of attempted suicide presentation occurred among 15–24-year-olds, with 179 individuals presented to ED (324.7 per 100,000). Māori had the highest rate of attempted suicide presentation (n=112; 126.7 per 100,000) followed by New Zealand European (n=238; 76.2 per 100,000). People from urban settings were twice as likely to present with attempted suicide as those from rural settings (rates 139.8 per 100,000, and 67.9 per 100,000 respectively).

Table 1: Ten-item checklist assessed by MH&AS clinicians at ED.

<p>Ten-item checklist (adapted from the 2003 MOH publication, “Assessment and Management of People at Risk of Suicide.”(New Zealand Guidelines Group (NZGG) and Ministry of Health, 2003)</p> <ol style="list-style-type: none"> 1. The family were involved in the assessment or contacted at some point. 2. Patients who self-identified as Māori were asked whether they wanted to include culturally appropriate services in their assessment. 3. Additional attempts to verify DSH information (eg, family, GP, previous notes) were attempted, eg, under-reporting of overdose. 4. Intoxicated or sedated patients were observed in a safe environment until they were sober or could appropriately participate in an assessment. 5. MHS staff conducted a comprehensive suicide assessment. 6. When a patient was not admitted to the inpatient setting, outpatient/community follow-up occurred within the first 72 hours. 7. Evidence existed that the patient (including whanau and important others) were included in treatment planning. 8. A written copy with information about medication, treatment plans and key contacts, eg, CAHT to call (if needed) was provided. 9. The patient’s general practitioner (GP) received a full copy of the discharge plan including any medication recommendations, ie, evidence from Clinical Results Viewer (CRV) report of correspondence sent to GP. 10. The potential for further/future overdose risk was considered in prescribing medications, ie, treatment plans indicated that medications were prescribed and dispensed in dosages and quantities that are less likely to be lethal in overdose or in combination with other drugs or alcohol, ie, close control prescribing.

Table 2: Sixteen-item risk assessment checklist.

<p>Comprehensive suicide assessment:</p> <ol style="list-style-type: none"> 1. The description of suicide attempt existed. 2. The association with alcohol intoxication/dependence history was asked about (and recorded). 3. Duration and sophistication of prior planning (including presence of a farewell letter) was recorded. 4. Access to further methods for DSH was explored, eg, access to medications, firearms, etc. 5. Psychosocial stresses (ie, Predisposing, Precipitating and Perpetuating factors) that are believed to have contributed to DSH attempt identified. 6. Attitude to surviving DSH recorded. 7. Attitude to current and immediate future personal safety documented. 8. Presence of protective factors explored and documented. 9. Presence of depressive features explored and documented. 10. Presence of another Axis I psychiatric condition, especially alcohol dependence and sleep disorder, explored and documented. 11. Medical history recorded (especially chronic medical conditions). 12. Psychosocial status and existing support; support available during recovery phase documented. 13. Access to and willingness to access professional services documented. 14. Family/caregiver concerns identified and documented. 15. Family’s/caregiver’s predicted future DSH risk of the patient documented, ie, notes indicated that family were asked about their concerns about their relative’s immediate safety and their ability to assist in keeping safe. 16. Immediate risk judgement identified or described, ie, no risk, mild-low, moderate, severe, very high (extreme).

Table 3: Level of achievement of checklist items.

Item (n=376)	Standard achieved (%)	Standard NOT achieved (%)
<i>Description of suicide attempt</i>	356 (94.7%)	20 (5.3%)
<i>Association with alcohol intoxication/dependence history obtained</i>	301 (80.1%)	75 (19.9%)
<i>Duration and sophistication of prior planning recorded</i>	242 (64.4%)	134 (35.6%)
<i>Access to further methods of DSH explored</i>	91 (24.2%)	285 (75.8%)
<i>Psychological stresses identified</i>	309 (82.2%)	67 (17.8%)
<i>Attitude to surviving DSH recorded</i>	193 (51.3%)	183 (48.7%)
<i>Attitude to current and immediate future personal safety recorded</i>	69 (18.4%)	307 (81.6%)
<i>Presence of protective factors explored</i>	198 (52.7%)	178 (47.3%)
<i>Presence of depressive features explored</i>	210 (55.9%)	166 (44.1%)
<i>Presence of another Axis I psychiatric condition explored</i>	296 (78.7%)	80 (21.3%)
<i>Medical history recorded</i>	310 (82.4%)	66 (17.6%)
<i>Support available during recovery phase recorded</i>	224 (59.6%)	152 (40.4%)
<i>Access to and willingness to access professional services documented</i>	248 (66.0%)	128 (34.0%)
<i>Family/caregiver concerns identified</i>	137 (36.4%)	239 (63.6%)
<i>Family asked about concerns for patient's safety and their ability to assist in keeping safe</i>	105 (27.9%)	271 (72.1%)
<i>Immediate risk judgement identified or described</i>	194 (51.6%)	182 (48.4%)

Table 4: Level of achievement of Clinical Practice Guidelines.

Item	Achieved (%)	Not achieved (%)
<i>Family/caregiver involved in assessment or contacted (n=376)</i>	194 (51.7%)	174 (47.5%)
<i>Patients identifying as Māori asked if they want to include culturally appropriate services in assessment (n=112)</i>	8 (7.1%)	95 (84.8%)
<i>Additional attempts to verify DSH info attempted (n=376)</i>	190 (50.5%)	184 (48.9%)
<i>When patient not admitted, follow up (scheduled to have) occurred within 72h (n=275)</i>	251 (91.3%)	15 (5.5%)
<i>Patient was included in treatment planning (n=275)</i>	188 (68.3%)	81 (29.1%)
<i>Written copy of medication, treatment, key contacts provided (n=275)</i>	71 (25.8%)	194 (70.5%)
<i>Patient's GP received full copy of discharge plan and medication recommendations (n=275)</i>	216 (78.5%)	51 (18.5%)
<i>Close control prescribing incorporated (n=376)*</i>	51 (13.6%)	57 (17.8%)

*68.4% of patients were either admitted or were not on medications requiring close control prescribing.
 Note: All n listed above include patients with missing data (ie, not recorded on the assessment checklist).

Results for adherence by MH&AS clinicians to the psychiatric assessment standards are outlined in Tables 3 and 4. The levels of adherence (recorded as either 'achieved' or 'not achieved') indicate the percentage of clinicians that adhered to the checklist items. ED clinicians cannot refer patients who are sedated or intoxicated (Item 4, Table 1) for the psychiatric assessment, therefore this item was excluded.

Discussion

The face-to-face interview has traditionally remained an important assessment to help prevent repeat attempted suicide.²¹ The highest risk factors identified during the clinical assessment are suicide intent and the degree of planning involved in the attempt, including availability and ease of access to suicide means.

While the clinical assessment helps identify high risk factors and provide appropriate, targeted interventions, based on the synthesis of interview and collateral information, systematic literature reviews have failed to identify the positive predictive validity of the psychiatric risk assessment.¹⁴ The traditional use of categorical labels, ie, high, moderate and low risks, have to date held poor predictive validity and low inter-rater reliability.²² The psychiatric assessment has also frequently been augmented by other diagnostic tools and rating scales designed to predict short-term suicidal behaviour following a suicide attempt. Likewise, the predictive validity of these various tools in predicting short-term suicidal risk remains poor.²³⁻²⁵ In his study, Horowitz calls for more meticulous exploration of risk; the psychiatric assessment offers this opportunity.²⁵

This study relied solely on recorded information and this limits discussion on the findings and recommendations. The authors acknowledge that discrepancies are likely to exist between actual clinical practices and what was documented in the electronic medical records. However, retrospective formal analysis, as part of a critical review process following a sentinel event (such as suicide) can be aided by contemporaneous documentation, as clinicians' memories can be fallible.²⁶

Regarding the recorded risk assessment, the clinicians' practices appeared to have

focused on the historical facts of the event: recording details of the attempted suicide episode and determining the presence of other psychiatric conditions. Those areas where clinicians adhered to CPG recommendations appeared to coincide with electronic note categories. The format and requirements of the electronic note record has, and could play a further quality improvement role in CPG adherence.

Clinicians tended not to record extrapolations or judgements about future suicidal behaviours and outcomes. For example, attitude to current and immediate future safety was often missing, as was information about access to further potential DSH methods. Clinicians recorded their interactions with family members (ie, identifying specific concerns or checking their ability to assist in keeping the patient safe) in less than 50% of the cases reviewed. The poorest result observed was the low percentage (recorded in less than 10% of clinical records) of documented invitation for provision of culturally appropriate services for Māori patients as part of their assessment.

More than 75% of patients who were discharged from the ED were referred for outpatient review to occur within a week of the incident with community services. This study did not assess whether this goal for re-assessment was achieved. Standard practice ensured that all general practitioners (GPs) received an automatically generated letter about the risk assessment.

Based on the above findings, we recommend that the psychiatric risk assessment and adherence to an identified CPG requires further additional work. An Australian study into completed suicide found that of the suicides that could have been prevented, 59% had incomplete or poor assessment of suicide risk; suicide risk was not adequately determined and given due consideration.²⁷ The authors would suggest the development of educational workshops to include the following topics:

- a) Psychiatric risk assessment for clinicians working in acute mental healthcare settings. Clinicians should be aware of the recommended standards when it comes to suicide risk assessment.

- b) Clinicians must comply with medico-legal requirements for documentation in clinical records. Aligning electronic clinical notes with CPG recommendations could improve adherence.
- c) The importance of the individualised suicide risk assessment. A diagnostic statement or risk category is insufficient and staff should be encouraged to provide a psychiatric formulation. This should include the judgement of immediate risk for future harm by weighing up the interactions of the multiple identified (dynamic and static) risk factors (for suicide) against the protective and resilience factors. Isolated and even combinations of risk factors indicate little about immediate risk—hence the need for a comprehensive formulation.²⁸
- d) Addressing privacy and confidentiality aspects of the clinical assessment especially pertaining to risk. The risk exists that clinicians may be opting for non-disclosure and non-involvement with family and caregivers as the norm rather than exploring how much, and when to safely share information with relatives. It is important for services to balance the need to engage family and caregivers in the assessment and care of patients with suicidal behaviours while ensuring appropriate patient confidentiality.
- e) Cultural competency training. Organisations need to ensure that their clinicians have had adequate training in addressing cultural needs of their patients. Many large hospitals in New Zealand employ cultural workers, therefore it is essential that clinicians know how to access these staff members.

The authors of this study concluded that adherence to CPG was moderate to poor. (It remained uncertain whether clinicians performed the CPG activities but had failed to record these in the patients' clinical records). Despite uncertainties existing about the predictive validity of the comprehensive psychiatric assessment, a comprehensive and individualised assessment remains the cornerstone of clinical assessment and guides the treatment and intervention plans.

Competing interests:

Nil.

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Acceptability of electronic cigarettes as an option to replace tobacco smoking for alcoholics admitted to hospital for detoxification

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ABSTRACT

AIM: A feasibility/acceptability trial was undertaken at Ward 5, Kenepuru Hospital, Porirua, to ascertain whether electronic cigarettes (e-cigarettes) were a useful option to replace or reduce smoking in the detoxification ward.

METHODS: Two groups of patients were studied. Tobacco use and dependency data were collected for each. The first group was surveyed on the usefulness of standard nicotine replacement therapy (NRT). The second group were offered e-cigarettes with the option of standard NRT as well. All were asked to record their use of cigarettes, e-cigarettes and NRT during their stay on the ward, and to comment on their experiences.

Outcomes monitored were self-reported use of NRT and of tobacco. Informal impressions of the nursing staff were also collected, where offered. For the e-cigarette group, a blood sample was taken on day 3 or 4 of their stay in hospital for nicotine/cotinine analysis, to confirm nicotine intake status.

RESULTS: E-cigarettes were well tolerated as a form of nicotine replacement, eliciting positive comments, though they were not effective for all. The average reduction in median cigarettes per day was very similar between the group given standard NRT and the e-cigarette group, at 80% and 86% respectively. There were no adverse effects reported.

CONCLUSION: The study showed that e-cigarettes were an acceptable form of nicotine replacement for these alcohol-dependent patients during their time in the ward. For heavily tobacco-dependent smokers, e-cigarettes may provide a useful aid to patient management within a hospital setting.

Smoking tobacco is an addiction which, for some, is very difficult to give up, even during hospital admissions.^{1,2} In New Zealand and in many other countries smoking is banned within hospital buildings for health reasons. It is desirable that patients stop smoking and, ideally, hospital visits will be a trigger for smoking cessation. This is, however, particularly challenging for those entering hospital with complex mental health/addiction and physical disorders.³

This study concerns alcohol-dependent patients, many of whom are smokers. When

they enter hospital, the immediate problem is not their tobacco dependence. Treating tobacco dependence is seen as secondary while the immediate task of helping the patient through the initial stages of alcohol withdrawal is undertaken.⁴ Patients are thus allowed to smoke, but have to go outside the hospital building to do so, and this can jeopardise patient safety.

E-cigarettes have proved very popular overseas, and major reasons for this are that—as well as providing similar behavioural reinforcement—they provide

a more rapid nicotine uptake, better replicating the smoking experience overall.^{5,6}

In New Zealand, as elsewhere, e-cigarettes are a controversial subject, with some excited by the prospect of their use for smoking cessation and for harm reduction,⁷ whereas others fear a renormalisation of smoking, with e-cigarettes becoming a gateway to recruiting a new generation of smokers.⁸

In the case of those with addictions and associated mental health problems, the harm reduction arguments for allowing e-cigarettes are particularly strong, because this group is notoriously difficult to reach with conventional smoking cessation interventions.²

In this feasibility trial, we studied whether e-cigarettes would be acceptable to patients as a way of reducing or stopping smoking while they were in hospital, and how this compared to conventional approaches.

Methods

The study groups were drawn from alcohol-dependent patients consuming a mean of 20 standard drinks per day, admitted for an expected 5–6 days for medically supported alcohol withdrawal. The patients selected for hospital detoxification are at the more severe end of alcohol dependence. The mean 24-hour intake is 22 standard drinks. These patients often present with comorbidities associated with alcohol dependence, including alcoholic liver disease, nutritional deficiencies and other organ damage. Depression and anxiety disorders are also commonly encountered. They have high rates of tobacco dependence. In this project, all smokers who were considered capable of giving informed consent at the time of admission were included in the study.

Two groups of patients were recruited. The first (recruited July 2013–April 2014) were offered standard nicotine replacement therapy (NRT). Where patches were used, they were applied at 9am and removed at 9pm. Nicotine gum was available as required. They were asked to keep written records of their daily smoking and their use of NRT while they were in the ward and to comment on their experience of NRT.

The subsequent group (recruited May 2014–Feb 2016) were given access to an

e-cigarette with the option of standard NRT as well. They were permitted to use the e-cigarette as a smoking replacement while on the ward and did not need to take it outside. Again, smoking and use of e-cigarettes and of standard NRT was recorded by the patients for each 24 hours. On day 3 or 4 of their stay, a blood sample was taken for measurement of serum nicotine and cotinine. Serum samples from the study were stored at under -20°C prior to testing. Nicotine/cotinine concentrations were measured by Canterbury Health Laboratories (Christchurch).

Samples were extracted with acetonitrile, with inclusion of an internal standard (D4-nicotine), followed by dilution with water. Dilutions were analysed on an Agilent 1200 series high-performance liquid chromatograph using a Phenomenex Synergi Polar-RP 80 A 4 μm 150×4.6mm column. A solvent gradient was used for elution, with mass spectral detection (ABSciex 3200 QTrap mass spectrometer). Extraction efficiency was 95% and the limit of detection was 1ng/mL. The standard curve ranged from 5 to 50ng/mL for each analyte.

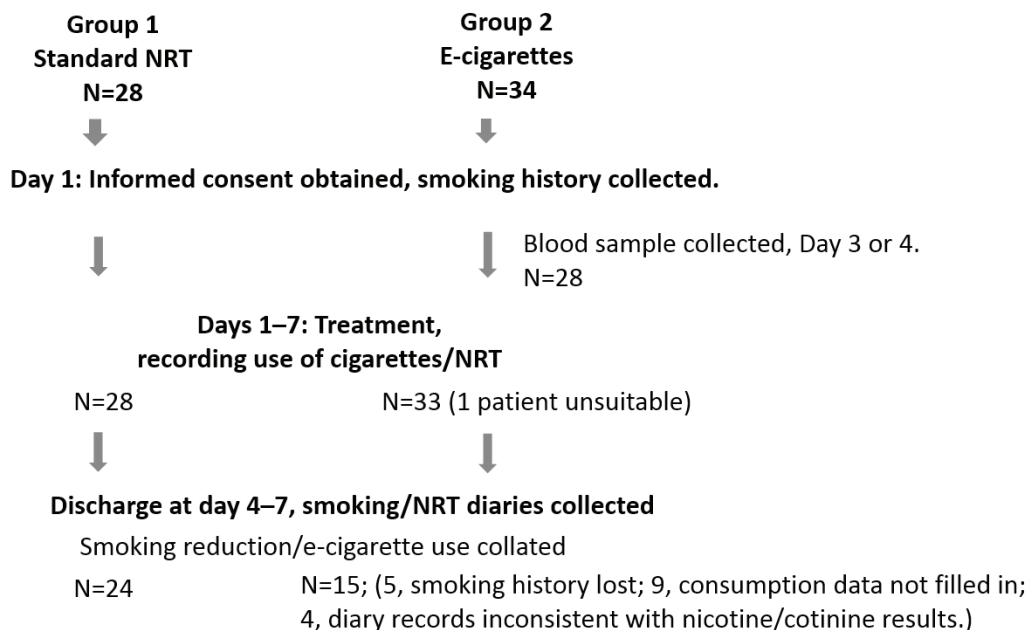
For each group, data pertaining to tobacco dependency (tobacco type used, cigarettes/day and time to first cigarette on waking (TTFC)) were collected.⁹

The e-cigarette brand chosen was one which was well established and which had been tested for quality, effectiveness and toxicity in a previous study.¹⁰ The e-liquid chosen was “eskimo” (a very mild menthol flavour) at 18mg nicotine/mL. A rechargeable type of e-cigarette was chosen, using re-fillable tips (Liberro Realis), each patient being given their own re-fillable tips for use during their stay. During the course of the trial this product was discontinued, and the study moved to using a disposable e-cigarette from the same brand (Liberro Go, UK) as these remained within the terms of the ethical approvals given to the study. The e-liquid had the same nicotine concentration but was tobacco flavoured.

Reactions of the nursing staff were collected verbally and informally by all members of the team as opportunities arose.

Responses (including all comments) were tabulated into Excel. Dependence-related data (cigarettes per day, time to first cigarette on waking) were collected as

Figure 1: Flow chart summarising study structure.



ranges. Subsequent estimation of average cigarettes per day (to calculate median reduction in smoking) was conservative (eg, range >30cpd; estimated at 35cpd) and was consistent between groups.

All appropriate ethical approvals were obtained (13/CEN/111). The trial was registered with the Australasian Clinical Trials Network (ACTRN12614000370606) and had been granted approval by the HRC Standing Committee on Therapeutic Trials (TT50-9479 (1598)).

Results

All patients approached to be part of this study agreed to be included. Complete data from 24 controls and 19 e-cigarette group

participants were collected, with partial data from a further four controls and 14 e-cigarette users also included, where appropriate.

Participants ranged in age from 24 to 54, the median age being 45, and slightly more men (58%) than women (42%) were admitted into the study. These characteristics were very similar between groups.

The alcohol withdrawal syndrome commonly presents with tremor, unsteadiness of gait, anxiety, insomnia, tachycardia, high blood pressure and nausea. These were well controlled with prescribed benzodiazepines. True delirium tremens did not develop in these project participants.

Table 1: Smoking characteristics of patients enrolled in the e-cigarette trial.

	Control group	E-cigarette group
	Number* (%)	Number* (%)
Roll-your-own use	18 (65%)	18 (72%)
Cigarette only	10 (36%)	7 (28%)
>30 cigs/day	6 (21%)	10 (40%)
20–30 cigs/day	20 (71%)	10 (40%)
<20 cigs/day	2 (7%)	5 (20%)
TTFC <5 min	15 (54%)	13 (52%)
TTFC 5–15 min	9 (32%)	7 (28%)
TTFC >15 min	4 (14%)	5 (20%)

*The variation in total number for each information group is a result of the missing data.

Table 2: Use of cigarettes, conventional NRT and e-cigarettes (median (range)) for each day of treatment.

	Control group		E-cigarette group		
	Cigarettes/day median (range)	NRT use (No./total*)	Cigarettes/day median (range)	E-cigarette uses/day median (range)	NRT use (No./total*)
Day 1	3 (0–19)	20/24	3.5 (0–10)	5 (0–20)	3/22
Day 2	4 (0–15)	17/21	2 (0–13)	6 (0–23)	4/18
Day 3	4 (0–15)	17/21	2 (0–17)	5 (0–20)	3/18
Day 4	6 (0–13)	16/20	3 (0–15)	3 (0–20)	3/14
Day 5	3 (0–13)	14/17	3 (0–14)	2 (0–8)	3/9
Day 6	3 (0–11)	11/11	4 (0–13)	3 (0–7)	2/7
Day 7	1 (0–6)	6/6	3 (0–6)	1 (0–10)	1/4

*Total number of patients declines across the week as patients leave, are discharged, or stop recording their smoking. The average duration of hospital stay was six days.

Tobacco dependence data for each group is shown in Table 1. The control and e-cigarette groups were very similar in all characteristics assessed.

As expected, the majority of patients were heavy smokers exhibiting high tobacco dependence, as expressed by their ‘time to first cigarette on waking’ (TTFC) scores and high tobacco usage. A high proportion (65%) in both groups were users of roll-your-own tobacco (either exclusively or with some use of cigarettes as well).

Serum cotinine concentrations in patients tested ranged from 15–300ng/mL with a median of 120ng cotinine/mL, and serum nicotine was in the range 1–24ng/mL with a median of 6.5ng nicotine/mL.

In the standard NRT group most smokers cut down on smoking significantly ($p < 0.0001$, Wilcoxon signed ranks test) while in hospital. Most (83%) used 21mg patches, lozenges or both. Median reduction (self-reported smoking while on the ward, compared with self-reported smoking habits) was 80% (range 44–100%). The average number of cigarettes reported as being smoked per 24 hours while in hospital was five. Using conventional NRT, three patients said that they did not smoke at all during their time in hospital.

In the e-cigarette group most patients also cut down significantly ($p < 0.0001$, Wilcoxon signed ranks test) on smoking tobacco cigarettes while on the ward, where the median reduction was 86% (range 0–100%).

The average number of tobacco cigarettes reported smoked per 24 hours was four and the average number of uses of an e-cigarette was six. Two of the patients used e-cigarettes only (no tobacco use reported) and four did not report any use of either tobacco cigarettes or e-cigarettes after the first day. Although most of the e-cigarette group did not use conventional NRT so long as e-cigarettes were available to them, three users of disposable e-cigarettes reported some use of conventional NRT as a supplement to the e-cigarettes.

A major difference between the two groups was in the comments. Patients in the control group were politely positive about NRT, suggesting that it helped them cut down their smoking. One said that keeping the records of their smoking and NRT use was useful in itself.

Comments on the usefulness of e-cigarettes were more positive than those for conventional NRT (“they really helped me to cut down”; “liked not going outside to smoke”; “much better than patches and gum”). Another commented that he liked them but “needed a real cigarette after day 3” adding that he would try them again later when he was ready to quit smoking. Four complained of technical problems in keeping up the supply of nicotine-filled cartridges and charged batteries (“I only smoked when the battery ran out”; “technical issues frustrating”). At least four patients asked about the possibility of taking

their e-cigarette with them when they left. Three requested information on how to get hold of e-cigarettes via the internet.

At the beginning of the study there was some resistance from the nursing staff to patients being allowed to use e-cigarettes in the ward. Some were worried whether it was right to allow something that looked like smoking, and this project challenged the thinking of some around addiction and harm reduction. Some were worried about health aspects of the vapour. Once they had seen the e-cigarettes used, much of this worry dissipated.

Nurses much preferred giving out the disposable e-cigarettes compared to the rechargeable ones, as they did not require any technical expertise to maintain the supply, but when we swapped over to them, the enthusiasm of the patients diminished noticeably, as evidenced from a change in the comments (“I do not like these”) and the need for additional NRT for some. At the end of the trial some staff expressed regret that the trial could not continue longer, and that this option would no longer be available to their patients.

Problems encountered

One patient lit the end of their e-cigarette with a lighter and was removed from the study.

Other problems encountered ranged from the difficulty of deciding whether an intoxicated or agitated and distressed patient was in a fit state to give informed consent, technical issues with the use of the e-cigarettes (particularly during night shifts) and the tendency of the e-cigarettes to vanish when the patients left the ward, combined with supply and communication delays in replacing them.

Discussion

E-cigarettes were well tolerated by this group of smokers. Patients entering hospital cut down their smoking significantly, whether they were given e-cigarettes or standard NRT, but the e-cigarettes were preferred ahead of patches and gum, seeming to encourage an interest in continued cessation or in switching away from tobacco use.

The serum cotinine results were in the mid-lower end of the expected concentrations for heavy smokers, consistent with some degree of smoking reduction while in hospital. However, wide variations in cotinine metabolism rates (half-life, 10–27h)¹¹ mean that where nicotine intake has recently changed, the results of a single serum cotinine test are indicative only. Nevertheless, it was possible to see that some under-reporting of smoking did occur. In particular, three of the four patients who reported no use of either e-cigarettes or of tobacco cigarettes had serum cotinine concentrations inconsistent with this (at 135–300ng/mL) corresponding with the observations of staff that at least four patients were using e-cigarettes and were not smoking, but were not keeping records of their e-cigarette use.

Limitations of this study include its small size, and that we did not systematically collect data about the experiences of the nursing staff. The study was made more difficult because of heavy workload demands on frequently changing staff. It proved difficult to maintain the staff's ability to keep the patients supplied with charged batteries and filled cartridges, or to encourage diary maintenance by the patients.

Recording of e-cigarette use was generally inconsistent, with some counting individual puffs and some counting vaping sessions. Uncertainty about how to record e-cigarette use may have contributed to some patients not recording their e-cigarette use.

While the disposable e-cigarettes were preferred by the nursing staff, they appeared to be less effective than the rechargeable variety. This type of e-cigarette is known to be less effective at nicotine delivery than are the later types, and so that result was not unexpected.¹²

Regardless of these limitations, the results showed that e-cigarettes provided a form of NRT that these alcohol-dependent patients, with psychological and physical illnesses, were prepared to use, either for cessation or as a smoking substitute. E-cigarette technologies are improving rapidly and, were this trial to be repeated, it should be possible to find a brand of e-cigarette which

is both easy for the nursing staff to supply and adequate in its nicotine delivery.

Further, our over-riding impression from the nursing staff was that management of these patients became easier with e-cigarettes being supplied. This project aimed simply to assess whether e-cigarettes would be used, if available. Future work should explore further the ways in which this innovation was helpful, both for the nursing staff and for the patients.

If the availability of e-cigarettes within a hospital ward reduces some stresses both on patients and on the nursing staff, this could make a significant difference to treatment of drug and alcohol patients or other heavily tobacco-dependent patients admitted for care. This is an important and recalcitrant public health issue, particularly for psychiatric and drug or alcohol-dependent patients.^{3,4,13}

Competing interests:

Dr Truman reports grants from New Zealand Tobacco Control Research Tūranga (Emerging Issues Fund): The Tūranga is supported through funding from the Reducing Tobacco-related Harm Research Partnership, co-funded by the Health Research Council of New Zealand and the Ministry of Health of New Zealand (HRC grant 11/818), during the conduct of the study; grants from New Zealand Tobacco Control Research Tūranga (Emerging Issues Fund), personal fees from California Department of Public Health, outside the submitted work; and Dr Truman is a member of End Smoking New Zealand, a charitable organisation which advocates for harm reduction.

Acknowledgements:

We thank the staff of Ward 5, Kenepuru Hospital for their interest and cooperation, and Canterbury Health Laboratories for their analytical work.

Funding for this project was provided by the New Zealand Tobacco Control Research Tūranga (Emerging Issues Fund): The Tūranga is supported through funding from the Reducing Tobacco-related Harm Research Partnership, co-funded by the Health Research Council of New Zealand and the Ministry of Health of New Zealand (HRC grant 11/818).

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Limiting complication rates in implant-based breast reconstruction

Michelle B Locke, William LE Malins, Jia Le See, John Kenealy

ABSTRACT

BACKGROUND: External beam radiotherapy (XRT) to the breast has been shown to increase complication rates in women undergoing implant-based breast reconstruction (IBBR). Owing to concerns about high complication and failure rates, our department began to favour autologous reconstructive in patients requiring XRT in 2013. This study assesses the outcomes of IBBR prior to and following this policy change.

METHODS: The records of all patients who underwent first-stage IBBR in 2012 and 2013 in our department were reviewed. Patients undergoing peri-operative XRT were identified. Complications and failure rates were analysed.

RESULTS: Over two years, 77 IBBRs were performed in 53 patients. In 2012, 11 patients underwent peri-operative XTR compared with five in 2013. Radiotherapy was significantly associated with higher reconstructive failure rates while pre-operative XRT was associated with more complications overall ($p=0.0099$). Over the two years, the number of IBBRs with any complication fell from 16 (43.2%) to 11 (27.5%) while reconstructive failure fell from six (16.2%) to four (10%).

CONCLUSIONS: Peri-operative XRT increases complication rates and reconstructive failure with IBBR. Our current policy of recommending autologous reconstruction if they have had pre-operative XRT seems to be resulting in decreased complication rates and increased reconstructive success.

Breast cancer is the most prevalent cancer of women in New Zealand and around the world. Breast reconstruction is commonly undertaken after mastectomy, to improve the quality of life and functional wellbeing of affected women. Treatment with external beam radiation therapy (XRT) to the breast has been shown to increase complication rates and associated morbidity in women undergoing implant-based breast reconstruction (IBBR).¹⁻³ Both prior and post-operative XRT has also been shown to negatively affect implant-related outcomes (Figure 1A and B).^{4,5} While XRT is not an absolute contraindication to IBBR, concern over complications rates in our department resulted in surgeons encouraging such patients to favour autologous reconstructive options if XRT was planned. To facilitate this, since 2012 all referrals to our department for breast reconstruction must be accompanied by an oncological appraisal, detailing the probability of XRT by classifying the patient's risk of requiring

post-mastectomy XRT into 'Certain', 'Likely', 'Possible' or 'Unlikely'.

As breast reconstruction is often a staged procedure and complications can occur weeks to months after surgery, it is only now appropriate to analyse data from the time period around this policy change, to allow capture of all complications through the entire reconstructive process. The aim of this study was to assess the outcome of IBBR at Counties Manukau District Health Board (CMDHB) Plastic and Reconstructive Surgery Department for two years, between January 2012 and December 2013. This department includes six breast reconstructive surgeons. Primary endpoints include assessment of the proportion of patients who underwent IBBR received either pre- or post-operative adjuvant XRT, as well as the development of any acute complication associated with their reconstructive surgery and final reconstructive success overall.

Figure 1: Patient undergoing IBBR at a different surgical unit following left breast XRT, showing challenges in expansion of left breast tissue.



A: Expansion was able to be progressed to 375mL on the right but only 250mL on the left.

B: The same patient as 1A following expander to implant exchange with 300cc round silicone implants in situ, showing poor cosmetic result of IBBR due to pre-operative XRT.

Patients and methods

Institutional approval for this project was obtained from the CMDHB Research Office (#2139). All patients treated with first-stage of their immediate reconstruction in 2012 and 2013 in our department were identified from our prospective records. After reviewing available electronic notes, all patients who underwent adjuvant XRT were identified. We stratified our cohort by year, to identify those prior to and immediately after the introduction of our new departmental guidelines. Those treated with XRT were sub-classified into whether treatment was delivered prior to undertaking reconstruction ('pre-operatively') or following completion of reconstruction ('post-operatively') for the purpose of outcome analysis. Length of follow up was conservatively defined as the time from insertion of first expander to the date last seen in our clinic. Complication was defined as an adverse outcome noted in the records, regardless of how this was managed. Despite the presence of a complication, these patients were still considered to have had successful reconstructions. Reconstructive failure was defined as removal of expander or implant for clinical or aesthetic reasons with abandonment of this reconstructive method.

All patients underwent reconstructive surgery by a plastic surgeon who sub-specialised in breast reconstruction. All mastectomies were performed by oncological breast surgeons. Our department

does not have access to technologies for intra-operative perfusion assessment of the mastectomy skin flaps, therefore all intra-operative surgical decision making was clinically based.

Descriptive statistics of demographics were reported as a mean or percentage of patients. Categorical variables were compared using the Student's t-test and Fishers Exact Test with two-sided probability as appropriate using GraphPad InStat v3.10 (San Diego, CA, USA). Past3 (Palaeontologica Electronica, Oslo) statistical software was used for Kaplan-Meier analysis. Significance was set at $p \leq 0.05$.

Results

Patient characteristics

In 2012, 27 patients underwent immediate IBBR on 37 breasts. Thirty-three of these were two-stage, expanded to implant only reconstructions, and four involved a latissimus dorsi (LD) flap plus an implant. In 2013, 26 patients underwent immediate IBBR on 40 breasts, of which only one involved a LD flap plus an implant. No patients had acellular dermal matrix.

Demographic data are summarised in Table 1. The groups were well matched for age. Follow up was significantly longer for the earlier (2012) cohort. A greater percentage of patients in 2012 underwent pre- or post-operative XRT than in 2013, but this was not statistically significant ($p=0.1699$).

Table 1: Patient demographics, radiotherapy treatment and outcomes.

	2012	2013	p value
Number of patients	27	26	
Number of breasts	37	40	
Mean age at surgery (years)	48	47	p=0.75
Age range (years)	31–64	30–68	
Ethnicity			
New Zealand European	18	15	
Māori	2	3	
Asian	3	4	
Other/not stated	4	4	
Mean follow-up (months)	28	20	p=0.002*
Radiotherapy (n (%))	11 (29.7%)	5 (12.5%)	p=0.091
Pre-operative	6	0	
Post-operative	5	5	
Median radiotherapy dose# (Gy)	50	50	
Range (Gy)	45–50	50	
Overall outcome (n (%))			
No complication	21 (56.8%)	29 (72.5%)	p=0.1614
Complication	10 (37%)	7 (17.5%)	
Reconstructive failure	6 (16.2%)	4 (10%)	p=0.5074

Gy = Grey. * = statistically significant. # = Where known; data only available for 7 of 11 patients in 2012 and 4 of 5 patients in 2013.

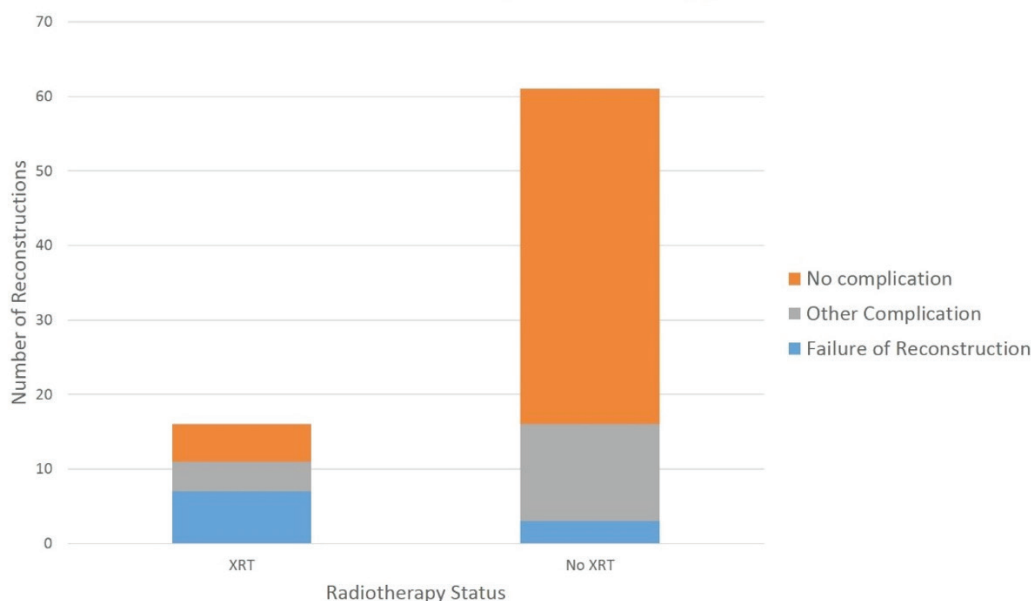
XRT = external beam radiotherapy.

Primary outcomes

Both the complication rate and the reconstructive failure rate was higher in the 2012 cohort than the 2013 cohort, but this was

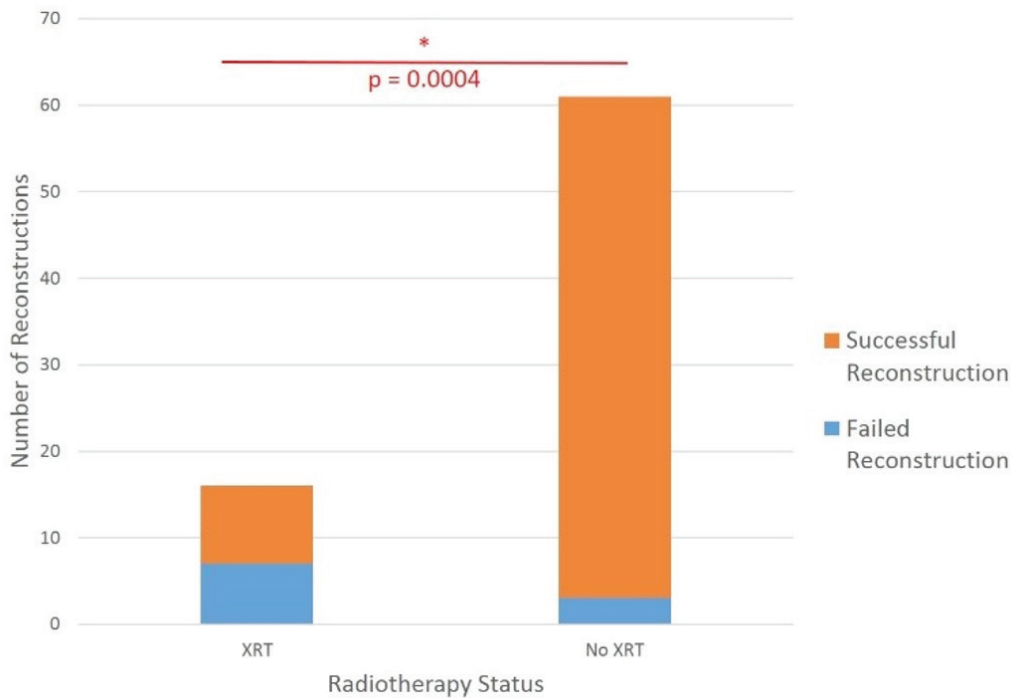
not statistically significant. However, when analysed by the presence or absence of XRT and by timing of XRT, there were significant differences. Overall outcome by radiotherapy status is shown in Figure 2.

Figure 2: Overall outcomes by radiotherapy status.



XRT = external beam radiotherapy.

Figure 3: Rate of failure of implant-based breast reconstruction by radiotherapy status.



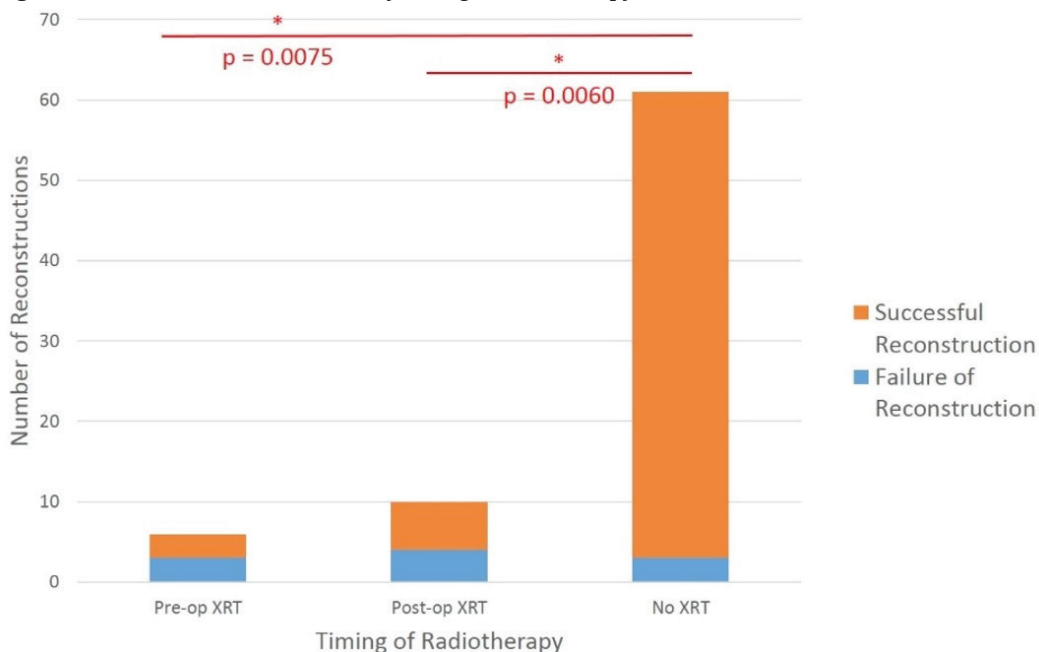
XRT = external beam radiotherapy.

Taken together, a history of perioperative XRT was significantly associated with the development of a reconstructive complication including failure ($p=0.0027$) and failure of IBBR alone ($p=0.0004$, Figure 3).

A history of pre-operative XRT or the requirement for post-operative XRT were both significantly associated with higher

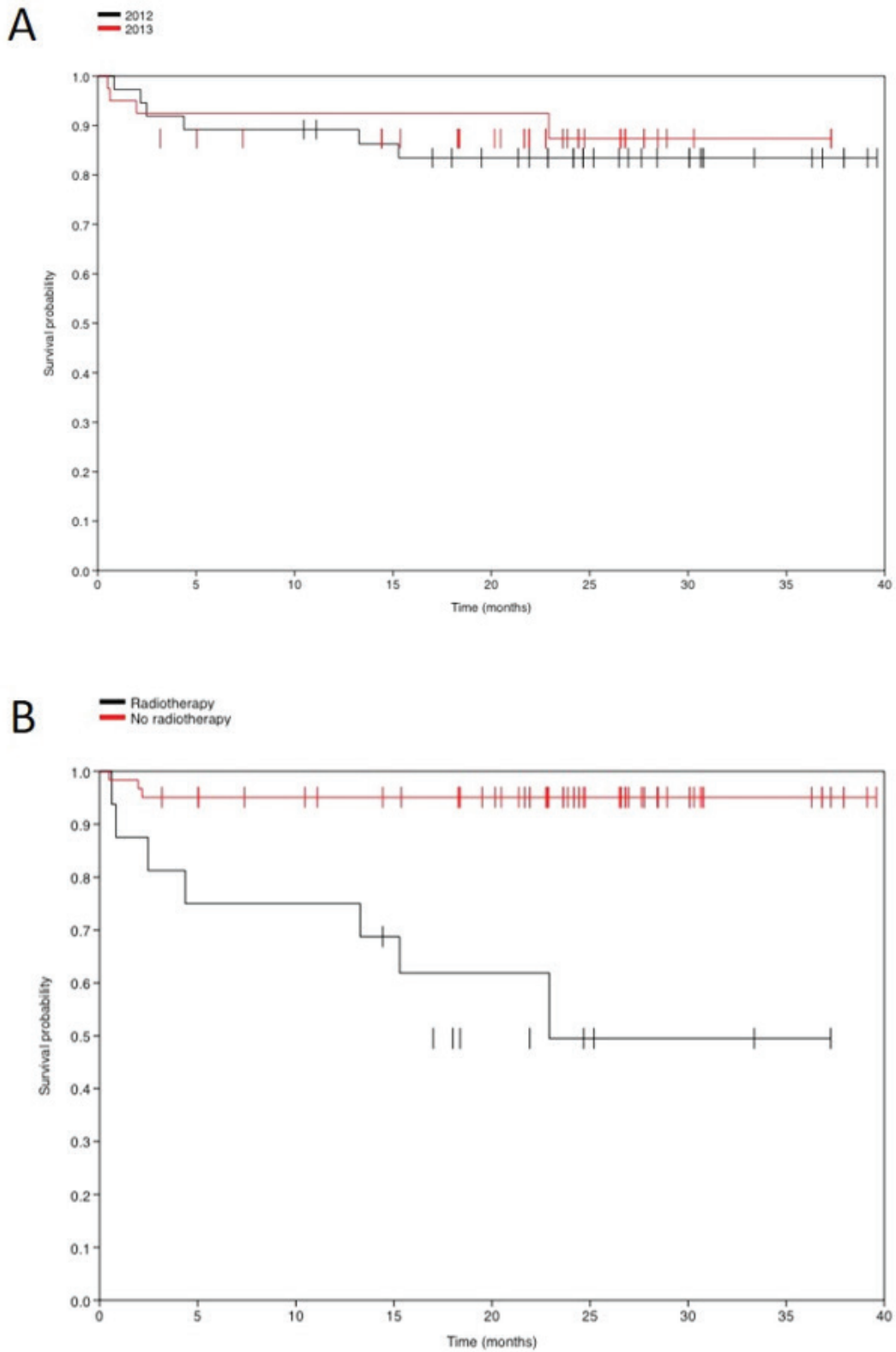
reconstructive failure rates ($p=0.0075$ and 0.0060 respectively, Figure 4) while pre-operative XRT was also associated with higher rates of any complication, including reconstructive failure ($p=0.0099$). The difference between the yearly cohort groups and by presence or absence of peri-operative XRT can be clearly seen in Kaplan-Meier survival curve depictions, Figure 5.

Figure 4: Outcome of reconstruction by timing of radiotherapy.



XRT = external beam radiotherapy.

Figure 5: Kaplan-Meier survival curves for each group.



A: By year cohort group. B: By radiotherapy status.

Discussion

IBBR is still commonly provided in the setting of peri-operative XRT, either due to a lack of autologous options or patient or surgeon preference. While this may accomplish a reasonable reconstruction,⁶ meta-analysis suggests that XRT results in higher complication and morbidity when compared with non-irradiated cohorts, while autologous reconstruction in the setting of XRT results in lower morbidity.¹ It is not possible to predict with absolute certainty which patients will require post-operative XRT, so any immediate IBBR patient may potentially require XRT. In our series, five IBBR patients per year were unexpectedly subject to post-operative XRT. However, where there is already a previous history of XRT treatment or a high suspicion of post-operative XRT being required, our departmental guidelines now suggest that these patients be steered away from IBBR. The success of this policy can be seen in the 2013 patient cohort, of which no patients undergoing IBBR had previously received XRT.

Our data shows a significant association between peri-operative XRT and the development of a complication or reconstructive failure from IBBR, in line with other literature on this topic.⁶⁻⁸ Uncertainty exists in the literature over whether pre-operative or post-operative XRT is the bigger risk factor for complications. Our data support the idea that pre-operative XRT poses more of a problem, with both higher operative complication rates and overall failure of IBBR in this group. While post-operative XRT was significantly associated with long-term failure of IBBR, it did not result in an increased acute complication rate, presumably due to the fact that XRT was commenced after surgical healing had occurred. Our radiation oncology colleagues will not irradiate a tissue expander with an integrated metallic fill port due to concerns that this may compromise their optimal adjuvant treatment plan.⁹ Therefore, any patient identified as requiring post-operative XRT either has their expander removed (hence relegating the reconstruction to the 'Failed' category—one patient in the 2013 cohort) or is rapidly expanded and changed to

a definitive cohesive gel breast implant prior to undergoing XRT, similar to the "fast track exchange" used by Cordeiro and colleagues.¹⁰ While a recent systematic review found that failure rates in both groups were not statistically different,⁵ Cordeiro feels that the long-term result is better if it is the final implant which is irradiated, rather than the expander.¹⁰

Expressing these results from a patient viewpoint, if no XRT is required, the patients chance of successful IBBR is 95.1%. However, this rate falls to only 56.2% for patients undergoing XRT. This XRT-related failure rate is high compared with published literature, where implant loss ranges from 20–30% for irradiated patients compared with 5–14% for non-irradiated controls.^{2,7,8,11} Cordeiro, whose outcomes are among the best published, has an 11.1% implant failure rate for irradiated patients and 6.1% for non-irradiated controls.¹⁰ In contrast, our failure rate in the non-irradiated control cohort of 4.9% compares very favourably. While the small sample size limits to conclusions we can draw from this, we believe that the improvement in our complication rate (43.2% in 2012 vs 27.5% in 2013) and failure rate (16.2% in 2012 vs 10% in 2013) is positive reinforcement of our departmental policy and in line with the first tenet of medicine, *primum non nocere*.

There is a difference in follow-up periods between our two cohorts, as is commonly seen when cohorts are separated by a date range, with the earlier patients having a longer follow-up period. As radiation-associated damage can take several years to develop, it is possible that the lower rate of complications in the 2013 cohort reflects the shorter follow-up period. However, this study was not designed to identify long-term complications from IBBR, but rather success of the reconstructive method employed. As most reconstructive failures occur from acute problems such as failure of expansion, wound breakdown or early implant infection, we believe that the 20-month follow-up period for our 2013 patient cohort is long enough to identify all cases of reconstructive failure. Similarly, the retrospective nature of some of our data collection can result in decreased identification of complications. However, as all patients were seen in our clinic for a lengthy follow-up

period as above, we are confident that any significant complications would have been identified. Another limitation of our study is the lack of comparative data from patients with pre-operative XRT who underwent autologous reconstruction under this new policy. It is possible that their complication rate from autologous reconstruction was no different than it would have been with IBBR, and this policy has simply transferred their complications to a different reconstructive pathway. However, the literature suggests this would not be the case.¹

Our department currently relies on predictions from the breast surgery team to determine the future risk of XRT. To limit the risk of XRT-related complications, the threshold for immediate reconstruction based on the estimated likelihood of needing future XRT could be lowered, for example, only accepting patients who are rated as 'Unlikely' to need XRT, rather than those rated as 'Unlikely' and 'Possible'. For these latter patients, reconstruction could be

delayed until post-mastectomy histopathology results are reported or autologous reconstruction offered. However, we do not feel these changes are warranted in our department at this time, as our current policy seems to have resulted in an improving complication profile for the 2013 patient cohort to a level which is felt to be acceptable.

Conclusions

Our data shows that both pre-operative and post-operative XRT are associated with increased complication rates from IBBR, while pre-operative XRT is also associated with increased failure of this form of breast reconstruction. We recommend that patients with a history of previous XRT or a high likelihood of requiring post-operative XRT be counselled regarding the high risk of complications of XRT and IBBR and be steered instead to favour autologous reconstructive options.

Competing interests:

Nil.

Acknowledgements:

The authors would like to thank Newcastle University and the Susan Channon Breast Cancer Trust for their support of author William Malins.

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E-cigarette use in New Zealand—a systematic review and narrative synthesis

Sarah Merry, Christopher Bullen

ABSTRACT

AIM: This study aimed to systematically review the literature on e-cigarette use in New Zealand, focusing on prevalence, rationale for use, perceptions and exposure to the devices.

METHODS: Six databases were systematically searched for articles regarding e-cigarette use in New Zealand, supplemented with a grey literature search. Seven hundred and eighteen abstracts were identified and full text of 100 articles reviewed. Studies addressing prevalence of and rationale for use, perceptions of and exposure to e-cigarettes were included. Relevant data were synthesised in a narrative summary.

RESULTS: Fourteen studies addressed aspects of e-cigarette use in New Zealand, published between 2010 and 2017. Ever-use of e-cigarettes among adults and adolescents has increased, although current use remains low. Smoking strongly predicts use, and ever-use may decrease with age. Investigation of other predictors has been hindered by low prevalence and small samples. While curiosity is commonly cited for sampling e-cigarettes, many smokers are drawn by harm reduction or cessation. More complex motivators are becoming evident. Although exposure to e-cigarettes is common, many remain uncertain about their harm relative to tobacco.

CONCLUSION: While the available evidence provides an overview of current use, exposure and acceptance of e-cigarettes in New Zealand, it highlights knowledge deficits and informs future monitoring.

Electronic cigarettes (e-cigarettes) are a global phenomenon. These diverse devices have surged in popularity since their introduction to the market just over a decade ago.^{1,2} E-cigarettes have, however, been subject to considerable scrutiny from the public health community. Underpinning this is a tension between the devices' promise to assist smoking cessation and harm reduction, and the possibility they may re-normalise smoking and have, as yet unknown, adverse health consequences.³

Currently, e-cigarettes that contain nicotine may not legally be sold in New Zealand, and may only be imported for personal use. Non-nicotine e-cigarettes have occupied a regulatory limbo.⁴ The Ministry of Health announced proposed regulatory changes in March 2017, likely

to take effect in 2018.^{4,5} Legislation would be under an amendment to the Smoke-free Environments Act 1990.⁵ Among a suite of changes, sales of nicotine e-cigarettes are set to be liberalised, reclassified as a consumer product.⁵

The e-cigarette literature is rapidly accumulating. A recent systematic review identified only six primary research articles on e-cigarettes in 2010, soaring to 139 in 2014.⁶ New Zealand has contributed significantly to the global evidence base—national research productivity on the subject ranked fifth globally in bibliometric analysis.⁷ While reviews constitute a considerable proportion of the literature on e-cigarettes, none have addressed the New Zealand context.⁶

Table 1: Databases searched and terms used.

Databases	Search terms
PubMed; Embase; PsycINFO; Scopus; Cochrane Central Register of Controlled Trials; NZResearch Database; Health Improvement and Innovation Resource Centre.	NZ; nicotine AND vap*; e-cig*; electronic cig*; ENDS; Electronic nicotine delivery system*

New Zealand’s unique demography and significant inequities in smoking prevalence mean that international literature is unlikely to be sufficient to direct future policy and practice pertaining to e-cigarettes.⁸ The intention of this review is to summarise the current New Zealand evidence. In doing so, it will serve to deliver a baseline picture of e-cigarette use in New Zealand prior to regulatory change, as well as identifying gaps in the evidence, and the way in which this is collected, to inform future monitoring.

Methods

Design

A systematic review of the New Zealand literature on e-cigarettes was undertaken. Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines were followed where relevant.⁹ Meta-analysis was deemed impracticable. Evidence from included studies was instead synthesised and presented as a narrative summary.

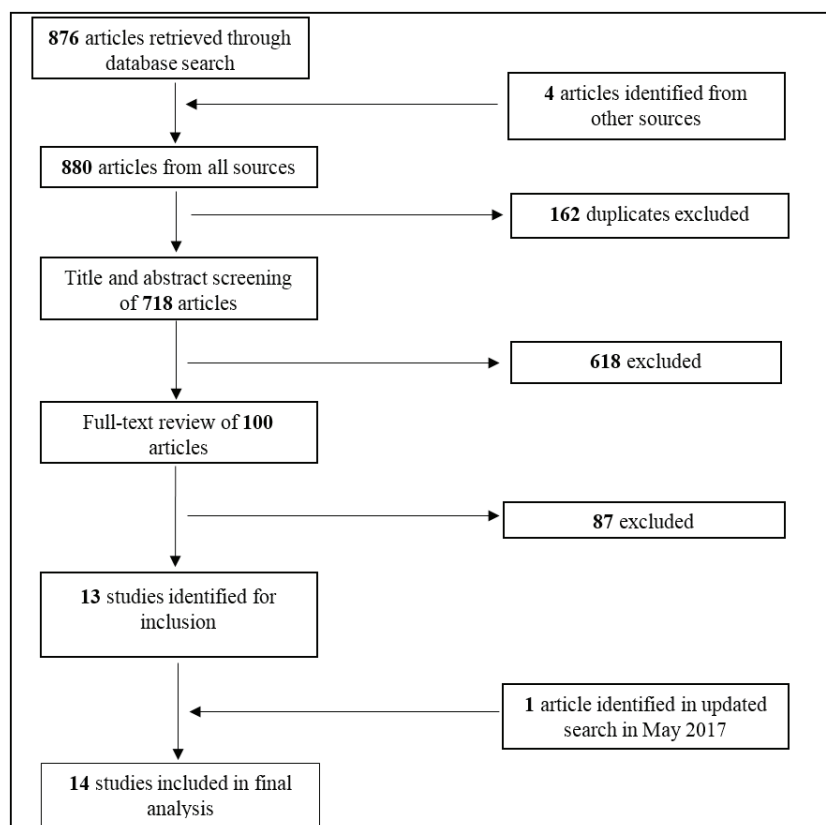
Study acquisition

A systematic search was conducted in February 2017 and updated in May 2017. The search was supplemented through bibliographic and key author review. Search terms were adapted from methodology outlined in the Public Health England report on e-cigarettes.¹⁰ Terms were kept as similar as possible between databases. English language was set as a search limit and only articles published after 2000 were retrieved.

Study selection

Primary research set in New Zealand addressing perceptions and exposure to e-cigarettes, prevalence and reasons for use were eligible for inclusion. Study design was not restricted. Excluded papers were: studies not meeting the inclusion criteria; review articles; opinion/editorial pieces; study protocols; studies set outside New Zealand; and guidelines. Figure 1 illustrates the search process. A report containing early results from the 2016 Health and Lifestyles Survey (HLS) was not included in the analysis due to its preliminary nature; however, we include an account of its results in the discussion.

Figure 1: PRISMA flow diagram.



Data extraction and study quality assessment

The included studies are heterogeneous. Findings of all studies were synthesised. Data relevant to key themes were extracted (summarised in Appendix 1). Studies were assessed against quality appraisal tools, and, where a validated tool was not available, methodological concerns outlined (Appendix 2).

Results

The search yielded 14 eligible studies. Four were published in the *New Zealand Medical Journal*.^{11–14} Another was an electronically published report.¹⁵ The remainder were published in international peer-reviewed journals.^{16–24} Articles were grouped according to whether they addressed perceptions and exposure, prevalence or reasons for use. Some studies apply to multiple categories.

Exposure and perceptions

Nine studies reported on exposure to, and perceptions of, e-cigarettes.^{11–14,16–20} These investigate diverse populations, including smokers,^{11–14,17–20} recent quit-attempters,^{12,13,18} health professionals¹⁴ and children.¹⁶

Exposure to e-cigarettes was assessed in two studies of current smokers and recent quit-attempters. Li and colleagues' study (n=267), using data collected in 2013, explored exposure to e-cigarettes through others' use and advertising.¹⁸ Up to 41% reported exposure to others using e-cigarettes, more among acquaintances than strangers.¹⁸ Recent exposure to e-cigarette advertising was reported by 39–55%.¹⁸ In a study by the same authors using data collected shortly thereafter (n=172), 44% and 48% reported exposure to e-cigarette advertising and use respectively.¹²

Among smokers, e-cigarettes are perceived favourably compared with tobacco. Nicotine e-cigarettes were considered more than 80% as satisfying as cigarettes in two studies.^{17,19} A gender difference was identified, with higher satisfaction ratings among females.¹⁷ Bullen and colleagues' randomised cross-over trial, investigating nicotine uptake and craving relief using e-cigarettes compared with non-nicotine e-cigarettes, regular cigarettes and nicotine inhalator

(n=40), found that nicotine e-cigarettes were favoured as cigarette substitutes compared with a nicotine inhalator and non-nicotine e-cigarette.²⁰

There is public uncertainty about the safety of e-cigarettes. A study reporting data from 2011 (n=840) found that only one-third of respondents (smokers and recent ex-smokers) identified e-cigarettes as safer than tobacco. Non-Māori respondents were more than twice as likely as Māori participants to consider e-cigarette use safer than smoking.¹³ A third of respondents reported that they were unsure.¹³ Qualitative research from Fraser and colleagues found that a poverty of knowledge about e-cigarettes was an emergent theme among both smokers and health professionals.¹⁴ Health professionals expressed concerns about the potential for smoking renormalisation.¹⁴

E-cigarettes are perceived as promising smoking cessation aids. A 2013 study found that 34% of smokers and recent quit-attempters believed e-cigarettes were efficacious in smoking cessation. Over half indicated that they would use e-cigarettes to support cessation, significantly more among younger adults than older.¹³ The appeal to young smokers is corroborated in a study of young-adult smokers who had started smoking after age 18 (n=111), which found that, in 2013, e-cigarettes were the cessation aid most frequently identified for use in a future quit attempt (50%).¹¹ Females were more likely to intend to use e-cigarettes for cessation than males.¹¹ Among smokers and recent quit-attempters, 87–93% agreed that e-cigarettes were for smoking reduction, while 67–71% supported use for complete cessation.¹⁸

One study examined children's perceptions of e-cigarettes.¹⁶ Qualitative research undertaken by Faletau and colleagues, with Māori and Pacific children, found that none of the participants recognised e-cigarettes, raising the possibility that vaping may be misperceived as smoking.¹⁶

One study, published in 2014, canvassed public opinion on e-cigarette regulation.¹⁸ Support for bans on use in indoor areas of pubs, cafes and restaurants, as will be instituted following proposed regulatory change, was relatively low (30–41%).¹⁸

Prevalence

Three studies have estimated the prevalence of e-cigarette use among New Zealand adults.^{13,18,21} Two presented data from the New Zealand Smoking Monitor (NZSM), a survey of current smokers and recent ex-smokers, from 2011 (n=480) and 2013 (n=267).^{13,18} A further study used data from the 2014 HLS (n=2,594), examining prevalence within the general New Zealand population.²¹

Ever-use: Prevalence of ever-use among smokers has increased over the examined period. In 2011, 7% of smokers and recent quit-attempters reported ever purchasing an e-cigarette. Ever-purchase was used as a proxy for ever-use in this study.¹³ In 2013, prevalence of ever-use was higher among those smokers assessed as 'serious quitters' (39%) than those who had no intention of quitting (23%).¹⁸ Between 2% and 6% reported purchasing an e-cigarette in the prior fortnight.¹⁸ In 2014, 13% of participants in the HLS reported ever using an e-cigarette. Fifty percent of smokers reported ever-use, substantially more than never-smokers (3.4%).²¹ Ex-smokers were also more likely to have ever used an e-cigarette than never-smokers, with 8.4% reporting ever-use.²¹

Current use: In 2013, 84–92% of smokers reported no recent e-cigarette use (defined as use in the last fortnight). The prevalence of daily use was low at 2–5%.¹⁸ Less than 1% of respondents in the HLS sample reported current use (use at least monthly).²¹ Among smokers in the study, 4% described current use, with an odds ratio of current e-cigarette use close to 50 compared with never-smokers.²¹

Predictors: As described, smoking is a consistent predictor of e-cigarette use.²¹ Among never-users of e-cigarettes who participated in a follow-up survey of NZSM participants, current smokers had 17-fold higher odds of e-cigarette susceptibility than ex-smokers.¹²

Age appears significant. Younger adults are more likely to have ever used an e-cigarette, while this association seems not to persist for current use. In 2011, those respondents 18–24 years old were over four times more likely to have purchased an e-cigarette than those ≥45 years old.¹³ Three

years later this was again observed, with an inverse relationship identified between age and ever-use. The odds of ever-use among 15–24 year olds were more than seven times that of ≥45 year olds.²¹ Those aged ≥35 years have been found to be significantly less susceptible to e-cigarette use.¹²

In 2011, smokers from high-income households were most likely to have purchased an e-cigarette.¹³ In 2014, a relationship between low deprivation and increased odds of e-cigarette use became non-significant when adjusted for other factors.²¹ However, low household income was associated with susceptibility to e-cigarette use.¹²

The 2011 and 2014 studies also undertook analysis by ethnicity. No significant difference was found between Māori and non-Māori in 2011. When adjusted for other factors, Asian and Pacific respondents had lower odds of e-cigarette ever-use compared with the European/Other group, with no significant difference found between European/Other and Māori groups in 2014.^{13,21}

There are mixed findings with respect to gender. In 2014, gender appeared to be a predictor of current e-cigarette use, although not ever-use, with the odds of current use among males approximately three-fold lower than females.²¹ No association between gender and adult use was found elsewhere.

Adolescents: A 2015 paper presented data from the Youth Insights Survey from 2012 and 2014.²² An earlier 2013 report included results from the 2012 Survey.¹⁵ Use of e-cigarettes among adolescents increased significantly over the two-year period. Ever-use increased from 7% in 2012 to 20% in 2014.^{15,22} Similar prevalence of ever-use was found among 15–17 year olds surveyed in the HLS the same year. However, none reported current use.²¹ No increase in smoking prevalence was noted over the period studied.

Similar to evidence from adult surveys, smoking is an important predictor of e-cigarette use. In 2012, prevalence of reported ever-use among current smokers was 36%, compared with only 2% for non-susceptible never-smokers.¹⁵ In 2014, when more detailed analyses were undertaken, current or ex-smoking remained the most

important predictors of ever-use.²² Higher income and male gender were also significantly associated with use. Neither ethnicity nor school decile status were significant after adjustment. The display of other risk behaviours, such as cannabis use or 'binge' alcohol consumption, was also associated with greater odds of ever-use.²²

The motivation for first trying an e-cigarette among adolescent ever-users differs from the adult pattern. Almost two-thirds of respondents in the Youth Insights Survey cited curiosity, with approximately a quarter reporting peer endorsement.²² Among adolescents who smoke, a small proportion cited smoking cessation or reduction (17% and 18% respectively). Greater numbers, in particular among infrequent smokers, cited harm reduction.²²

Reasons for use

Three studies investigated reasons for e-cigarette use among adults.^{21,23,24} In 2014, HLS participants were asked about their motives for first sampling an e-cigarette.²¹ The article only presented results from smokers and ex-smokers, as prevalence of use among never-smokers was low. Another study, using data collected in 2014 through a follow-up survey from the NZSM, also investigated reasons for initial use (n=93).²³ In both samples, curiosity was most commonly cited. When analysed by e-cigarette use status however, the proportion of non-current users citing curiosity was close to double that of current users in both studies.^{21,23} Smoking cessation was cited by more than a quarter of all ever-users.^{21,23} Smoking reduction was the third-most cited reason in both studies,^{21,23} with current users more likely to want to substitute e-cigarettes for tobacco some of the time than non-current users.²³ Smaller numbers cited wanting to 'smoke' in areas subject to tobacco smoking bans.

Li and colleagues' study of e-cigarette ever-users also investigated the context around first use. Overall, 53% had purchased the first e-cigarette they used. Current users were significantly more likely to have purchased their first e-cigarette (84.2%) than those who did not currently use e-cigarettes (44.6%). More than half of ever-

users first tried an e-cigarette at home, and close to a quarter were in the workplace.²³

Hoek and colleagues' qualitative study of young adult e-cigarette users employed a different approach to examine use.²⁴ Their analysis, which considered the rituals users constructed, identified four key themes. Some users sought to replicate the smoking experience, favouring cigalikes (e-cigarettes designed to be similar in appearance to conventional cigarettes) and finding that e-cigarettes could emulate much of the smoking ritual. Others found e-cigarettes unfulfilling, an unsatisfactory replacement for smoking, with too many aspects of the ritual different. Some sought to actively differentiate themselves from smokers, using mods and valuing customisation opportunities. Generally, those users who were non-smokers used the devices to facilitate social connection, particularly with smoker peers.²⁴

Discussion

An increasing number of New Zealand adults report ever using an e-cigarette,^{13,18,21} but the proportion reporting current use is low.^{18,21} Prevalence among smokers is considerably greater than among never-smokers, with ex-smokers falling in-between.^{13,18,21} Among adolescents, ever-use has increased markedly, predominantly among current and infrequent smokers.²² Preliminary findings from the 2016 HLS indicate ever-use among adults has increased, rising to 17%. However, current use remains uncommon—less than 2% report at least monthly use.²⁵

Data on e-cigarette use in New Zealand are collected through five population-based surveys (Table 2). E-cigarette data have only been published from three, with the presented epidemiological evidence sourced from a small number of studies. Most evidence addressing adult use comes from current smokers or recent ex-smokers, with only one published study investigating use in the general New Zealand adult population. While the prevalence of e-cigarette use among smokers and ex-smokers is higher than among non-smokers, both locally and internationally, understanding use among never-smokers is important.^{1,2}

Table 2: Population-based surveys investigating e-cigarette use in New Zealand.

Survey	Frequency	Age group
New Zealand Health Survey	Continuous	Children and adults
Health and Lifestyles Survey	Biennial	≥15 years old
New Zealand Smoking Monitor	Fortnightly	≥18 years old
Youth Insights Survey	Biennial	Year 10 students
ASH Year 10 Snapshot Survey	Annual	Year 10 students

The included studies, while heterogeneous, generally used high-quality statistical analyses, but most were limited by small numbers. Those measuring perceptions and exposure tended to be limited by small sample size, while meaningful subgroup analysis of those addressing prevalence were limited by the low prevalence of regular use. Further limitations are detailed in Appendix 2.

Questions addressing prevalence have been inconsistent, between and within surveys. This impacts estimates of use. In 2011, ever-purchase was a proxy for ever-use in a NZSM sample.¹³ Considering the 2014 finding from the same survey suggesting that almost half the ever-users did not own the device they first tried, this likely underestimated use.²³ Trends are thus difficult to interpret, as subsequent surveys asked explicitly about use. Similarly, current use was defined in one study as use in the last fortnight,¹⁸ while in another it was at least monthly use.²¹ Caution, therefore, must be exercised in making direct comparisons to assess national trends or contrast with international examples. Recent expert recommendations suggest classifying frequency more specifically, and emphasise the need for consistency between surveys.²⁶

Obtaining prevalence data on current e-cigarette use among adolescents is important. Given high numbers reporting curiosity as the reason for first use, ever-use may reflect experimentation and sensation-seeking. Some evidence suggests a relationship between frequency of use and future smoking risk.²⁷ Adolescents who have occasionally tried e-cigarettes are less likely to initiate smoking than those who report weekly use.²⁷

Under proposed regulations, nicotine e-cigarettes may be legally sold in New Zealand. There are no published New Zealand estimates of nicotine e-cigarette use. According to 2016 HLS preliminary data, approximately two-thirds of adults who use e-cigarettes at least monthly use a device containing nicotine.²⁵ However, there is no available evidence about the use of nicotine e-cigarettes in adolescents, or infrequent users. This will become increasingly relevant as these devices become more readily available.

The proportion of smokers and recent quit-attempters reporting exposure to e-cigarette advertising was high.¹⁸ Exposure to advertising increases odds of e-cigarette use among adolescents and young adults.^{28,29} Further research into adolescents' and non-smokers' exposure to advertising would thus be valuable, particularly to support policy development around advertising restrictions.

There are limited and conflicting data regarding predictors of e-cigarette use (aside from smoking), including across socioeconomic gradients and by ethnicity. In part, this is a consequence of small sample sizes and low prevalence of use. Further, the evidence regarding use in priority populations including Māori, Pacific Peoples, pregnant women and those with mental illness is inadequate. These groups have very high smoking rates and are underserved by current cessation services.^{8,30} Understanding e-cigarette use may serve to inform responsive service delivery.

New Zealand smokers and recent ex-smokers generally have a favourable view of e-cigarettes as a potential cessation tool. The use of e-cigarettes in cessation

attempts has not, however, been detailed. Further, many New Zealanders are uncertain about the relative harms of e-cigarettes compared with tobacco. Preliminary HLS findings in 2016 suggest that fewer than half the respondents correctly identified e-cigarettes as safer than tobacco.²⁵ This should be considered in future health promotion campaigns.

While curiosity is the most common rationale for ever-use, both among adults and adolescents, those who are considered 'current users' of e-cigarettes are likely to cite smoking cessation or harm reduction. There is, however, emerging evidence from qualitative research of more nuanced reasons for use, revealing rituals valued in a developing subculture.

Monitoring e-cigarette use, increasingly important given regulatory change, could be undertaken within the remit of current population-based surveys. Tobacco use is already comprehensively monitored, and co-option of these established surveys is a straightforward approach. Standardised measures of use, including prevalence, patterns of use and associated cigarette smoking, will be crucial. Future monitoring should seek

to adequately represent priority population groups, employing an equity focus.

Limitations

This review has several limitations. A single author undertook the screening and data extraction process, a possible source of bias. Findings are presented narratively, rather than quantitatively synthesised, due to small numbers and study heterogeneity. The study quality varied, and findings should thus be interpreted with caution. Lastly, the rapid increase in popularity of e-cigarettes means that these findings may already no longer accurately reflect e-cigarette use in New Zealand.

Conclusion

This review is the first to gather and synthesise the growing body of New Zealand literature on e-cigarettes. New Zealand research, published and ongoing, contributes significantly to the international evidence base on e-cigarettes. Further research should continue to examine epidemiological trends, in particular, use patterns among priority populations.

Appendix 1: Study table.

First author and study design	What was being investigated?	Study population	Participants	Relevant findings
Bullen (2010) ¹⁰ Randomised cross-over trial	Short-term effects of a nicotine e-cigarette (16mg) on withdrawal symptoms, desire to smoke and adverse effects. Also investigated acceptability and pharmacokinetic properties. Controls were e-cigarette without nicotine, nicotine inhalator and usual cigarette.	Adult smokers in Auckland	40	Pleasantness rating for nicotine e-cigarette 1.49 units (95%CI 0.23–2.74, p=0.016) higher than nicotine inhalator. Lower embarrassment associated with e-cigarette use than inhalator. Fifty-eight percent reported nicotine e-cigarette as preference for future smoking cessation (vs 25% for the inhalator).
Fraser (2016) ¹⁴ Focus groups and semi-structured interviews	Views on e-cigarettes.	Health professionals and smokers in Wellington, Otago and Southland	28	Key themes included limited knowledge about e-cigarettes, perception of reduced harm compared with smoking, and potential as a cessation aid. Concerns included renormalisation of smoking and persistent addiction.
Faletau (2013) ¹⁶ Focus groups and interviews	Whether children can differentiate between conventional tobacco smoking and novel devices (e-cigarette and nicotine inhaler).	Māori and Pacific 6–10 year-old students at two Auckland primary schools	20	Nicotine inhaler and e-cigarette not recognised by children—thus might be incorrectly perceived as tobacco smoking. Most children supportive of e-cigarettes for cessation.
Grace (2015) ¹⁷ Survey	Gender differences in satisfaction ratings for nicotine e-cigarettes and usual brand tobacco. A repeat sample examined change in smoking behaviour and cessation rates.	Adult smokers and never-users of e-cigarettes, in Auckland, Wellington, Christchurch and Dunedin	357 (227 in Wave 2)	Satisfaction rating for e-cigarettes—83.3% of that for own brand tobacco. Females reported significantly greater satisfaction ratings for e-cigarettes than males (p<0.0001).
Grace (2015) ¹⁹ Experiment	Cross-price elasticity of e-cigarettes for usual tobacco cigarettes. Favourability of e-cigarettes compared with own tobacco also assessed.	Adult smokers in Auckland, Wellington, Christchurch and Dunedin	210	Favourability: E-cigarettes rated 81.6% as highly as own tobacco.
Guiney (2015) ¹¹ Survey	Identifying barriers to smoking cessation among young adults who started smoking at ≥18 years old. Also explored future intentions.	New Zealand Smoking Monitor—smokers and recent ex-smokers	111	E-cigarettes the most common intended cessation aid (50%). No statistically significant variation by age-group or gender.
Hoek (2017) ²⁴ Semi-structured interviews	Perceived psychosocial benefits of e-cigarette use and the role of e-cigarettes in replacing or replicating smoking rituals.	Young adult e-cigarette users in Dunedin	16	Different types of e-cigarettes used for varied purposes. Some sought to recreate smoking experience (cigalikes preferred), others privileged process of technical creation (mods). Non-smokers used e-cigarettes to connect with smoking peers. Ex-smokers missed certain aspects of smoking, including the finite nature of a smoked cigarette.

Appendix 1: Study table (continued).

Li (2013) ¹³ Survey	Current and recent ex-smokers' use and perceptions of e-cigarettes. Two sets of questions added to survey at different times.	New Zealand Smoking Monitor	840 (480 Set One; 360 Set Two)	<p><u>Ever-purchase:</u> Reported by 7%. More likely in 18–24yr group than in ≥45yr group (OR 4.36; 95%CI 1.17–16.16). More likely in high-income households than in low/medium income.</p> <p><u>Perceived safety:</u> Thirty-three percent felt e-cigarettes safer than tobacco cigarettes (non-Māori more than Māori, OR 2.16; 95%CI 1.16–4.03).</p> <p><u>Use for cessation:</u> Thirty-four percent felt e-cigarettes could be used for cessation. High income and ≥45yrs more likely to agree that could be used for cessation. Fifty-eight percent would use to quit, more likely among 18–24yrs than ≥45yrs (OR 3.37 95%CI 1.17–9.69).</p> <p>Forty-one percent agreed would change to e-cigarettes from tobacco if cheaper, OR 2.98; 95%CI 1.51–5.88 for low income compared with high.</p>
Li (2014) ¹⁸ Survey	Exposure to e-cigarettes and e-cigarette advertising, and use and perceptions of these.	New Zealand Smoking Monitor—current and recent ex-smokers	267	<p><u>Ever-use:</u> Twenty-three to 39% report ever-use of e-cigarettes, most among serious quitters.</p> <p><u>Recent use:</u> Eight to 16% report use in the last fortnight, with 2–5% daily. Most use among recent quit attempters, but small numbers.</p> <p><u>Exposure:</u> In prior fortnight, 45% reported exposure to e-cigarette advertising. Exposure to e-cigarette use was lower among those aged 18–34yrs than ≥35yrs (AOR 0.42; 95%CI 0.21–0.83). Recent quit-attempters more likely to be exposed to e-cigarettes than non-attempters (AOR 2.52; 95%CI 1.25–5.05).</p> <p><u>Perceptions:</u> Thirty to 41% agreed with bans on use in indoor public spaces. Sixty-six to 72% agree that e-cigarettes are for complete cessation, 87–93% agree that they are for those who want to reduce tobacco consumption.</p>
Li (2015) ¹² Survey	Potential susceptibility to e-cigarette use.	New Zealand Smoking Monitor. Smokers and recent ex-smokers who had never used e-cigarettes	172	<p>Fifty-three percent classified as unsusceptible (unlikely or very unlikely to try if offered). Sixty-three percent current smokers were considered susceptible vs 20% ex-smokers. (AOR 17.23; 95%CI 5.58–53.27).</p> <p>Adults ≥35yrs less susceptible than younger. Low income and trade certificate/diploma qualification more susceptible than high income and no formal qualification respectively (AOR 5.25; 95%CI 1.41–19.57 and 7.14; 95%CI 1.28–39.75 respectively).</p>

Appendix 1: Study table (continued).

Li (2015) ²¹ Survey	Ever-use and current use of e-cigarettes in adults ≥15yrs Also identifies reasons for use and e-cigarette brand recall.	Health and Life-styles Survey	2,594	<p>Ever-use: Reported by 13%. Compared with ≥45yrs, 15–17yrs and 18–24yrs were more likely to report use. AORs 7.53; 95%CI 1.03–54.96 and 7.28; 95%CI 3.28–16.19 respectively. Compared with never smokers, current smokers had AOR 33.5; 95%CI 16.25–69.12 of ever-use, and ex-smoker had AOR 95%CI 3.11 (1.40–6.88).</p> <p>Current use: 0.8% report use at least monthly. Higher among current smokers (AOR 49.08; 95%CI 2.48–970.87) than never-smokers.</p> <p>Reason for first use: Fifty-seven percent report curiosity as reason for first use, with 31% for smoking cessation and 8% for reduction. Current e-cigarette users more likely to report smoking cessation/reduction however, with curiosity only 15%.</p> <p>Brand recall: Poor brand recall among ever-users, with 57.8% not able to remember the brand they tried.</p>
Li (2016) ²³ Survey	Identifying information around first use of an e-cigarette, including setting, e-cigarette ownership and reason for use.	New Zealand Smoking Monitor (follow-up group)	93	Fifty-three percent owned first e-cigarette tried. Fifty-five percent tried at home, 24% in the workplace. Most common reason for trying was curiosity (45%), followed by desire for complete cessation (25%) and smoking reduction (17%).
White (2013) ¹⁵ Survey	Prevalence of ever-use of e-cigarettes in adolescents.	Youth Insights Survey	3,143	Ever-use: Seven percent report ever-use of e-cigarettes. Highest rates among current smokers (36%) and experimental or ex-smokers (13%) compared with never smokers (2%).
White (2015) ²² Survey	Change in prevalence of ever-use of e-cigarettes among adolescents. Reasons for first use investigated in 2014 survey.	Youth Insights Survey	3,127 (2012) 2,919 (2014)	<p>Ever-use: E-cigarette ever-use increased from 7% to 20%. Highest rates among current smokers (64.7%), reducing to 6.1% among non-susceptible never smokers (AOR 4.56; 95%CI 2.20–9.43). More likely if display other risk behaviours.</p> <p>Reasons for use: 64.5% identify curiosity as reason for first trying, then recommendation from a friend 24.2%. Of current smokers, curiosity still most common. 16.6% used for cessation and 18.4% for reduction.</p>

Appendix 2: Quality appraisal.**Qualitative studies**

Quality appraisal of qualitative studies in this review undertaken using the Critical Skills Appraisal Programme criteria. The results are summarised below.

Criteria	Fraser et al (2016) ¹⁴	Faletau et al (2013) ¹⁶	Hoek et al (2017) ²⁴
Was there a clear statement of the aims of the research?	Y	Y	Y
Is a qualitative methodology appropriate?	Y	Y	Y
Was the research design appropriate to address the aims of the research?	Y	Y	Y
Was the recruitment strategy appropriate to the aims of the research?	?	Y	Y
Was the data collected in a way that addressed the research issue?	Y	Y	Y
Has the relationship between researcher and participants been adequately considered?	?	?	?
Have ethical issues been taken into consideration?	Y	Y	Y
Was the data analysis sufficiently rigorous?	?	?	Y
Is there a clear statement of findings?	Y	Y	Y
How valuable is the research?	?	Y	Y

Y= yes; N= no; ?= unclear.

Randomised controlled trials

Assessment of the randomised crossover trial included in the review was undertaken using the Joanna Briggs Institute RCT appraisal tool.

Criteria	Bullen et al (2010) ²⁰
Was true randomisation used for assignment of participants to treatment groups?	Y
Was allocation to treatment groups concealed?	N
Were treatment groups similar at the baseline?	N/A
Were participants blind to treatment assignment?	N
Were those delivering treatment blind to treatment assignment?	N/A
Were outcomes assessors blind to treatment assignment?	?
Were treatments groups treated identically other than the intervention of interest?	N
Was follow-up complete, and if not, were strategies to address incomplete follow-up utilised?	N
Were participants analysed in the groups to which they were randomised?	Y
Were outcomes measured in the same way for treatment groups?	Y
Were outcomes measured in a reliable way?	Y
Was appropriate statistical analysis used?	Y
Was the trial design appropriate, and any deviations from the standard RCT design accounted for in the conduct and analysis of the trial?	Y

Y= yes; N=no; ?=unclear; N/A= not applicable.

Cross-sectional studies

Quality appraisal for cross-sectional studies in this analysis undertaken using the Joanna Briggs Institute tool validated for use in prevalence studies.

Criteria	Grace et al (2015) ¹⁷	Guiney et al (2015) ¹¹	Li et al (2013) ¹³	Li et al (2014) ¹⁴	Li et al (2015) ¹²	Li et al (2015) ²¹	Li et al (2016) ²³	White (2013) ¹⁵	White et al (2015) ²²
Was the sample frame appropriate to address the target population?	N	N	Y	Y	Y	Y	Y	Y	Y
Were study participants sampled in an appropriate way?	?	N	Y	Y	Y	Y	Y	Y	Y
Was the sample size adequate?	Y	N	?	?	?	Y	N	Y	Y
Were the study subjects and the setting described in detail?	Y	?	Y	Y	N	Y	N	Y	Y
Was the data analysis conducted with sufficient coverage of the identified sample?	N/A	?	?	?	?	?	?	?	?
Were valid methods used for the identification of the condition?*	Y	Y	N	Y	Y	Y	Y	Y	Y
Was the condition measured in a standard, reliable way for all participants?	Y	Y	Y	Y	Y	Y	Y	Y	Y
Was there appropriate statistical analysis?	Y	Y	Y	Y	?	Y	Y	Y	Y
Was the response rate adequate, and if not, was the low response rate managed appropriately?	N/A	?	?	?	Y	Y	Y	Y	Y

Y=yes N=no ?=unclear N/A=not applicable.

*Not from peer-reviewed publication.

**All studies rely on self-reporting, which while the standard means by which use of e-cigarettes is determined, is vulnerable to misreporting.

Other studies

No validated tool available, so potential limitations are enumerated.

Study	Potential limitations
Grace et al (2015) ¹⁹	<ul style="list-style-type: none"> • Small sample • Participants first introduced to e-cigarettes at time of purchase task, so may influence e-cigarette desirability • Simulated demand, without external factors, is not a clear reflection of actual behaviour • Only a short-run measure, unclear what long-term effects may be

Competing interests:

Nil.

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Ethnic- and sex-related differences in pain characteristics, psychological distress and pain-related disability in patients attending a New Zealand teaching hospital pain service

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ABSTRACT

AIM: The aim of the present observational study was to provide a description of the demographic, psychological and pain characteristics of patients attending the Waitemata Pain Services (WPS), Auckland, New Zealand.

METHOD: Data were collected via a comprehensive paper-pencil questionnaire handed out to 798 consecutive new patients seen at the WPS over a four-year period.

RESULTS: 32.3% attending the WPS were men and 67.7% women, with a mean age of 52.1 years. 65.7% of patients were New Zealand Europeans, followed by 19.1% other Europeans, 5.7% Asians, 3.9% Māori, 2.8% Middle Eastern/Latin/Africans and 2.7% Pacific Islanders. Patients reported an average of 2.6 visits to the GP before presenting to the unit. Average pain duration was seven years and seven months. Women reported a significantly higher number of pain sites in the whole body, as well as in the left and right side of the body compared to men ($p < 0.0001$ for all). Highest interference due to pain was found for *enjoyment of life*. Men and women further differed in a range of psycho-behavioural variables, with women reporting less psychological distress and depression but more stress compared to men ($p < 0.05$ for all). Men showed higher levels of kinesiophobia ($p < 0.005$) and less pain acceptance and pain willingness ($p < 0.05$ for both). Cross-cultural comparison found Māori patients reported highest pain levels, highest number of pain sites, highest pain interference, as well as highest levels of psychological distress, depression, stress and anxiety compared to all other ethnicities. Lowest pain severity was reported for New Zealand European patients and lowest interference due to pain for Pacific Islanders. While Middle Eastern/Latin/African patients showed highest levels of kinesiophobia, Pacific Islanders had the highest tendencies to catastrophise about their pain.

CONCLUSION: There are important sex- and ethnicity-related differences in the clinical presentation of chronic pain patients attending a large, hospital-based New Zealand pain service. While service provision can be based on generalised guidelines, specific interventions should be informed by important demographic and cultural variables. Studies are needed to identify strategies to improve service delivery in subgroups of the population who may be undertreated or lack access to appropriate interventions.

Chronic pain is recognised as pain that persists past normal healing time and is usually regarded as chronic when it lasts more than three to six months.^{1,2} Worldwide prevalences are estimated at around 20%,³ with patterns of chronic pain in New Zealand being similar to those found internationally. According to data from the 2006/07 New Zealand Health Survey, one in six (16.9%) New Zealanders report chronic pain.⁴ In this particular survey, Pacific and Asian peoples had much lower odds of reporting chronic pain compared with New Zealand Europeans or ‘other’ ethnicities. This is not surprising, given that ethno-cultural variables have long been known to play a significant role not only in pain perception and expression, but also in treatment outcomes.^{5–7} Similarly, female sex has emerged as an important factor with women showing considerable differences compared to men in pain perception,⁸ as well as in reporting of pain and in the use of healthcare services.⁹ A previous New Zealand study from a large tertiary center did not identify any association between sex and ethnicity with respect to pain severity, duration, psychological factors and pain-related disability.¹⁰ However, all non-European ethnicities were collapsed into a single group, which may explain the lack of differences observed. In this regard, each ethnicity likely has its own unique beliefs and values that may lead to differences in the way individuals understand and cope with their pain. Furthermore, there are known geographical variations in ethnicity and other socio-demographic factors across New Zealand. As such, Shipton et al’s findings may not be representative of all populations in the New Zealand setting.

Overall, chronic pain accounts for a substantial proportion of physician visits as most patients are attended to in the community by their general practitioners (GP). Internationally, pain has been reported in 50% of all presentations to primary care, with 40% of these patients reporting persistent pain with important psychosocial consequences.¹¹ In many cases, primary care offers the potential to address all aspects of chronic pain, however in other cases, specialised treatment programmes are needed to restore and improve an individual’s quality of life. The Waitemata Pain Services (WPS) offer such a programme.

In a multidisciplinary setting consisting of pain physicians, a health psychologist, a clinical nurse specialist and physiotherapists, patients with chronic pain are taught how to manage their pain better by learning different ways of thinking and acting so that pain interferes less with life. The model of care is based on a self-management approach that requires an individual and their family/*whānau* to play an active role in the pain management process and that emphasises an improvement in quality of life and function, rather than an absolute cure. This may be an activity-focused intervention, mindfulness-based pain response workshop, medical review, nurse-led sleep clinic or combination of interventions. Patients seen in specialty pain clinics such as the WPS tend to have higher levels of functional impairment and psychosocial difficulties as they often present after years of suffering from chronic pain. They might therefore not be representative of other pain populations presenting to the GP or to other physicians.^{12,13}

The objective of the present study was to outline the demographic distribution and pain characteristics of patients presenting to a large public hospital-based pain clinic in Waitemata District Health Board (WDHB)—New Zealand’s largest district health board—and explore sex- and ethnicity-related differences in clinical presentation. A better understanding of the socio-demographic background of the patients utilising the service and the prevalence of pain-related problems they present with (eg, pain-related disability, depression, anxiety) might lead to improvements in resource allocation and in the design and delivery of more targeted, effective and culturally responsive interventions.

Method

Population

Data were collected from a consecutive series of baseline questionnaires completed by patients ($N=798$) referred to the WPS at WDHB, Auckland, New Zealand, over the course of four years (from 2012 to 2015). The WDHB provides hospital and community services from North Shore and Waitakere hospitals and from 30 community sites throughout the district. With more than 597,510 people, it is the largest and fastest growing New Zealand

DHB by population (60% European/New Zealand, 18% Asian, 10% Māori, 10% Pacific peoples). (<http://www.health.govt.nz/new-zealand-health-system/my-dhb/waitemata-dhb>).

Demographic information of the patients such as age, sex and ethnicity was extracted from the hospital medical records. Clinical information was provided by the patients presenting at WPS via a comprehensive paper-pencil intake questionnaire completed just prior to the time of first consultation. This questionnaire helps the clinicians in the service understand key issues affecting each patient, guide the choice of treatment pathway, and allows the evaluation of individual patient outcomes following intervention(s). The comprehensive questionnaire consists of a total of eight standardised questionnaires (for a more detailed description see the Material section) and supplementary information on demographics, employment status, health care utilisation and medication use. Additional information was obtained from a detailed neuromusculoskeletal examination and, in some cases, from clinical follow-up visits. Ethnicities were classified based on the New Zealand Ministry of Health ethnicity code table (ie, New Zealand Europeans, other European, Māori, Pacific People, Asian, Middle Eastern/ Latin/African). Data collection and analysis was approved by the Awhina Research & Knowledge Centre (RM13452).

Material

Information on pain duration and intensity was collected using self-constructed questions asking “How long have you had your pain?” (in months) and “How severe is your pain?” (responded to on a 0 *no pain* to 10 *worst pain you can imagine* scale). Number of pain sites was assessed using a mannequin composed of a 31 region coding frame on which patients were asked to “shade the areas where you experience pain”.

Information on pain catastrophising was collected using the ‘Pain Catastrophising Scale’ (PCS).^{14,15} Pain catastrophising has emerged as one of the most robust psychological predictors of adverse pain outcomes and has been repeatedly associated with increased sensitivity to pain, increased risk

of persistent pain, heightened pain intensity and severity, increased disability and higher levels of psychological distress and depressive symptoms.^{16–19} In the PCS, participants are asked to reflect on past painful experiences and to indicate the degree to which they had certain thoughts or feelings when experiencing pain. Response options for the 13 items are on a five-point Likert-type scale ranging from (0) *not at all* to (4) *all the time*. A total score, as well as three subscales scores (for rumination, magnification and helplessness) may be computed by summing the item scores. The PCS has been shown to have good psychometric properties and adequate internal consistency.^{14,15} Cronbach’s alpha in our study was 0.95 for the whole questionnaire, 0.92 for helplessness, 0.80 for magnification and 0.91 for rumination.

The 10-item Pain Self-Efficacy Questionnaire (PSEQ) was used to measure pain self-efficacy, indicating the confidence chronic pain patients have in performing activities while in pain. Low pain self-efficacy is a predictor of long-term disability and depression.²⁰ In general, higher self-efficacy appears to enhance and maintain the long-term effects of rehabilitation.¹⁸ The PSEQ covers a range of functions (eg, household chores, socialising). Participants are asked to rate how confidently they can perform the activities described, at present, despite their pain on a seven-point Likert scale (0 = *not at all confident* and 6 = *completely confident*). A total score, ranging from 0 to 60 can be calculated by adding the scores for each item. Higher scores reflect stronger self-efficacy beliefs. The measure has shown excellent psychometric properties.²¹ Cronbach’s alpha in our study was 0.95.

Depression, anxiety and stress were assessed using the short version of the Depressive, Anxiety and Stress Scale (the DASS-21).²² The 21-item self-report questionnaire measures negative affect based on the three main symptoms of depression, anxiety (eg, psychological stimulation) and stress (eg, cognitive reconstruction). Response options are on a four-point scale ranging from (0) *not valid for me* to (4) *especially valid for me*. Cronbach’s alpha in our study was 0.99 for the entire questionnaire, 0.96 for stress, 0.99 for depression and 0.99 for anxiety.

To assess the severity of pain and the impact of pain on daily functions in the past 24 hours or the past week, the Brief Pain Inventory (BPI) was used.²³ The questionnaire is composed of pain drawing diagrams, four items about pain intensity (worst pain, least pain, average pain, pain right now), two items on pain relief treatment or medication, and one item on pain interference, with seven sub-items (general activity, mood, walking ability, normal walk, relations with other people, sleep and enjoyment of life). Two main scores can be generated by adding the corresponding items: a pain severity score and a pain interference score. Each item is rated from (0) *no pain* to (10) *pain as bad as you can imagine*. The BPI has shown good psychometric properties (including internal consistency, test-retest reliability and construct validity).^{24,25} Cronbach's alpha in our study was 0.92.

The Short Form McGill Questionnaire 2 (SF-MPQ 2) provides valuable information on the sensory, affective and evaluative dimensions of the pain experience.²⁶ The 22 questionnaire items are rated on an intensity scale from (0) none to (10) worst possible. A total score can be calculated by summing all items, which can be further divided into four pain quality subscales of "continuous", "intermittent", "neuropathic" and "affective" pain. The reliability and validity of this scale has been established.²⁷ Cronbach's alpha in our study was 0.95.

The self-report Pittsburgh Sleep Quality Index (PSQI) was used to assess sleep quality over a one-month time interval.²⁸ The 19 items can be summarised into seven components that produce one global score. These components include subjective sleep quality, sleep latency (ie, how long it takes to fall asleep), sleep duration, habitual sleep efficiency (ie, the percentage of time in bed that one is asleep), sleep disturbances, use of sleeping medication and daytime dysfunction. Response options for each item are on a 0–3 interval scale with higher scores indicating poorer sleep quality. The questionnaire has been used in many settings, including research and clinical activities, and has been used in the diagnosis of sleep disorders. The PSQI has shown favorable psychometric properties and has been cross-validated in numerous populations.²⁹

The Tampa Scale for Kinesiophobia (TSK) is one of the most frequently employed

measures to assess fear of movement/(re) injury and has been applied to various pain conditions such as chronic low back pain³⁰ or fibromyalgia.³¹ In the present study, the shorter version consisting of 11 items was used (TSK-11).³² Each item is scored on a four-point Likert-type scale. Scoring possibilities range from (1) *strongly disagree* to (4) *strongly agree*. Sample items are, for example: "I'm afraid that I might injure myself if I exercise" or "My body is telling me I have something dangerously wrong". The psychometric properties of the scale are comparable to those of the original TSK with good internal consistencies, test-retest reliability, responsiveness and concurrent validity and predictive validity.³² Cronbach's alpha in our study was 0.96.

The 20-item self-report Chronic Pain Acceptance Questionnaire (CPAQ) was applied for the measurement of acceptance of pain.³³ Acceptance of pain is thought to reduce unsuccessful attempts to avoid or control pain and thus focus on engaging in valued activities and pursuing meaningful goals. Factor analyses of the original measure identified two subscales: Activity engagement (sample item: "I am getting on with the business of living no matter what my level of pain is") and pain willingness (sample item: I would gladly sacrifice important things in my life to control this pain better). All items are scored on a seven-point scale ranging from (0) *never true* to (6) *always true*. Subscale scores, as well as a total score can be computed by adding the respective items together. Higher scores indicate higher levels of acceptance. The CPAQ has shown excellent psychometric properties.³⁴ Cronbach's alpha in our study was 0.99 for the entire questionnaire and 0.99 for both subscales.

Pain Disability Index (PDI)

The Pain Disability Index (PDI) is a brief instrument developed to assess self-reported, pain-related disability across seven areas of life activity: family/home, recreation, social, occupation, sexual, self-care, life-support and average.³⁵ Participants use a 0 (no disability) to 10 (total disability) numeric rating scale to rate the degree of impairment. A German version of the PDI has been developed by Dillman and colleagues (1994), which showed good internal consistency of the overall score ($\alpha=.86$) and sufficient validity.

Statistical analyses

Data handling and all statistical analyses were undertaken using SPSS 24.0 (IBM Corp, Armonk, NY, USA) and STATA 14 (StataCorp LP, College Station, TX, USA). Owing to deviation from the normal distribution of most variables, non-parametric statistical methods were chosen for all analyses. Ordinal scaled variables were treated in a continuous manner. For all analyses, a P value less than 0.05 was considered statistically significant, unless stated otherwise. For descriptive statistics, chi-square tests were used to assess differences between sex and across ethnicities on categorical and binary data. Mann–Whitney tests were conducted to assess differences between

men and women on the continuous variables. Univariate Kruskal–Wallis analyses (nonparametric test, equivalent to ANOVA) were calculated to compare differences between ethnic groups.

Results

Socio-demographic characteristics

Over the four-year period, data from a total of 798 new patients were collected, consisting of 258 (32.3%) men and 540 (67.7%) women. Socio-demographic and pain characteristics of the overall sample and by sex are summarised in Tables 1 and 2. The mean age of patients attending the WPS was 52.1 years. The majority of men (39.1%) and women (41.8%) were currently

Table 1: Descriptive statistics for categorical variables between men and women in the total sample of new patients presenting to the WDH B Pain Management Unit (N=798).

	Overall sample (n=798)		Males (n=258)		Females (n=540)		Chi-square ^a	p value
	N	%	N	%	N	%		
Ethnicity							3.52	.741
<i>NZ European/Pakeha</i>	510	65.72	158	64.97	352	66.54		
<i>Other European</i>	148	19.07	49	19.84	99	18.71		
<i>Māori</i>	30	3.87	9	3.64	21	3.97		
<i>All Pacific</i>	21	2.71	10	4.05	11	2.08		
<i>Asian</i>	44	5.67	15	6.07	29	5.48		
<i>Middle Eastern/Latin/African</i>	22	2.84	6	2.43	16	3.02		
<i>Other</i>	1	.129	0	0	1	.19		
Work status							2.89	.576
<i>Retired</i>	88	13.17	33	14.67	54	12.27		
<i>Currently working/studying</i>	274	41.02	88	39.11	184	41.81		
<i>Returning to work</i>	38	5.69	15	6.67	23	5.22		
<i>Intending to return</i>	152	22.75	55	24.44	97	22.05		
<i>Not intending to return</i>	116	17.37	34	15.11	82	18.64		
Financial assistance							5.89	.207
<i>WINZ benefit</i>	227	34.76	81	37.85	146	33.49		
<i>ACC weekly compensation</i>	14	2.14	7	3.27	7	1.60		
<i>Superannuation</i>	163	24.96	52	24.30	110	25.23		
<i>Private insurance payments</i>	1	.15	1	.47	0	0		
<i>No financial assistance</i>	248	37.98	73	34.1	173	39.68		

* $p < .05$, ** $p < .001$.

^aPearson Chi-square test for mean differences.

working/studying or returning/intending to return to work (28.4%), whereas the minority 17.4% of the overall sample had no intentions to return to work (Table 1). Patients reported on average 2.6 visits to the GP and/or two visits to a health professional, but only one visit to a medical specialist or an alternative health practitioner in the six months prior to attending the Pain Services. In terms of financial assistance, around a third reported WINZ (Work and Income New Zealand) benefits (34.8%) followed by superannuation (24.9%). 37.9% reported no financial assistance. Overall, men and women did not differ in terms of any of the assessed socio-demographic variables.

Pain characteristics and pain-related disability

Patients reported an average pain duration of seven years and seven months (Table 2), ranging from two months to 65

years (SD 104.9). Based on a 10-point scale, average lowest pain was 3.9 and highest pain 8.1. Usual and current pain was 5.8 and 5.9, respectively. While not different in terms of pain duration and intensity, men and women differed significantly in the number of pain sites, with women reporting a higher number of pain sites in the whole body ($p < 0.0001$), as well as in the left ($p < 0.001$) and right ($p < 0.0001$) side of the body (Table 2). In terms of interference due to pain as assessed by the BPI, the highest interference was reported for *enjoyment of life* (6.8), closely followed by *normal work* (6.8) and the lowest for *walking ability* (5.6). For the PDI, interference was highest in the domain of *recreation* (7.0) and *occupation* (6.7), and lowest for *self-care* (4.2). No sex differences could be detected for any of the assessed domains apart from *enjoyment of life*, with men reporting a greater restriction compared to women (7.2 vs 6.6.; $p = 0.05$).

Table 2: Descriptive statistics for continuous variables between men and women in the total sample of new patients presenting to the Waitemata Pain Services ($n = 798$).

	Overall ($n = 798$)			Males ($n = 258$)			Females ($n = 540$)			p value ^a
	N	Mean	SD	N	Mean	SD	N	Mean	SD	
Age	783	52.11	17.41	255	52.38	16.48	527	52.01	17.86	.824
Frequency of visits to										
GP/Family doctor(s)	666	2.63	2.59	224	2.54	2.44	441	2.68	2.67	.544
Medical specialist(s)	619	.93	1.71	201	.85	1.15	415	.95	1.93	.888
Health professionals	588	2.00	4.45	198	1.43	2.84	387	2.30	5.07	.799
Alternative professionals	588	.96	2.47	191	1.04	2.96	394	.92	2.21	.192
Hospital ED	609	.49	1.34	199	.59	1.57	407	.44	1.21	.748
Hospital admission overnight	597	.24	.72	196	.35	.93	398	.19	.58	.097
Pain duration (months)	672	91.42	104.91	218	89.23	110.22	451	92.47	102.35	.530
Lowest pain	748	3.88	2.39	244	3.85	2.42	501	3.88	2.37	.885
Highest pain	763	8.10	1.66	247	8.01	1.70	513	8.14	1.65	.400
Usual pain	749	5.82	1.95	238	5.71	1.98	508	5.86	1.93	.338
Current pain	264	5.92	2.18	90	5.81	2.23	171	5.94	2.16	.517
Number of pain locations										
Left side of body	790	4.47	3.24	255	3.89	2.92	532	4.76	3.35	.001*
Right side of body	790	4.52	3.28	255	3.83	2.89	532	4.86	3.41	.000**
Over whole body	790	6.90	4.95	255	5.84	4.37	532	7.43	5.14	.000**
Psychological distress	761	23.20	15.45	250	24.64	14.96	508	22.46	15.66	.030*
Depression	772	8.12	6.19	253	8.95	6.31	516	7.70	6.09	.009*

Table 2: Descriptive statistics for continuous variables between men and women in the total sample of new patients presenting to the Waitemata Pain Services (n=798) (continued).

<i>Anxiety</i>	768	6.00	5.14	252	6.06	5.04	513	5.96	5.20	.530
<i>Stress</i>	764	9.12	5.81	251	9.76	5.45	510	8.81	5.96	.019*
<i>Pain self-efficacy</i>	784	25.25	13.60	252	24.55	13.15	529	25.60	13.85	.402
<i>Kinesiophobia</i>	765	27.24	7.98	252	28.56	7.92	510	26.56	7.93	.001**
<i>Pain catastrophising</i>	758	26.15	14.03	248	27.22	14.00	507	25.59	14.04	.119
<i>Magnification</i>	770	4.87	3.50	249	5.13	3.55	518	4.74	3.46	.150
<i>Rumination</i>	767	8.75	4.99	250	9.21	4.93	514	8.50	5.00	.070
<i>Helplessness</i>	770	12.61	6.63	251	12.92	6.69	516	12.47	6.62	.376
<i>Chronic pain acceptance</i>	334	52.75	18.80	117	49.51	18.14	214	54.72	18.86	.019*
<i>Activity engagement</i>	338	32.46	12.36	118	31.30	12.30	217	33.21	12.34	.193
<i>Pain willingness</i>	337	20.25	9.92	117	18.37	8.87	217	21.33	10.31	.010*
BPI-interference										
<i>General activity</i>	364	6.66	2.54	119	6.68	2.50	242	6.62	2.56	.901
<i>Mood</i>	364	6.38	2.73	120	6.38	2.70	241	6.36	2.77	.984
<i>Walking ability</i>	357	5.56	3.24	118	5.49	3.15	236	5.61	3.28	.674
<i>Normal work</i>	357	6.79	2.53	117	6.78	2.49	237	6.77	2.56	.877
<i>Relations with other people</i>	359	5.59	3.03	119	5.68	2.92	237	5.54	3.11	.835
<i>Sleep</i>	361	6.20	3.09	119	6.32	3.12	239	6.09	3.07	.442
<i>Enjoyment of life</i>	366	6.84	2.66	121	7.24	2.45	242	6.61	2.74	.050*
<i>Average interference</i>	348	6.30	2.19	115	6.42	2.14	230	6.22	2.22	.469
PDI interference										
<i>Family/home responsibilities</i>	425	6.11	2.24	134	5.88	2.21	291	6.21	2.24	.087
<i>Recreation</i>	419	7.00	2.23	132	7.08	2.28	287	6.97	2.22	.552
<i>Social activity</i>	417	6.33	2.47	130	6.42	2.38	287	6.29	2.51	.653
<i>Occupation</i>	406	6.72	2.37	129	6.84	2.30	277	6.67	2.40	.433
<i>Sexual behaviour</i>	306	6.26	3.27	115	6.45	3.23	191	6.14	3.30	.424
<i>Self-care</i>	424	4.42	2.70	135	4.35	2.75	289	4.46	2.67	.711
<i>Life-support activity</i>	415	4.82	2.73	131	4.94	2.74	284	4.76	2.73	.535
<i>Average interference</i>	285	5.86	2.11	107	5.99	2.07	178	5.77	2.14	.271
<i>Average pain interference (incl. BPI-I and PDI)</i>	792	6.12	2.11	254	6.14	2.06	535	6.08	2.14	.693
<i>Trouble sleeping due to pain</i>	356	2.60	.78	119	2.65	.74	234	2.57	.80	.393
<i>Subjective sleep quality</i>	356	1.73	.87	117	1.75	.92	236	1.71	.85	.623

* $p < .05$, ** $p < .001$.

^aMann-Whitney U test comparing men and women.

Psychological factors and comorbidities

While not significantly different for pain self-efficacy and pain catastrophising, men and women differed in terms of chronic pain acceptance, kinesophobia, psychological distress, stress and levels of depression (Table 2). Interestingly, women reported less psychological distress ($p < 0.05$) and depression ($p < 0.01$), but more stress

compared to men ($p < 0.05$). Men further reported higher levels of kinesophobia ($p < 0.005$), and less pain acceptance and pain willingness ($p < 0.05$ for both).

Ethnic distribution and differences

With 65.7%, the vast majority of patients attending WPS were New Zealand Europeans, followed by other Europeans (19.1%). Only 5.7% were Asians, 3.9% Māori, 2.7% Pacific Islanders and 2.8% Middle Eastern/

Table 3: Demographic and pain characteristics by ethnicity—summary of the main findings.

	NZ/European (n=510)	Other European (n=148)	Māori (n=30)	All Pacific (n=21)	Asian (n=44)	Middle Eastern/ Latin/African (n=22)	
	Mean	Mean	Mean	Mean	Mean	Mean	p value
Lowest pain	3.57	4.05	5.48	5.60	4.55	5.05	.000**
Highest pain	8.02	8.09	9.17	8.35	8.17	8.31	.000**
Usual pain	5.66	5.88	7.09	6.70	6.06	6.00	.002*
Number of pain locations							
Left side of body	4.38	4.35	6.57	5.32	4.19	3.91	.046*
Right side of body	4.38	4.45	6.82	4.95	4.55	4.32	.023*
Over whole body	6.70	6.87	10.29	7.79	6.74	6.41	.032*
Psychological distress	21.91	23.98	36.13	31.25	25.42	24.98	.000**
Depression	7.65	8.38	12.27	10.78	9.01	9.11	.003*
Anxiety	5.55	6.13	11.01	8.89	7.27	7.07	.000**
Stress	8.74	9.43	12.72	11.24	9.56	9.39	.015*
Kinesophobia	26.48	26.93	31.30	31.55	30.33	32.50	.000**
Pain catastrophising	24.43	25.53	34.75	37.92	34.62	31.30	.000**
Magnification	4.41	4.82	6.71	7.81	7.38	6.19	.000**
Rumination	8.16	8.52	11.75	12.75	11.68	10.62	.000**
Helplessness	12.01	12.23	16.29	17.37	15.49	14.49	.000**
PDI interference							
Family/home responsibilities	6.00	6.16	7.58	5.37	6.50	6.23	.033*
Social activity	6.17	6.42	7.97	5.89	6.66	6.92	.042*
Occupation	6.59	6.70	8.22	5.97	7.33	7.25	.029*
Self-care	4.14	4.63	6.66	4.47	5.54	4.38	.001**
Life-support activity	4.67	4.49	7.21	5.00	5.67	5.08	.002*
Average interference (7 items)	5.70	5.83	7.87	5.29	6.47	6.17	.008*

* $p < .05$, ** $p < .001$.

Highest variable expressions are highlighted in bold.

Latin/Africans (Table 1). Cross-cultural comparison of the main study variables showed significant differences for pain characteristics, pain disability, psychological and psycho-behavioral factors (for full information see supplementary Table 1, for a summary of the main findings Table 3). In terms of pain severity, Māori patients reported the highest pain levels across the categories of highest ($p < .0001$) and current pain ($p < .005$) compared to the other ethnicities. Lowest pain severity could be observed for New Zealand Europeans and other European patients. Māori patients also reported the highest number of pain sites across the whole body (10.3), as well as on the left (6.6) and right (6.8) side of the body ($p < .05$ for all), followed by Pacific Islanders. Pain interference according to the BPI was not significantly different across the various ethnic groups but significant disparities could be detected for the PDI domains of *family/home, social activity, occupation, self-care, life-support activity* and for *average interference*. Again, Māori patients reported the highest levels of interference across all PDI domains, whereas Pacific Islanders reported the lowest levels, closely followed by New Zealand Europeans (Table 3). A similar picture emerged for psychological distress, depression, stress and anxiety, where Māori patients scored highest on all variables compared to the other ethnic groups, whereas again New Zealand Europeans scored lowest ($p < 0.05$ for all). Highest levels of kinesiophobia were reported by Middle Eastern/Latin/Africans (32.5), closely followed by Pacific Islanders (31.55). Pacific Island patients had the highest tendencies to catastrophise about their pain (37.9), followed by Māori (34.8) and Asians (34.6).

Discussion

Chronic pain is a major public health issue in New Zealand and its management relevant to all healthcare practitioners. In this observational study we provide a description of the demographic, psychological and pain characteristics of chronic pain patients attending a hospital-based multidisciplinary chronic pain service in Auckland, New Zealand. Differences in pain presentation, pain-related disability and pain-relevant psychological factors were noted across sex and ethnicity.

Sex differences

While female patients significantly outnumbered male patients (68% vs 32%), they did not differ in terms of pain duration and pain intensity, but presented with a significantly higher number of pain sites in the whole, as well as in the right and left side of the body. The predominance of women in our patient population is in accordance with demographic data from other, international pain services³⁶ and with information from epidemiologic studies suggesting chronic pain is more prevalent in women compared to men.³⁷ There are well-established sex differences in pain sensitivity and pain processing that may at least partially account for these observations.³⁸ Furthermore, the prevalence of chronic widespread pain is known to be much higher in females than in males,³⁹ in agreement with our findings. Interestingly, we observed several sex-related differences in pain-related psychological factors. It is possible that sex-related differences in pain coping strategies at least partly explain the differences observed in psychological factors such as depression and emotional distress, despite men and women reporting a similar pain intensity and duration. Clinical studies suggest that men and women often cope with pain differently.⁴⁰ Women are more likely to use coping strategies involving social support and active self-management. In contrast, social norms often emphasise reduced pain expression in men and a focus on enduring pain.⁴¹ This may lead to men feeling more isolated and distressed by their pain. Alternatively, our findings may reflect sex-related differences in care-seeking behavior⁴² with men experiencing higher levels of emotional distress before seeking tertiary level care.

In agreement with our findings, recent studies in patients with chronic pain have shown that men are less accepting of their pain,⁴³ more likely to perceive their pain as reflecting harm and adopt avoidance coping strategies.^{43,44} These findings suggest men may benefit more from acceptance-based treatment approaches and require more educational input regarding the pathophysiology of chronic pain, particularly if they are going to engage in activity or exercise-based interventions.

Attendance by ethnicity and ethnic pain-related differences

Attendance and engagement with a self management approach to pain management does require individuals to have the ability to travel to the various pain centres at hospitals. Many of the patients in this study were unemployed or had very limited personal finances, making simple logistical issues such as attending clinic appointments challenging. This is magnified by being in a DHB with a large geographical area. Devolvement of services to primary care and the use of remote medicine are obvious alternatives but are yet to be established. This may also be reflected by the number of health professionals involved in patient care over the prior six months. The New Zealand health system has a 'user pays' system for primary care and as such any initiative based in this area would disadvantage low wage earners and unemployed people. While patients may have had their pain for several years, presentation to a tertiary service took over seven years to occur. It is unclear from this survey the reasons for this. It may in part be due to unwillingness by GPs to refer, or reluctance of the patient to attend. The WPS model allows for triage and engagement within 16 weeks of referral, so delay from initial referral should no longer be a major barrier to service access.

The present study found that New Zealand Europeans constituted the vast majority of patients (65.7%) attending our service. According to 2015 data, the population served by WPS comprises 9.7% Māori, 7.3% Pacific Islander and 20% Asians. However, with only 3.9% Māori, 5.7% Asians and 2.7% Pacific Islanders attending the Pain Services, these ethnic groups were significantly under-represented. This may be of particular interest for Māori when it is considered that recent data from the New Zealand Health Survey suggests that Māori are 1.2 times more likely to experience any chronic pain condition compared to non-Māori.⁴⁵ The under-representation of ethnic minorities in our service may be due to a number of factors such as access to primary and secondary care services, communication issues, financial barriers, geographical location, use of traditional medicine/healing interventions, lack of belief in western medical systems or genetic/epigenetic differences in pain perception and modulation. Importantly, individuals of certain ethnic groups (eg, Asians, Māori) have been shown to be more reluctant

to report chronic pain relative to other groups.⁴⁶ This non-disclosure of pain and associated symptoms may explain the lower proportion of individuals in certain ethnic groups, as it may be that they have gone unnoticed in the healthcare system. According to our findings, these individuals (eg, Māori) tend to present later to our service and with increased scores on adverse pain-related measures (eg, higher pain severity and disability, more pain sites and increased negative affect). Their delayed health-seeking behaviours may reflect a number of factors, including but not limited to: lack of culturally meaningful services, negative past experiences in healthcare settings, fear of being a burden and desire for privacy.⁴⁶ It is also possible that ethnic differences in other factors such as occupation (eg, manual work vs office work) could partly explain the increase in pain intensity and subsequently, psychological distress. An important consideration lies in the lack of knowledge about the most appropriate paradigms of pain management across different cultural backgrounds. The catchment area for WPS has a large Asian population, many of whom cannot speak fluent English. Yet, 'Asian' covers a wide spectrum of nationalities and may be too simplistic to be useful in identifying specific targeted treatment plans.

Study limitations

It is important to acknowledge that there are some limitations to our study. First, the present study results cannot be generalised to other pain clinic populations, as the data was only assessed in one pain service. Similarly, the sample sizes of Māori and other ethnic minorities were relatively small and follow-up data unavailable, therefore the presented results need to be interpreted with caution and more large-scale studies are needed to get a more in-depth understanding of possible differences. Furthermore, the catchment area is restricted to a specific region in Auckland, therefore ethnic distributions might not necessarily be representative for the whole of New Zealand (eg, more rural areas). Finally, several sources of referral biases might have been present such as location, availability, waiting list, referring physicians' and patients' preferences, specialisation, treatment approach, etc.) and could have influenced the types and numbers of patients attending this specific Pain Service. As far as the screening documents are concerned most have not

been validated in ethnic populations such as Samoan, Tongan, Korean or Māori. In addition, the proportion of non-English questionnaires and difficulty with any non-pharmacological interventions (eg, physiotherapy, group mindfulness-based pain response workshops) limits potential access and engagement.

Conclusion

Our study constitutes the first detailed report on the demographic and pain characteristics of patients attending a multidisciplinary hospital-based pain service in Auckland, New Zealand. Many patients present with psychological sequelae of chronic pain, yet resources may not match requirements and may be too biomedically focused. Though not necessarily representative of other pain clinics, a better knowledge of patient characteristics, especially in terms of sex and ethnic differences in pain presentation is important for the development of more effective treatment models. While service provision

can be based on generalised guidelines, specific interventions may need to be tailored to reflect important differences in pain presentation, illness beliefs and pain coping strategies across gender and ethnicity. While biomedical treatments are attractive for chronic pain management, the evidence clearly demonstrates that the majority of meaningful improvements arise from activity and cognitive interventions in a multidisciplinary setting. This is challenging for English speaking and European-based groups of patients—and almost impossible for significant proportions of our population. Raising awareness of the issue is useful, but future strategies include education at under and postgraduate level, language and cultural resources and the integration of healthcare professionals from a variety of cultural and ethnic backgrounds. Further studies are needed to identify specific strategies to improve service delivery and outcomes in ethnic minorities who may be undertreated or lack access to appropriate interventions.

Supplementary Table 1: Demographic and pain characteristics by ethnicity.

	NZ/European (n=510)		Other European (n=148)		Māori (n=30)		All Pacific (n=21)		Asian (n=44)		Middle Eastern/Latin/African (n=22)		p value
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	
Age	51.22	18.05	56.29	17.47	52.67	13.43	52.00	14.13	50.91	13.85	50.67	16.37	.081
Frequency of visits to													
GP/family doctor(s)	2.58	2.48	2.39	2.13	3.63	2.96	2.60	1.63	3.54	5.02	2.78	2.32	.184
Medical specialist(s)	.99	1.97	.79	1.10	1.11	1.10	.79	.97	.69	.76	1.00	1.13	.737
Health professionals	2.05	4.40	1.81	4.22	2.45	7.12	1.77	4.48	2.00	3.89	2.24	5.71	.932
Alternative health professionals	.94	2.62	.80	2.02	.69	1.66	.47	1.06	1.30	2.01	1.67	3.39	.204
Hospital ED	.55	1.48	.36	.83	.64	1.45	.46	1.13	.54	1.62	.50	.94	.983
Hospital admission overnight	.26	.72	.16	.47	.31	.87	.58	1.73	.15	.60	.46	1.22	.800
Pain duration	98.29	110.0	86.36	114.79	101.0	98.46	70.06	44.75	50.02	39.30	70.72	44.43	.156
Lowest pain	3.57	2.28	4.05	2.39	5.48	2.66	5.60	2.64	4.55	2.23	5.05	2.57	.000**
Highest pain	8.02	1.60	8.09	1.65	9.17	.92	8.35	1.28	8.17	2.41	8.31	2.18	.000**
Usual pain	5.66	1.87	5.88	2.03	7.09	1.91	6.70	2.01	6.06	1.88	6.00	2.62	.002*
Current pain	5.84	2.23	5.79	1.99	7.70	1.30	6.80	2.39	6.40	1.79	6.14	3.24	.298
Number of pain locations													
Left side of body	4.38	3.21	4.35	3.15	6.57	3.74	5.32	3.89	4.19	3.16	3.91	3.05	.046*
Right side of body	4.38	3.22	4.45	3.35	6.82	3.45	4.95	4.22	4.55	3.05	4.32	3.26	.023*
Over whole body	6.70	4.90	6.87	4.97	10.29	5.44	7.79	6.11	6.74	4.53	6.41	4.54	.032*

Supplementary Table 1: Demographic and pain characteristics by ethnicity (continued).

Psychological distress	21.91	15.13	23.98	15.18	36.13	16.64	31.25	21.12	25.42	15.45	24.98	13.13	.000**
Depression	7.65	6.09	8.38	6.32	12.27	6.28	10.78	7.50	9.01	5.99	9.11	5.52	.003*
Anxiety	5.55	4.94	6.13	4.96	11.01	5.34	8.89	6.86	7.27	5.67	7.07	4.71	.000**
Stress	8.74	5.77	9.43	5.85	12.72	6.00	11.24	7.41	9.56	5.50	9.39	4.86	.015*
Pain self-efficacy	25.92	13.35	25.84	13.87	21.21	16.72	21.96	14.45	21.62	14.54	21.00	11.28	.054
Kinesiophobia	26.48	8.02	26.93	7.84	31.30	6.67	31.55	6.98	30.33	7.28	32.50	5.90	.000**
Pain catastrophising	24.43	13.63	25.53	14.76	34.75	12.33	37.92	11.25	34.62	13.79	31.30	9.30	.000**
Magnification	4.41	3.34	4.82	3.60	6.71	2.87	7.81	3.37	7.38	3.62	6.19	3.27	.000**
Rumination	8.16	4.90	8.52	5.11	11.75	4.64	12.75	3.32	11.68	4.66	10.62	3.37	.000**
Helplessness	12.01	6.49	12.23	7.14	16.29	6.03	17.37	5.84	15.49	6.56	14.49	4.25	.000**
Chronic pain acceptance	53.95	18.38	52.76	18.97	55.10	23.27	33.27	15.23	53.10	19.08	42.89	15.57	.082
Activity engagement	32.92	11.70	32.27	13.04	38.78	14.88	20.52	14.53	34.88	13.66	26.67	11.72	.130
Pain willingness	21.12	9.81	19.97	10.16	16.32	13.12	12.75	10.77	18.21	8.41	16.22	6.55	.055
BPI-interference													
General activity	6.53	2.54	6.74	2.59	7.65	2.94	8.67	1.21	6.70	2.23	6.22	2.73	.143
Mood	6.32	2.81	6.50	2.67	6.50	2.85	7.33	1.21	6.80	2.35	5.44	2.40	.756
Walking ability	5.39	3.29	6.08	3.22	5.85	3.43	8.50	1.52	5.45	2.76	4.44	2.55	.090
Normal work	6.66	2.58	6.87	2.56	7.05	2.87	8.60	1.67	7.10	2.17	5.89	2.32	.353
Relations with other People	5.57	3.08	5.58	3.19	5.15	3.32	7.17	1.33	5.75	2.83	5.00	2.29	.824
Sleep	6.08	3.20	5.94	3.01	7.40	2.76	8.17	1.47	7.15	2.52	5.78	1.92	.221
Enjoyment of life	6.85	2.67	6.81	2.79	7.10	3.41	8.00	1.90	6.95	2.06	5.78	2.39	.640
Average interference (7 items completed)	6.19	2.18	6.42	2.23	6.67	2.69	8.20	1.42	6.56	2.12	5.51	1.74	.188
PDI interference													
Family/home responsibilities	6.00	2.18	6.16	2.44	7.58	1.70	5.37	2.18	6.50	2.43	6.23	2.49	.033*
Recreation	6.90	2.09	7.20	2.56	8.05	1.71	6.39	3.05	7.34	2.41	7.42	2.07	.081
Social activity	6.17	2.45	6.42	2.58	7.97	1.80	5.89	2.87	6.66	2.75	6.92	2.06	.042*
Occupation	6.59	2.32	6.70	2.60	8.22	1.81	5.97	2.58	7.33	2.33	7.25	2.14	.029*
Sexual behaviour	5.99	3.33	6.70	3.28	7.77	2.64	4.69	3.57	7.11	2.37	7.22	3.15	.061
Self-care	4.14	2.64	4.63	2.76	6.66	2.33	4.47	2.59	5.54	2.44	4.38	2.79	.001**
Life-support activity	4.67	2.66	4.49	2.82	7.21	2.34	5.00	3.07	5.67	2.52	5.08	2.75	.002*
Average interference (7 items)	5.70	2.01	5.83	2.44	7.87	1.71	5.29	2.12	6.47	2.11	6.17	1.66	.008*
Trouble sleeping due to pain	2.55	.84	2.73	.58	3.00	.00	3.00	.00	2.79	.54	2.33	.71	.052
Subjective sleep quality	1.67	.90	1.77	.85	2.20	.75	1.50	.84	1.80	.77	1.89	.93	.413

* $p < .05$, ** $p < .001$.

Competing interests:

Nil.

Acknowledgements:

We thank Precision Driven Health for the summer scholarship that made availability and analyses of the study data possible.

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Liver abscess: contemporary presentation and management in a Western population

Kareem Osman, Sanket Srinivasa, Jonathan Koea

ABSTRACT

AIM: Historically, liver abscesses (LA) affected elderly, immunocompromised patients and were characterised by high morbidity and mortality, however there are no data pertaining to a New Zealand population with little information surrounding recent management trends.

METHODS: A retrospective review of demographic characteristics, clinical management and microbiological data on patients presenting with liver abscess between 2005–2014 was conducted.

RESULTS: Fifty-seven patients [37 males, median age 64 (range 15–87)] presented with LA and most patients were not comorbid. Ethnicity included European (47%), Chinese (16%) and Pacific Island (11%). Twenty-six patients had primary abscesses, 31 patients had secondary abscesses [biliary disease, appendicitis, diverticular disease]. Presenting symptoms were non-specific. Admission white cell count was raised in 50 (88%) of patients and 43 (75%) had a CRP \geq 200mg/L. All patients were investigated with CT scan with 34 LA located in the right lobe, 14 in the left and eight bi-lobar. *Klebsiella pneumoniae* was the commonest pathogen (26% of aspirates). Percutaneous drainage (PD) was used to treat 36 of 37 patients, 17 patients were treated with intravenous antibiotics alone and three patients required open drainage for loculated collections despite PD (n=1), intra-peritoneal rupture or sepsis (n=2). Thirteen patients were readmitted within 30 days for ongoing symptoms requiring intravenous antibiotics/further PD (9) or further investigations (4). The median PD duration was 10 days (range 3–53). Twenty-six patients required follow-up imaging over one month with 16 requiring follow-up over six weeks.

CONCLUSION: In a New Zealand setting, LA affect fit patients, and primary abscesses account for almost half of all presentation. PD is effective treatment in most LA although prolonged drainage and treatment with antibiotics may be necessary.

Liver abscess is an important condition that presents acutely to surgical and medical services in both district and metropolitan hospitals. Historically it was described as occurring in comorbid, immunocompromised patients and was the result of portal pyemia from a septic focus elsewhere in the abdomen and associated with a high mortality.¹ However, the demographics of this condition have undergone a number of changes. A recent study in the US reported a national mortality rate of 6%,² although the incidence has increased to 3.6/100,000 with nearly 10,000 acute admissions annually. Other recent series report a similar

worldwide increase incidence and mortality rates between 11–31%.^{3,4}

The management of liver abscess has also evolved in the last 25 years. Historically, surgical drainage was the only definitive treatment available and was supplemented with antimicrobial therapy.⁴ With advances in cross-sectional imaging and localization, percutaneous drainage has now become the treatment of choice and surgical intervention is generally reserved as a salvage therapy.⁴ There is a general perception that less invasive procedures are more beneficial to the patient and may be associated with lower complication rates, hospital stay and

overall cost in comparison to operatively treated patients. However, there is a lack of standardised information pertaining to the percutaneous treatment of liver abscess, in particular the optimal duration of drainage and timing of drain removal, the investigations necessary to establish complete drainage as well as protocols relating to follow-up cross-sectional imaging to confirm resolution. Currently no international guidelines or protocols exist.

This investigation was undertaken to review our contemporary experience with liver abscess and to establish management protocols with regard to the optimal type of drainage, drain type, drain management and monitoring as well as the type and schedule of follow-up imaging required in these patients.

Methods

A retrospective review was conducted of all adult patients presenting with liver abscess between January 2005 to December 2014. Patient demographics, clinical presentation, haematological and biochemical data, microbiological results, daily ward management and clinical outcomes were collated. Comorbidities were graded using the Charlson index.⁵ If no underlying cause for the liver abscess was identified, the patients were considered to have a primary liver abscess, while those patients having an identifiable precipitating cause were defined as having a secondary liver abscess. Cross-sectional imaging was reviewed and the size and distribution of the abscesses was recorded. The management for each patient was recorded as intravenous (IV) antibiotics only, percutaneous drainage with IV antibiotics or surgery. Antibiotic therapy was commenced on admission with the support of the Infectious Disease Service. Initial therapy was with a broad-spectrum agent and this was further refined based on the culture results of blood and aspirated abscess fluid. Hospital policy dictated that patients with bacteremia received antibiotic therapy for four weeks and often this was administered at home via a central venous line. The duration of antibiotic therapy, duration of drain placement as well as the indications for drain removal and the results of subsequent cross-sectional imaging were also recorded.

Results

Fifty-seven patients (37 males, median age 56 years [range 15–87 years]) were admitted with a diagnosis of liver abscess between 2005–2014. The majority of patients were New Zealand European (n=26). Other ethnicities were Chinese (n=9), Pacific Island (n=11), Indian (n=5), Maori (n=2) and other (n=4).

Patient comorbid status classified using the Charlson index is shown in Table 1. The median hospital length of stay was 13 (range 3–51) days. Thirteen (23%) patients were readmitted to hospital within 30 days of discharge for issues primarily related to drain blockage (n=5) or accidental dislodgement (n=8).

Thirty patients presented with a primary liver abscess. Of the 27 patients with secondary liver abscess, underlying biliary disease (cholecystitis, cholangitis, cholangiocarcinoma and post-cholecystectomy) was the cause in 14 patients. Other causes included appendicitis (n=5), diverticular disease (n=4), gastric/duodenal ulcers (n=3) and one patient presented intra-abdominal sepsis following a laparotomy to treat a spontaneous hepatic haemorrhage.

Table 1: Summary of patient Charlson Index scores.⁵

Charlson Index	Number of patients
0	29
1	11
2	6
3	3
4	4
5	0
6	2
7	1
8	1

Abdominal pain and fevers were noted on presentation in 44 (77%) patients with other symptoms being less common—nausea and vomiting (n=14), rigors/chills (n=8), malaise (n=7), anorexia (n=6) and night sweats (n=6). White cell count was raised in the majority (n=50; 88%) of patients while c-reactive protein (CRP) was greater than 100mg/L in

Table 2: Bacterial isolates from 57 primary and secondary liver abscesses (LA).

Microorganism	Primary LA	Secondary LA
<i>Klebsiella pneumoniae</i>	8	7
<i>E.coli</i>	1	6
<i>Streptococcus Milleri</i>	2	5
<i>Enterococcus Faecalis</i>	0	6
<i>Entamoeba histolytica</i>	4	0
<i>Bacteroides Fragilis</i>	0	3
<i>Staphylococcus aureus</i>	0	2
<i>Klebsiella oxytoca</i>	0	2
<i>Citrobacter braaki/freundii</i>	0	2
<i>Fusobacterium nucleatum</i>	0	2
<i>Pseudomonas aeruginosa</i>	0	2
<i>Raoultella ornithinolytica</i>	0	1
<i>Morganella morganii</i>	1	0
<i>Actinomyces israelii</i>	1	0
<i>Candida albicans</i>	0	1
<i>Enterobacter clocae</i>	1	0
<i>Streptococcus sanguinis</i>	0	1

all patients on admission and over 200mg/L in 45 patients.

Thirty-eight (67%) patients had a solitary liver abscess while 19 (33%) had multiple liver abscesses. Thirty-four (60%) patients had a liver abscess involving the right lobe only, 14 (25%) involving the left lobe only and eight (14%) that were bi-lobar with the location of one patients abscess not specified. *Klebsiella pneumoniae* was the species most commonly cultured and was found in 15 (26%) patients. The incidence of cultured microorganisms in relation to primary and secondary liver abscesses is highlighted in Table 2.

All patients were treated with IV antibiotics for a median of 32 days (range 28–61 days). Seventeen patients were successfully treated with antibiotics alone. This choice of therapy was at the discretion of the treating clinician and only utilised in patients who demonstrated rapid clinical improvement. Review of these 17 patients showed that the abscesses treated in this way tended to be small (median diameter 3.5cm, range 1.5–4cm) and eight were multiple. In

addition, a further 37 (65%) patients were treated with percutaneous drainage of the liver abscess (median diameter 6cm, range 3–16cm). Open surgical drainage was utilised in three patients (5%). In one patient surgical drainage was elective for a multiloculated collection that could not be fully drained percutaneously. A further two patients underwent emergency surgical procedures after presenting with intraperitoneal abscess rupture and septic shock. Both abscesses were right sided and these latter two patients died within 24 hours of their surgical procedure from overwhelming sepsis. Seventeen patients (30%) were treated with intravenous antibiotics alone and did not require drainage.

Follow-up imaging modalities varied according to clinical context and included computed tomography (CT) and ultrasound (US). Fifty patients required follow-up imaging for over two weeks, 27 patients required follow-up imaging for greater than one month and 17 patients required follow-up imaging up to six weeks or more after initial diagnosis (Table 3).

Table 3: The frequency and timing of post-drainage cross-sectional imaging in each treated group.

Treatment	14 Days	30 Days	60 Days
Intravenous antibiotics alone (n=17)	12 (9 US, 3 CT)	5 (5 CT)	2 (2 CT)
Percutaneous drainage (n=37)	37 (6 US, 31 CT)	22 (2 US, 20 CT)	15 (1 US, 14 CT)
Surgical drainage (n=1)*	1 (1 CT)	-	-

*n=1 in the surgical group since two patients died within 24 hours of surgical drainage.

Only 24 patients had duration of drainage noted (median 10 days [range 3–53 days]). The primary indication for drain removal included radiological resolution (n=6), clinical and biochemical improvement (n=19) and decreasing drain output (<30ml/24hrs; n=5) and there were no standardised protocols to assess the completeness of abscess drainage and resolution.

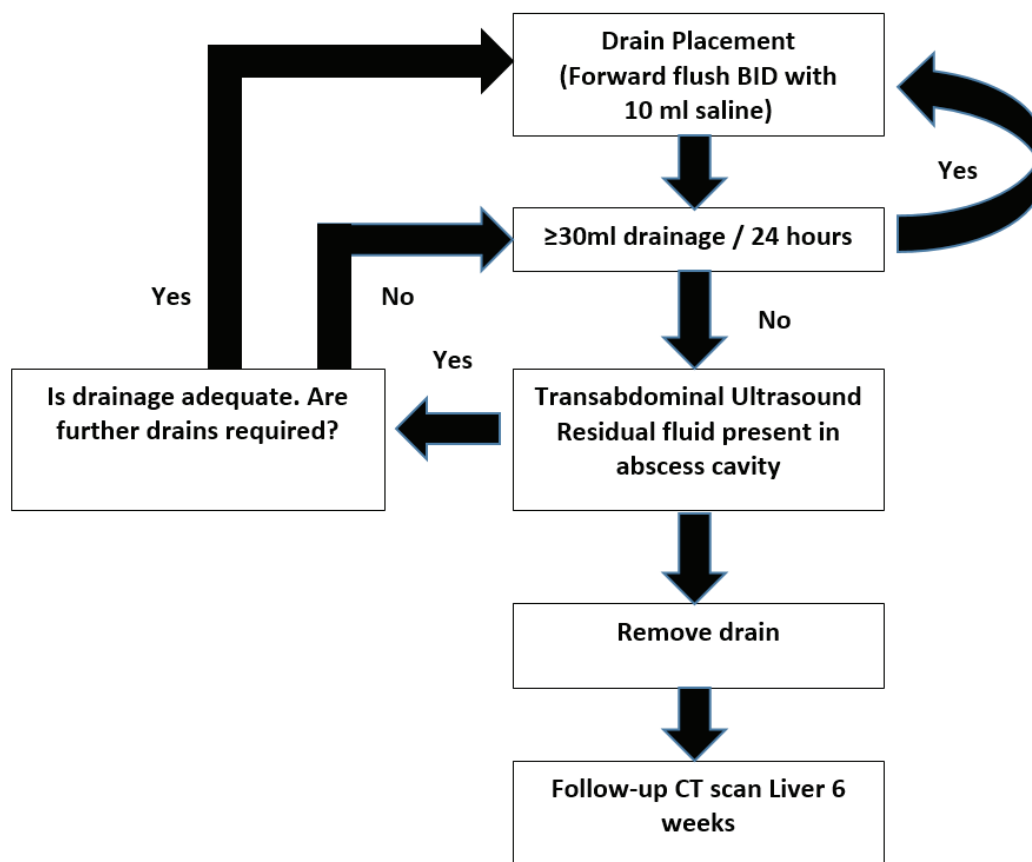
Discussion

This investigation has confirmed that liver abscesses frequently develop in otherwise well patients and often present without a preceding cause in almost half those affected.^{2,4,6} Clinical presentation is usually non-specific but all patients are likely to have raised inflammatory markers with variable microbiology and hepatic sectional distribution. Most patients can be managed with antibiotics and percutaneous drainage without significant morbidity. In comparison to earlier reports,¹ liver abscesses are no longer seen only in elderly, comorbid and immunocompromised patients. This may reflect improved acute management of intra-abdominal pathology such as diverticulitis or appendicitis, thereby reducing the overall incidence in the susceptible population cohort.⁷ Previous studies¹ have also described primary liver abscesses in a high proportion of cases and shown them to be associated with the presence of metastatic cancer and diabetes. In the current series, patients with primary and secondary liver abscesses had similar microorganisms cultured and there was no obvious preponderance of diabetes or malignancy. The incidence of primary liver abscesses is equivalent to Ochsner's series suggesting the pathophysiology may be blood borne or intrahepatic sepsis without a readily diagnosed, visible septic focus.¹

The treatment strategies employed confirmed recent international trends.⁶ Thirty percent of patients were treated successfully with antibiotics alone. These patients tended to present with smaller (diameter ≤ 4 cm), multiple abscesses that were widely distributed. A recent investigation⁶ specifically sought potential factors predictive of failure of antibiotic therapy alone but were unable to confirm that this therapy is more effective in smaller abscesses and suggest that if clinical response is rapid, the antibiotics are continued and percutaneous drainage is reserved for those patients who don't respond. This 'step up' approach was used at North Shore Hospital and a further 65% of patients were treated with percutaneous drainage in addition to antibiotic therapy. It must be emphasised that percutaneous drainage is an effective minimally invasive therapy but hospital stays were long with a median of 13 days and 23% of patients required readmission at some point due to drain blockage or dislodgement. Patients were generally mobile and eating during the admission but remained in hospital for regular intravenous antibiotics and drain care. Other investigators have noted this trend.^{6,7} It should be noted that the exact indications for surgical or percutaneous drainage have never been clarified. A number of investigations have shown that surgery has a higher success rate and a lower rate of secondary procedures in comparison to percutaneous drainage⁸ although this is controversial. However, percutaneous drainage has now been accepted as the standard of care.⁶

In this investigation, surgical drainage was utilised in only three patients. Two patients presented acutely in septic shock with ruptured abscesses and both died early in their post-operative course

Figure 1: Current unit protocol for the management of drains placed for the treatment of pyogenic liver abscess.



from severe sepsis. One patient with a multiloculated abscess failed 14 days of percutaneous drainage but made a good recovery following open surgical drainage. Rismiller et al⁶ have emphasised that surgical drainage should be reserved as a 'step up' treatment for patients who fail to respond to percutaneous drainage and as a primary treatment for those who present with ruptured abscesses or signs of other intra-abdominal emergencies.

One of the principle aims of this investigation was to establish best practice around monitoring the effectiveness of drainage, drain removal and follow-up imaging. However, even with detailed patient-by-patient review, no clear hospital protocols appeared to exist. Our unit practice is presented in Figure 1. Drains are forward flushed twice-daily with 10ml of normal saline to maintain patency. When total daily drainage is 30ml or less, a follow-up ultrasound is undertaken to assess drainage of the abscess cavity concentrating particularly on the presence of residual cavity fluid. The state of collapse of the abscess cavity is also assessed but many abscesses have a fibrous

wall and this may take some time to occur.⁹ Drains are removed when imaging confirms no residual fluid. Follow-up imaging is undertaken 6–12 weeks later, usually with CT scan, to verify resolution and to look for any rare complications such as segmental biliary obstruction or atrophy, or pseudoaneurysm. It is also important to document the presence of a persisting hepatic parenchymal scar if one is present.

This investigation confirms that percutaneous drainage is now the mainstay of liver abscess treatment. While it is successful in most patients, surgical drainage is required in those patients who present with ruptured abscess or who fail percutaneous drainage. Percutaneous drainage is well tolerated, minimally invasive and has few documented long-term complications, but is associated with significant hospital stays. Other minimally invasive abscess drainage techniques have been described, including percutaneous aspiration alone¹⁰ and laparoscopic drainage.¹¹ In the future, both of these techniques may achieve abscess drainage but reduce overall hospital stay.

Competing interests:

Nil.

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Monitoring pre-hospital transport of severely injured patients in the Midland Region of New Zealand

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ABSTRACT

AIM: Pre-hospital triage strategies aim to identify the type and extent of patient injuries and ensure that they are transferred to the most appropriate trauma centres. Despite the importance of appropriate pre-hospital transport, there is little evidence base to assist medical staff on optimal destination policy for emergent pre-hospital transport. This paper explores the spatial relationship of patient transfers prior to the implementation of the Midland Pre-Hospital Trauma Destination Matrix in New Zealand, and is a retrospective view of practice against a destination policy that was applied after the study period.

METHODS: We use data obtained from the Midland Trauma Registry merged with Global Positioning System (GPS) data from St John and Land Information New Zealand Data Service on major trauma occurring in 2014 and 2015. Using ArcGIS, data were analysed for spatial relationships between factors associated with major trauma events and pre-hospital transportation.

RESULTS: In the retrospective analysis of 162 major trauma patients, 107 (66%) were transported to a hospital that matched the destination specified in the Matrix, and 55 (34%) were transported to a non-Matrix designated hospital.

CONCLUSION: Approximately one-third of patients were not directly transported to the preferred definitive care hospital subsequently defined in the Midland Pre-Hospital Trauma Destination Matrix. Ongoing monitoring of the pre-hospital transportation system and the implementation of a formal pre-hospital transport policy may improve the efficiency of the Midland Trauma System. Future studies should examine the possible reasons for variations in triage decisions across the Midland Region.

In 2013, injuries accounted for 8% of New Zealand's morbidity and mortality (disability-adjusted life years) and were the second greatest cause of morbidity and mortality among children (10%) and youth (23%).¹ The establishment of trauma systems can improve patient outcomes and increase the cost-effectiveness of services.²⁻⁴ Pre-hospital triage strategies aim to identify patients with serious injury and ensure that as many of these patients as possible are transferred to trauma centres that are capable of treating their injuries.⁵ Clear evidence-based protocols for triage are important to meet the goal of trauma systems; "to get the right patient to the right facility at the right time".^{6,7} Efficient triage is important since many trauma deaths occur within four hours of

the incident⁸ and triaging severely injured patients to specialised trauma hospitals is associated with reduced mortality and morbidity.⁶ Formal triage criteria may aid paramedics in the decision-making process⁹ and increase the proportion of direct admissions to trauma centres.⁷ Even so, triage protocols are not always adhered to¹⁰ and triage guidelines can result in both under-triage, where patients with severe trauma are not identified, and the over-triage of patients with minor injuries being taken to trauma centres.⁸ Although inter-hospital transfers of trauma patients may be necessary when patients are not transported directly to the optimal facility, a well-organised trauma system may reduce these transfers.¹¹ The impact of inter-hospital transfers on trauma patient out-

Table 1: The Midland Major Trauma Pre-hospital Destination Matrix.²⁸

District	Waikato					Bay of Plenty		Lakes		Taranaki		Tairāwhiti
Incident locality	WKO	THA	TOK	TAU	TEK	TGA	WHK	ROT	TPO	TBH	HAW	GIS
Condition	Destination facility											
<i>Life-threatening problem requiring immediate medical intervention</i>	<i>Destination for life-threatening problem is the closest medical facility that can provide the immediate medical intervention</i>											
Manageable airway obstruction	WKO	WKO	WKO	WKO	WKO	TGA	WHK	ROT	ROT	TBH	TBH	GIS
Respiratory distress	WKO	THA	WKO	TAU	TEK	TGA	WHK	ROT	TPO	TBH	HAW	GIS
Shock	WKO	WKO	WKO	WKO	WKO	TGA	TGA	ROT	ROT	TBH	TBH	GIS
Motor score less than or equal to 5	WKO	WKO	WKO	WKO	WKO	TGA	TGA	ROT	WKO	TBH	TBH	GIS
Severe TBI likely to need neurosurgeon Age ≥15	WKO	WKO	WKO	WKO	WKO	WKO	WKO	WKO	WKO	WKO	WKO	GIS
Severe TBI likely to need neurosurgeon Age <15	WKO	SSH	WKO	WKO	WKO	TGA	TGA	ROT	ROT	TBH	TBH	GIS
Penetrating trauma to neck or torso	WKO	WKO	WKO	WKO	WKO	TGA	TGA	ROT	ROT	TBH	TBH	GIS
Penetrating trauma to a limb + arterial injury	WKO	WKO	WKO	WKO	WKO	TGA	TGA	ROT	ROT	TBH	TBH	GIS
Crush injury to neck or torso	WKO	WKO	WKO	WKO	WKO	TGA	TGA	ROT	ROT	TBH	TBH	GIS
Flail chest	WKO	WKO	WKO	WKO	WKO	TGA	TGA	ROT	ROT	TBH	TBH	GIS
More than one long bone fracture	WKO	WKO	WKO	WKO	WKO	TGA	TGA	ROT	ROT	TBH	TBH	GIS
Crushed/mangled/amputated/pulseless limb	WKO	WKO	WKO	WKO	WKO	WKO	WKO	WKO	WKO	TBH	TBH	GIS
Clinically obvious pelvic fracture	WKO	WKO	WKO	WKO	WKO	TGA	TGA	WKO	WKO	TBH	TBH	GIS
Isolated paraplegia or quadriplegia Age ≥15	MMH	MMH	MMH	MMH	MMH	MMH	MMH	MMH	MMH	CCH	CCH	MMH
Isolated paraplegia or quadriplegia Age <15	SSH	SSH	SSH	SSH	SSH	SSH	SSH	SSH	SSH	SSH	SSH	SSH
Multitrauma with paraplegia or quadriplegia	WKO	WKO	WKO	WKO	WKO	WKO	WKO	WKO	WKO	WKO	WKO	GIS
Burns involving airway	WKO	WKO	WKO	WKO	WKO	WKO	WKO	WKO	WKO	TBH	TBH	GIS
Burns >20% body surface area	WKO	WKO	WKO	WKO	WKO	WKO	WKO	WKO	WKO	TBH	WKO	GIS
Major facial injury	WKO	WKO	WKO	WKO	WKO	WKO	WKO	WKO	WKO	TBH	WKO	GIS
Severe multisystem injuries	WKO	WKO	WKO	WKO	WKO	TGA	TGA	WKO	WKO	TBH	WKO	GIS

WHK = Whakatane Hospital
 TGA = Tauranga Hospital
 WKO = Waikato Hospital
 ROT = Rotorua Hospital
 THA = Thames Hospital
 TBH = Taranaki Base Hospital
 GIS = Gisborne Hospital
 SSH = Starship Hospital

TOK = Tokoroa Hospital
 TAU = Taumarunui Hospital
 TEK = Te Kuiti Hospital
 TPO = Taupo Hospital
 HAW = Hawera Hospital
 MMH = Middlemore Hospital
 CCH = Christchurch Hospital

A. Direct transfer to the destination listed is recommended if rapid and safe transport is available.

B. Criteria for "severe TBI likely to need a neurosurgeon":

1. Intubated or ventilated
2. Lateralising motor signs or unilateral pupillary dilation
3. Clinically obvious penetrating brain injury

comes is not clear. Some evidence suggests a lower risk of death and improved outcomes for directly transported patients.¹²⁻¹⁴ However, other studies suggested no difference in outcomes,¹⁵ with a systematic review and meta-analysis demonstrating no significant differences in outcomes for patients with moderate-to-severe head injury or major trauma who experienced direct transport to specialist centres versus initial stabilisation at non-specialist centres.¹⁶ However, it has been argued that direct transportation can reduce the overall time to definitive care facilities by avoiding delays at secondary facilities before patients are transferred to a major trauma centre.¹⁷ Definitive care facilities are “usually a tertiary hospital that is able to provide leadership and total care for all aspects of the injury”.¹⁸

Trauma triage in Midland Region

Until recently, the lack of formal trauma systems and trauma triage criteria in New Zealand has been problematic.¹⁹⁻²³ In 2010, Midland Trauma System was established in the Midland Region of New Zealand (Waikato, Bay of Plenty, Lakes, Tairāwhiti and Taranaki District Health Boards (DHBs)) to guide and provide regionally consistent trauma care towards world best practice across the DHBs.²⁴ The capacity and capabilities of the Midland hospitals are well known: Waikato Hospital is a provisional Level 1 trauma centre that provides definitive trauma care for approximately 42% of all Midland residents.²⁵ Tauranga, Gisborne, Rotorua and Taranaki are regional base hospitals, while the remaining seven hospitals in the Midland Region are local or community hospitals. Middlemore Hospital (Auckland) and Christchurch Hospital are the designated centres for isolated adult Spinal Cord Injuries (SCI) in the upper North Island, and the lower North Island and entire South Island respectively. Starship Hospital (Auckland) is the national paediatric SCI centre.²⁶ St John is the emergency ambulance provider in the Midland Region, and it also provides pre-hospital emergency care to 97% of New Zealand.²⁰ In 2012, The Royal Australasian College of Surgeons, New Zealand Trauma Committee recommended that major trauma patients be transported directly to “a facility identified as having the

capability to stabilise or definitively manage severe trauma”.²⁷ However, the Ministry of Health has identified that trauma patients are not always referred directly to definitive care.²⁵ A nationally consistent pre-hospital destination policy has recently been developed between the New Zealand Major Trauma National Clinical Network (MTNCN) and pre-hospital providers, as well as regional policies to guide ambulance officers.²⁴ The Midland Pre-hospital Trauma Destination Matrix (the Matrix) is a regional destination policy customised to the known capabilities and capacities of Midland Hospitals.²⁸

Study rationale

The Matrix (Table 1) was developed prior to this study by Midland Trauma System (MTS) through a process of regional consultation with senior clinicians across the Midland Region to provide clear criteria for the transportation of severely injured patients to the most appropriate facility for their injuries.²⁸ Discriminative diagnoses used in the Matrix were developed in partnership with St John and are consistent with national prehospital triage policy. The Matrix covers 12 localities based on all hospitals within the Midland Region. It has subsequently been endorsed by the MTNCN and St John as the clinical decision-making schema for Midland Region. This study is the first stage of a two-part study that aims to improve our understanding of the pre-hospital transportation of patients within the Midland Region, and provides a snapshot of current pre-hospital transportation practice, while the second stage will monitor the trial implementation of the Matrix as a transport policy.

Methods

Study design

A retrospective evaluation of pre-hospital transportation was undertaken for trauma patients that met the pre-hospital diagnostic criteria for inclusion into the Matrix. The study proposal was submitted for review to the New Zealand Health and Disability Ethics Committees and was ruled out of scope for detailed ethics evaluation since all patient information was unidentifiable.

Study population

Major trauma patients that were injured between 1 January 2014 and 31 December 2015 and who met the criteria for major trauma as defined by the 20 “life-threatening problems requiring immediate medical intervention” included in the Matrix (see Table 1) were the subject of analysis. Data were extracted from the Midland Trauma Registry and each incident was linked to specific Global Positioning System (GPS) coordinates representing the St John ‘pick up point’. GPS data were provided by St John. Additional geographical data to support analysis, including Territorial Local Authority regional boundaries and the New Zealand coastline, were sourced from the Land Information New Zealand Data Service (<https://data.linz.govt.nz/>) and Statistics New Zealand (<http://www.stats.govt.nz/>).

Data analysis

Data analysis was performed by creating an algorithm using python code in PyScripter 2.7 to be applied in ArcGIS 10.3.1. Since there are no official catchment areas for each hospital, the locality of incidents was assigned by determining the closest hospital. The ArcGIS *Closest Facility Analysis* tool was used to calculate the distance from the GPS location of each major trauma incident to the nearest hospital along the road network and record the name of this hospital. The Matrix was applied to all major trauma incidents within a hospital locality in the form of a conditional statement algorithm. If patients were suffering from certain conditions, such as severe traumatic brain injury, the appropriate destination was Waikato Hospital in most cases. However, for other conditions such as respiratory distress the local hospital was designated as the most appropriate triage destination. This algorithm was applied to each hospital locality in the Matrix to retrospectively assign Matrix designated destination hospitals for all injuries in the sample. One hundred and ninety-three major trauma incidents were identified that met the study criteria. Data cleaning identified 14 duplicate incidents due to some patients being extracted from the database twice as they had multiple conditions and therefore met more than one Matrix criteria. In these cases, since all other patient information was the same,

including date and time of injury, the ‘least serious’ condition was removed to ensure that each patient was only included once in the analysis, leaving 179 major trauma incidents. The data were then imported into ArcGIS 10.3.1 and the trauma incident GPS points were plotted. The accuracy of the GPS data was verified by comparing the Territorial Local Authority that the GPS point was located within with the Territorial Local Authority that contained the location recorded in the trauma registry. At the Territorial Local Authority level, 42 (23%) of the incidents had GPS locations with uncertain accuracy. Since this may have been partially due to the Modifiable Area Unit Problem, whereby the results of data aggregation are influenced by arbitrary boundaries such as census areas or territorial authorities,²⁹ a manual review of uncertain GPS locations was performed and St John were contacted with a request to review the GPS data for these points. After this second phase of data verification the error rate was reduced to 9% and the 17 remaining inaccurate data points were removed, leaving 162 major trauma incidents in the final analysis. An attribute query was performed to select incidents where the Matrix designated destination matched the facility that the patient was actually transported to. Incidents that matched were designated as “Matrix” incidents, while those that did not match were designated as “Non-Matrix” incidents. It is important to recognise that these triage decisions were not made within the context of the Matrix.

Results

One hundred and ninety-three major trauma incidents were identified that met the study criteria. Data cleaning identified 14 duplicate incidents, while geographic verification identified 17 inaccurate data points, leaving 162 major trauma incidents in the final analysis.

Of the 162 major trauma patients included in the study, 107 (66%) were transported to a hospital that matched the destination specified in the Matrix, while 55 (34%) were transported to a non-Matrix designated hospital. Figure 1 shows the location of the hospitals, distribution of major trauma incidents and the rate of Matrix-consistent transportation within each district of the

Figure 1: Pre-hospital transport of major trauma patients in the Midland Region by DHB.

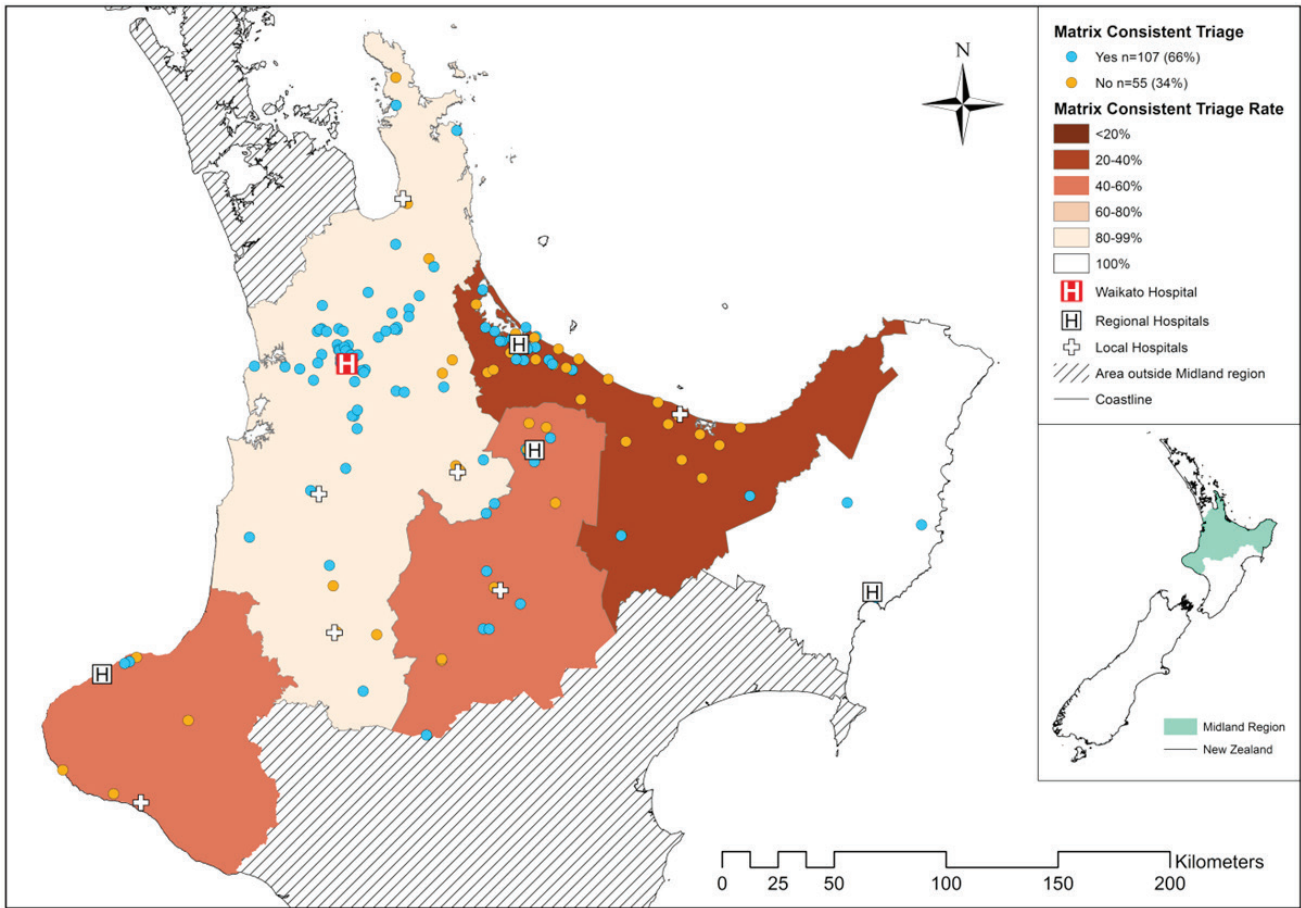


Table 2: Differences in triage by receiving hospital.

Hospital	Matrix destination	Non-Matrix destination
Whakatāne	0 (0%)	9 (100%)
Tauranga	17 (53%)	15 (47%)
Waikato Hospital	75 (90%)	8 (10%)
Rotorua	8 (50%)	8 (50%)
Thames	0 (0%)	2 (100%)
Taranaki	3 (50%)	3 (50%)
Gisborne	3 (100%)	0 (0%)
Tokoroa	0 (0%)	4 (100%)
Taumarunui	0 (0%)	3 (100%)
Taupō	1 (33%)	2 (66%)
Middlemore (Auckland)	0 (0%)	1 (100%)
Total	107 (66%)	55 (34%)

Midland Region. The blue points on the map represent trauma incidents that were found to have been transported to hospitals in accordance with the Matrix. Orange points represent incidents where pre-hospital transportation was not consistent with the Matrix. The darkest areas of the map represent districts with the lowest rates of Matrix consistent triage (less than 20%) while white areas are districts that had 100% of trauma patients triaged to a Matrix-consistent hospital. The diagonal lines signify areas outside of the Midland Region.

Table 2 displays the number of patients triaged to each hospital and the rate of Matrix consistent triage for each hospital. Tauranga and Whakatāne hospitals had the highest number of pre-hospital transportations that were not consistent with the Matrix, while the highest rates of triage not consistent with the Matrix (100%) were to Whakatāne, Thames, Middlemore, Tokoroa and Taumarunui hospitals. Half of the transportations to Rotorua and Taranaki hospitals were retrospectively deemed to be inconsistent with the Matrix, while the rates of triage not consistent with the Matrix to Tauranga hospital was 47% and two of the three transportations to Taupō hospital did not meet the Matrix criteria. The highest rates of triage that was retrospectively found to be compliant with the Matrix were to Gisborne and Waikato hospitals.

Discussion

Key findings

The current study aimed to gain a greater understanding of pre-hospital triage of seriously injured patients in the Midland Region, and makes up the first stage of a two-part study into the use of the pre-hospital triage protocols based on the Midland Matrix. The American College of Surgeons has indicated that acceptable under- and over-triage rates are those that are less than 5% and 35% respectively.³⁰ Correspondingly, the expectations of MTS for triage accuracy are 0% and 10%. Although this study retrospectively applied the Matrix to major trauma cases that occurred when no formal pre-hospital transport policy existed, the results indicate that 34% of major trauma incidents were transported to a hospital that would not have been designated as

the destination able to provide definitive care. This finding suggests that the trauma system in the Midland Region may not be performing optimally. Another key finding is that the rate of triage to non-Matrix facilities varies within the Midland Region. The results indicate that there may be localised factors, such as terrain, distance to major trauma centre or local resource availability, that affect the pre-hospital transportation of major trauma patients within the Midland Region. This finding has implications for both the Midland Trauma System and the overall health system in New Zealand. Health equity is an important part of New Zealand's health strategy and it is recognised that there should be "timely and equitable access for all New Zealanders to a comprehensive range of health and disability services".³¹ Figure 1 indicates that within the Midland Region, direct access to the facility best able to provide definitive care is not available equally to all residents, and trauma patients injured in certain DHBs appear to be more likely to be transported to hospitals that are not able to provide definitive care for their particular injuries.

Importance of this study

To our knowledge this study is the first of its kind to be carried out in the New Zealand context and it provides baseline data on pre-hospital transport in the Midland Trauma System. Continuing to monitor pre-hospital triage and implementing formal pre-hospital transport policies are important steps to ensure that access to definitive care within the trauma system is available to all residents regardless of geographical location. The New Zealand Ministry of Health recognises the importance of a "health system [that] constantly monitors its performance".³¹ It has also been argued that well-developed monitoring programmes are essential for ensuring that trauma systems are functioning effectively and efficiently.¹⁷ In particular, field triage guidelines should be assessed for over- and under-triage so that protocols can be improved and local issues identified.¹⁷ The current study raises the case for greater monitoring of pre-hospital transport in New Zealand in order to gain a clearer understanding of how trauma systems are performing and to identify areas for improvement.

Limitations

This study has several limitations. Primarily, the pre-hospital Matrix criteria were retrospectively applied to the transportation decisions that were made in real time in the field, when there was no official transport destination policy. Therefore, it is important to recognise that the decisions of paramedics were not “correct” or “incorrect” since the Matrix had not been developed or implemented as a pre-hospital transport policy at the time the decisions were made. It is accepted that decisions of paramedics were made in good faith with best available evidence. Furthermore, additional factors that could influence the decisions of paramedics, such as delayed arrival of emergency services, complex extrication of patients, weather or traffic conditions that act as a barrier to rapid transport to a major trauma centre, or resource allocation, were not taken into account by the pre-hospital

transport Matrix algorithm. The hypothesis that patients transferred to non-Matrix consistent hospitals may have assumed extra risk or worse outcomes as a result have not been examined in this study. This is likely to be the topic of further studies.

Conclusions

Retrospective analysis of pre-hospital transport in the Midland Region has revealed that 34% of major trauma patients were not directly transported to the closest hospital capable of providing definitive care for their injuries as defined by the destination Matrix. Ongoing monitoring of the pre-hospital transportation system and the implementation of a formal pre-hospital transport policy may improve the efficiency of the Midland Trauma System. Future studies should examine the possible reasons for variations in triage decisions across the Midland Region.

Competing interests:

Nil.

Acknowledgements:

The authors would like to acknowledge the following people for their help with the study and in the preparation of this manuscript: Sabrina Liu, Senior Performance Analyst, St John; Stephen Holmes, Biostatistician, Midland Trauma System. The authors also acknowledge the University of Waikato for the funding through a Summer Scholarship.

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Putting action into the revised Australian Medical Council standards on Aboriginal and Torres Strait Islander and Māori health

Shannon Springer, Suzanne Pitama, Kate Leslie, Shaun Ewen

ABSTRACT

Since 2006 the Australian Medical Council (AMC) accreditation standards have required medical schools to comprehensively address issues related to the health of Aboriginal and Torres Strait Islander peoples in Australia, and Māori in New Zealand. This has spanned areas of staff expertise, staff and student recruitment, curriculum and institutional leadership. These Indigenous specific standards have, until now, been absent for specialist medical college accreditation. The AMC revised its accreditation standards for specialist medical colleges in 2015, and for the first time included Indigenous specific standards. This commentary presents a guideline to support Australasian medical colleges' responsiveness to these Indigenous specific standards.

The Australian Medical Council (AMC) is an independent national standards body for medical education and training, which acts as an external accreditation entity for the purposes of the Health Practitioner Regulation National Law in Australia. The AMC also works with the Medical Council of New Zealand (MCNZ) to accredit programmes of study leading to general or specialist (vocational) registration in Australia and New Zealand.¹ The AMC is responsible for ensuring that standards of medical education promote and protect the health of the community, including Aboriginal and Torres Strait Islander peoples of Australia and, through the MCNZ, Māori of New Zealand.²

In 2006 the AMC revised the *Standards for Assessment and Accreditation of Primary Medical Programs* to include standards about effective partnerships with Indigenous communities, organisations and individuals; curriculum coverage of Indigenous health and culturally competent

communication and care; and recruitment of Indigenous students and staff. Australian and New Zealand medical schools have made substantial progress in meeting these standards.³ Currently in Australia approximately 1.6% (1.56%) of medical students and 0.3% of doctors identify as being Aboriginal and/or Torres Strait Islander.⁴ In New Zealand 14% of medical students and 3.2% of medical practitioners identify as Māori.⁵

Encouragement to embark on the same project for the *Standards for Assessment and Accreditation of Specialist Medical Programs and Professional Development Programs* came from multiple sources. After signing a collaboration agreement with Medical Deans Australia and New Zealand (MDANZ), the Australian Indigenous Doctors Association (AIDA) sought a similar agreement with the Committee of Presidents of Medical Colleges (CPMC). This was concluded in 2013 and included a priority output to “negotiate with the Australian Medical Council for the inclusion of specific standards

to address Aboriginal and Torres Strait Islander health”. At the same time the AMC’s Indigenous Planning and Advisory Group began charting the AMC’s strategic options in Indigenous development. A key element of this strategy was to embed Indigenous health and medical education at all points throughout the training pipeline. Finally, during preparation for revising the standards, the Specialist Education Accreditation Committee (SEAC) of the AMC received feedback from colleges, jurisdictions, Indigenous organisations and other stakeholders that inclusion of new standards specific to the health and medical education of Indigenous people would be welcome.

The revision of the AMC accreditation standards to address Indigenous health affects specialist medical colleges, their Fellows and trainees, Indigenous health advocacy organisations and ultimately, Indigenous communities.

Across the 10 Standards, there were 34 substantive changes (including additions) that specialist medical colleges are now required to meet. Among the additions, five specifically address the health of Aboriginal and Torres Strait Islander peoples in Australia, and Māori in New Zealand. These standards are summarised below in Table 1.⁶ Training providers will be expected to demonstrate how they meet, or plan meet, the new standards.

Table 1: Five standards addressing Aboriginal and Torres Strait Islander and Māori health.⁶

Standards	
Standard 1: The context of education and training	1.6.4 The education provider has effective partnerships with relevant local communities, organisations and individuals in the Indigenous health sector to support specialist training and education.
Standard 2: The outcomes of specialist training and education	2.1.2 The education provider’s purpose addresses Aboriginal and Torres Strait Islander peoples of Australia and/or Māori of New Zealand and their health.
Standard 3: The specialist medical training and education framework	3.2.9 The curriculum develops a substantive understanding of Aboriginal and Torres Strait Islander health, history and cultures in Australia and Māori health, history and cultures in New Zealand as relevant to the specialty(s).
	3.2.10 The curriculum develops an understanding of the relationship between culture and health. Specialists are expected to be aware of their own cultural values and beliefs, and to be able to interact with people in a manner appropriate to that person’s culture.
Standard 7: Trainees	7.1.3 The education provider supports increased recruitment and selection of Aboriginal and Torres Strait Islander and/or Māori trainees.
Standard 8: Implementing the programme—delivery of education and accreditation of training sites	8.2.2 The education provider’s criteria for accreditation of training sites link to the outcomes of the specialist medical programme and: <ul style="list-style-type: none"> • ensure trainees receive the supervision and opportunities to develop the appropriate knowledge and skills to deliver high-quality and safe patient care, in a culturally safe manner • support training and education opportunities in diverse settings aligned to the curriculum requirements, including rural and regional locations, and settings which provide experience of the provisions of healthcare to Aboriginal and Torres Strait Islander peoples in Australia and/or Māori in New Zealand.

The aim in writing this paper is to raise the profile of the new standards, and to share some perspectives from experts in the field, spanning Indigenous health medical education and assessment of medical education programmes.

Seven areas for consideration to meet the AMC's Indigenous specific standards

Improving Indigenous health outcomes in Australia and New Zealand requires the medical profession to take philosophical, practical and strategic actions towards Indigenous peoples and their health needs. In the context of specialist medical colleges, a transformative change (*and successful accreditation against the standards*) will only be achieved by a developing and consolidating a comprehensive organisation-wide approach with reconciliation at its core. In the Australian context, 'reconciliation' has many different meanings and actions. However, it remains the foundation for respectful relationships and genuine organisational intent towards addressing Indigenous disadvantage. An approach that does not recognise this fundamental principle and makes specific 'quick fixes' to meet accreditation standards is unlikely to neither satisfy the AMC nor bring about real change for Indigenous peoples. The seven recommended areas for consideration listed below will assist colleges with their own transformative strategies through leadership and governance, partnership, health workforce development, advocacy strategy, curriculum and assessment, collaboration and celebration. These recommendations are discussed in detail below. Figure 1 diagrammatically brings together the seven recommended areas of action. The diagram highlights the central role that we expect leadership and governance to play in realising the aspiration behind the inclusion of the new standards. It represents how the seven principles work together within an organisation to grow transformative change. Each principle complements each other. Principles 1 and 2 are the foundation stones to developing principles 3 to 5. Principles 6 and 7 reinforce the process by sharing and embedding the collective vision and experiences by bringing people and communities together. The diagram was developed by author SS, and modified through discussion by the team.

1. Leadership and governance

Leadership

Transformative change of an organisation requires 'leadership from the top', as well as supporting strategies to support change throughout the organisation.⁶ College leadership needs to be demonstrably supportive of Indigenous health as a college priority. Growing positive attitudes and values across the membership and organisation will assist in achieving the AMC standards and mitigate resistance and barriers that stifle progress and undermine future actions. The drive of a few, without clear institutional support and direction towards Indigenous health, can never be a pattern for a transformative change, let alone meeting the AMC standards.

Indigenous representation

Governance structures that include Indigenous peoples in leadership positions with decision-making capacities will be intrinsic to success. Where it is not possible to have Indigenous representation on committees, the college should consult with key Indigenous organisations and support and value Indigenous leadership in decision making.

Operationalising Indigenous health initiatives

An action plan should be developed for each of the operational areas of the college, including those that are relevant to AMC accreditation. Input from internal and external stakeholders into developing this plan is critical. The action plan will provide the overarching framework that will guide a set of goals and subsequent actions over the life of the plan. The "*Indigenous health (or reconciliation) action plan*" (however recognised or named) needs to align intimately with the college's core business. It should be fashioned in a way that is both symbolic and practical, and should identify a clear commitment to improving Indigenous health with targets, actions and reporting processes. The plan should address, at a minimum, the key principles outlined in this paper. The administration of the Indigenous health activities outlined in this plan should be similar to other operational areas of the college. Some colleges have developed Indigenous health committees that include members with Indigenous health expertise to oversee the initiatives set out in their strategies.⁷ These initiatives

Figure 1: Seven recommended areas for action.



should be funded and resourced in the standard college budget to demonstrate their equal importance to other college functions. Resourcing and funding in this way can help protect Indigenous health initiatives in a scarce funding climate.

2. Partnerships

There are many Indigenous organisations that lead in Indigenous health advancement that can assist colleges in developing Indigenous health strategies and methodologies

that are more likely to translate into meaningful outcomes. Nurturing, respectful and mutually sustainable Indigenous health partnerships can amplify the reach to Indigenous medical students, doctors and the wider Indigenous communities. Table 2 includes six Indigenous organisations that work in the areas of Indigenous medical education, recruitment and support of Indigenous medical students and doctors, Indigenous research development and Indigenous health advocacy with Australasia.

Table 2: Indigenous organisations.

Organisation	Purpose
Leaders in Indigenous Medical Education (LIME)	LIME aims to ensure the quality and effectiveness of teaching and learning of Indigenous health in medical education, as well as best practice in the recruitment and graduation of Indigenous medical students. The LIME Network Programme seeks to establish a continuing bi-national presence that encourages and supports collaboration within and between medical schools in Australia and New Zealand to support the development, delivery and evaluation of quality Indigenous health content in medical education.
Australian Indigenous Doctors' Association (AIDA)	AIDA's ultimate goal is to reach population parity of Indigenous doctors, and to inform and support a culturally safe healthcare system.
Te Ohu Rata o Aotearoa (Te ORA)—Māori Medical Practitioners Association	Te ORA is a professional body representing Māori medical students and doctors working as clinicians, researchers and teachers. Te ORA's vision is to provide Māori medical leadership to the health sector to affect Māori health development.
Lowitja Institute	The Lowitja Institute facilitates research and knowledge exchange that improves the health and wellbeing of Aboriginal and Torres Strait Islander peoples.
National Aboriginal Community Controlled Health Organisation (NACCHO)	NACCHO is the national peak body for Aboriginal health. It is entrusted to represent the needs and interests of Aboriginal health on behalf of its members in the national arena.
Reconciliation Australia	Reconciliation Australia was established in 2001 and is the lead body on reconciliation in the nation. It is an independent not-for-profit organisation which promotes and facilitates reconciliation by building relationships, respect and trust between the wider Australian community and Aboriginal and Torres Strait Islander peoples.
Mauri Ora Associates	Mauri Ora Associates are an Indigenous lead health education research centre that provide e-learning courses in Māori health and cultural competency for a range of health professionals.

3. Health workforce development

Colleges need to actively support the development of a health workforce that is culturally safe and responsive to addressing Indigenous healthcare access. Each college needs to implement strategies to actively recruit and retain Indigenous doctors into their respective specialities. Colleges should also aim to recruit non-Indigenous doctors who intend to make Indigenous health a professional practice priority. Developing strategies in the following areas can assist in growing the workforce of Indigenous doctors and non-Indigenous doctors working in Indigenous health. These strategies include:

- Demonstrating a commitment to improving Indigenous health
- Ensuring a safe learning and practice environment to support Indigenous and non-Indigenous doctors that prioritises their professional development within Indigenous health
- Ensuring supportive pathways to Fellowship for Indigenous doctors ie, *developing Indigenous candidate's awareness of college selection criteria and providing appropriate support and direction to promote their eligibility*
- Providing support through initiatives such as scholarships, assistance

with fees and training courses, and mentorship

- Creating Indigenous training posts or opportunities to work with Indigenous organisations or communities in a safe, supervised and structured way ie, *clinical specialist rotations within Aboriginal Community Controlled Health Organisations (ACCHO's)*
- Supporting Indigenous research partnerships and opportunities for Indigenous health research.

4. Curriculum and assessment

Australian and New Zealand medical graduates are expected to have developed emerging professional skills related to Indigenous health upon graduation.^{8,9} Specialist medical colleges must capitalise on this knowledge and skill, and further develop Indigenous health-competent medical specialists. Colleges need to draw on their membership, and on Aboriginal and Torres Strait Islander and Māori health experts to develop their Indigenous health curriculum framework. The curriculum standards in this framework need to produce a specialist with a “*substantial understanding*” of Indigenous health in their area of expertise. Indigenous health post-graduate learning that has been pitched at an undergraduate level has been met with resistance and pushback from trainees. Such an approach has not lent itself to ongoing professional development of clinician’s Indigenous health capabilities and has contributed to a lack of confidence to advocate on behalf of Indigenous patients. Indigenous health curriculum within the college should be mapped to a “national Indigenous curriculum standard.” This generic blueprint can be implemented to each training site by engaging and including local Indigenous organisations and communities where doctors are embedded. Where possible the Indigenous health curriculum should be integrated horizontally and vertically throughout the training programme and should be mapped to assessment.^{9–13} Colleges will need to ensure learning in Indigenous health to the required standard is occurring in all its jurisdictions and training sites. Developing a monitoring, evaluation and reporting process will be an essential requirement as part of the oversight.

5. Advocacy strategy

Colleges are in a position to advocate for improvements in Indigenous health outcomes by contributing to the evidence around Indigenous health and promoting government/s and community action on Indigenous community concerns. Developing Indigenous representation on research committees and collaborating with Indigenous research organisations, such as the Lowitja Institute, can orientate culturally acceptable research opportunities that can deliver meaningful health outcomes. Publishing this information in a peer-reviewed journal will see greater transference of Indigenous health best practices and evidence into the medical profession.

6. Collaboration

Indigenous health is a universal platform where colleges can work together to develop their shared values, experiences, resources and expertise. There are many areas where colleges will find similarities, for example recruitment and retention, curriculum development and assessment and research opportunities. The various Indigenous health committees from each of the colleges should share their strategies, challenges and successes in each of the domains outlined in this paper as they negotiate and advance forward. This process will be a new/emerging process for some colleges. Other colleges however, have made and continue to make considerable inroads in the development of Indigenous health curriculum, Indigenous doctor recruitment/retention strategies, Indigenous health professional development opportunities and social contracts with Indigenous communities.

7. Celebration

Having an organisational wide approach to improving Indigenous health provides everyone with an opportunity to celebrate the milestones and achievements. Celebrating each milestone strengthens the vision and the purpose of this important collective transformative process. The act of “showcasing” positive stories helps to challenge the deficiency-focused learning models that we deliver “about” Indigenous peoples. This, in turn, creates a hidden curriculum where by people may engage in meaningful conversations about continuing to apply Indigenous health initiatives in the college and the wider medical profession.

Conclusion

Having a set of standards focusing specifically on Indigenous people's health, the AMC is signalling the importance of accountable Australian and New Zealand medical professionals in Indigenous health. Most Australian and New Zealand medical schools have undergone considerable institutional development to include Indigenous medical students, curriculum, leadership development and staff over the last 10 years. This transformative change, while not yet complete, has reorientated primary medical programmes and their awareness

about and action with regard to Indigenous health. With the AMC Indigenous health standards now firmly in place, it will not be a question of if colleges develop the required changes to meet the standards, but rather a question of when, and how. The aspiration is that by applying the areas for consideration outlined in this paper, that the medical profession will not only meet these standards and improve Indigenous health outcomes, but also come to value Indigenous peoples' knowledge on health and wellbeing and the contribution they can make to the wider medical profession, and add to the overall excellence of the college activities.

Competing interests:

Associate Professor Shannon Springer is a Leader's in Indigenous Medical Education (LIME) Reference group member; and a board member of the Australian Indigenous Doctors' Association (AIDA); and a board member for the National Faculty of Aboriginal and Torres Strait Islander Health Royal Australian College of General Practitioners (RACGP).

Acknowledgements:

The authors wish to acknowledge the work undertaken by the Leaders in Indigenous Medical Education (LIME) network who has advocated and demonstrated ongoing leadership in this space of indigenous medical education.

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Primary oral malignant melanoma of the tongue

Ahmed Abu-Zaid, Nabil Al-Zaher

A 30-year-old man presented with a two-month history of tongue discoloration. Past medical history was negative for skin disorders. Physical examination of the oral cavity revealed general poor dentition with suspicious tar staining of teeth from cigarette smoking/tobacco use. Further examination showed numerous, flat to slightly raised, ill-defined, non-tender and purple lesions involving the dorsum of the tongue with scattered islands of leucoplakia (Figure 1A). Patient had no other lesions within the oral cavity. Biopsy of the lesions showed malignant melanoma. Full oncological work-up showed no evidence of regional or distant metastasis. Patient was managed with subtotal glossectomy,

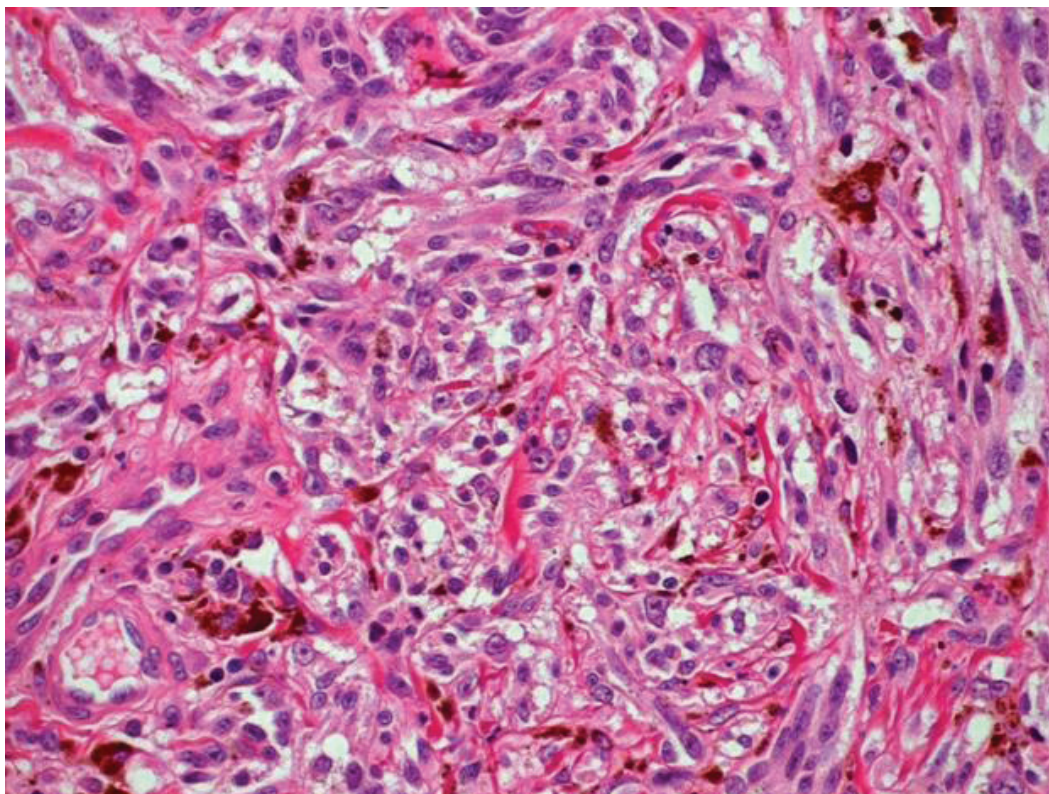
bilateral supraomohyoid neck dissections and reconstruction with a revascularised radial forearm free flap. Histopathological examination showed sheets of epithelioid and spindle-shaped malignant melanocytes (Figure 1B). Immunohistochemical examination showed positive reactivity to S-100 and HMB-45 proteins. The bilateral supraomohyoid neck dissections were negative for malignancy. The final histopathological diagnosis was compatible with primary oral malignant melanoma (OMM) of the tongue. Post-operatively, no adjuvant therapy was administered, and the patient had an uneventful recovery course. No recurrence was detected at 12-month follow-up.

Figure 1A: Primary oral malignant melanoma (OMM) of the tongue.



Gross picture of the tongue showing multiple, flat to slightly elevated, non-tender, ill-defined and whitish-purple lesions with scattered islands of leucoplakia.

Figure 1B: Primary oral malignant melanoma (OMM) of the tongue.



Histopathological examination of the subtotal glossectomy showing sheets of epithelioid and spindle-shaped malignant melanocytes (H&E stain, magnification power: 40x).

Primary OMM of the tongue is rare, and can originate from pre-existing melanocytic (pigmented) lesions, or develop *de novo* from a malignant transformation and an uncontrolled proliferation of neural crest-derived melanocytes that are normally situated in the basal layer of oral mucosa.¹

Australia and New Zealand harbour the highest incidence rates of cutaneous malignant melanoma worldwide.² However, to the best of knowledge, from New Zealand, no single case of primary non-cutaneous (mucosal) OMM has been reported in the PubMed literature.

Competing interests:

Nil.

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Māori Indigenous Health Framework in action: addressing ethnic disparities in healthcare

Ibrahim S Al-Busaidi, Tania Huria, Suzanne Pitama, Cameron Lacey

ABSTRACT

There has been a steady increase in cultural competency training in medical education programmes worldwide. To provide high-quality culturally competent care and reduce health disparities between Māori and non-Māori in New Zealand, several health models have been devised. The Indigenous Health Framework (IHF), currently taught at the University of Otago, Christchurch undergraduate medical programme, is a tool developed to assist health professionals to broaden their range of clinical assessment and communicate effectively with Māori patients and whānau, thereby improving health outcomes and reducing disparities. The authors of this article present a Māori health case study written from the observations of a trainee intern (first author) using components from the IHF to address health disparities between Māori and non-Māori.

Cultural competency education has been integrated in medical schools' curricula worldwide¹ and in New Zealand.² Effective doctor-patient interaction is one factor associated with favourable health outcomes.³ To optimise both communication and clinical interaction with Māori patients/whānau (support networks) during consultations, and therefore contribute to improved health outcomes, the Indigenous Health Framework² (IHF) was developed at the University of Otago, Christchurch, New Zealand.

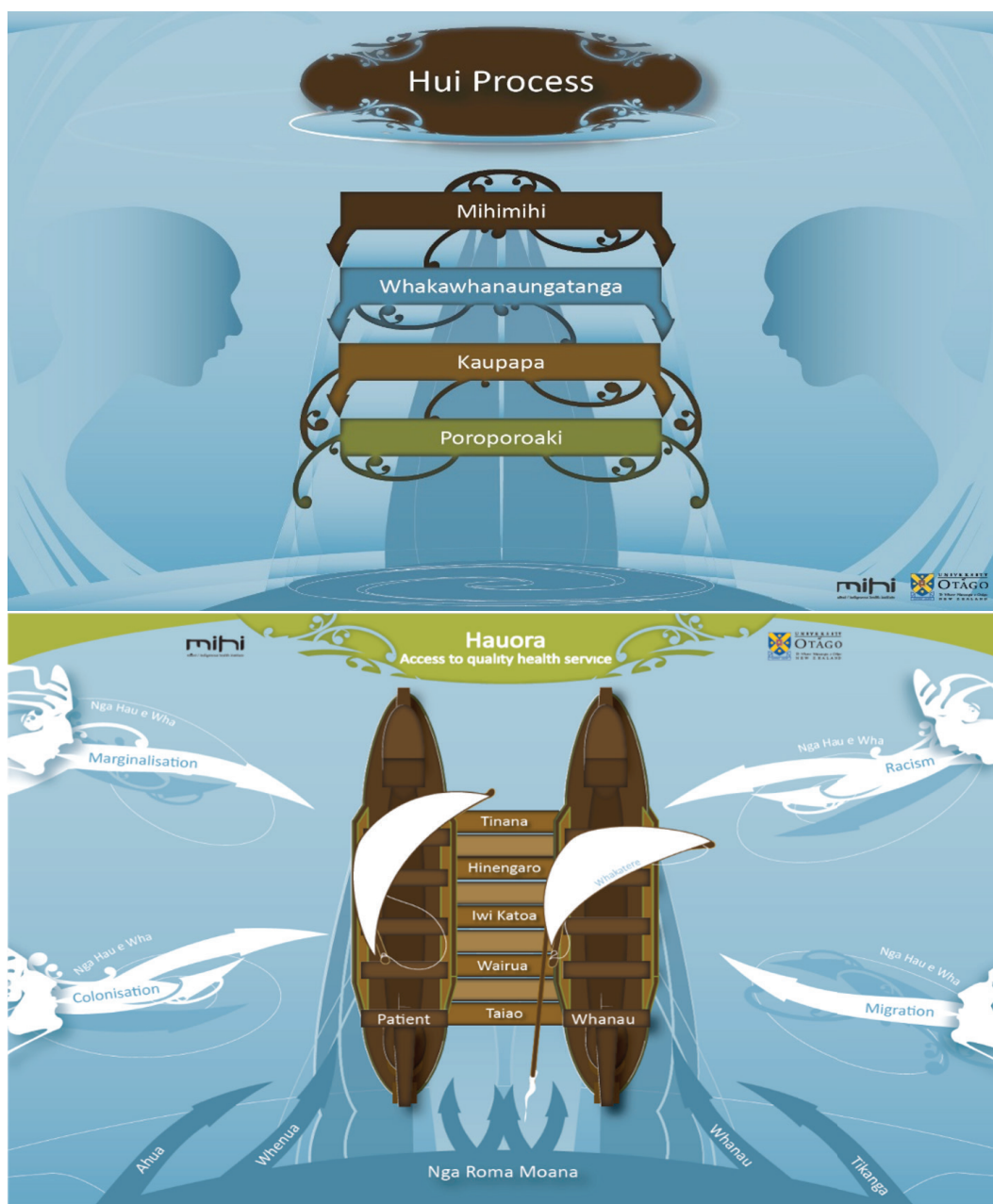
The IHF components and their clinical applications are described in detail elsewhere.² In brief, the IHF adapts and builds on the Calgary-Cambridge model for use with Māori patients and their whānau. It is comprised of two conceptualisations: the Hui Process and the Meihana model (Figure 1).² The Hui Process is a set of recommendations used to enhance Māori patients' engagement during clinical encounters, and consists of four parts: mihimihi (initial greeting engagement), Whakawhānau (making a connection), Kaupapa (purpose of the encounter) and Poroporoaki (closing the session). The Meihana model,

based on the Māori health framework Te Whare Tapa Wha, is a clinical history-taking model that supports health practitioners to gain a broader understanding of Māori patients' presentations (Figure 1).²

At the Christchurch campus of the Otago Medical School, medical students are introduced to the IHF and its components during a three-day Māori/indigenous health orientation programme based in a local marae (an indigenous meeting place). Throughout the Advanced Learning in Medicine Hauora Māori module (years 4 to 6), students continue to be exposed to concepts of Māori health status and health disparities through tutorials, lectures and summative assessments coordinated and convened by The Māori Indigenous Health Institute (MIHI), University of Otago, Christchurch.

Written initially by the first author of this article (author ISA) during his trainee intern (TI) year as part of the Hauora Māori module, Christchurch clinical campus, this case study highlights how components from the IHF were effectively utilised with a Māori patient and how this correlated to improving clinical outcomes for this Māori patient.

Figure 1: Diagram of the Indigenous Health Framework.²



Case study

The following case study outlines a clinical encounter that occurred between a TI (trainee intern) and a Māori patient.

Mihimihi (initial greeting engagement). A three-year-old boy, Hahona (pseudonym), was admitted under the paediatric surgical services in our Hospital. I (author ISA, a TI and member of the surgical paediatric team caring for Hahona) met with him and his whaea (mother), Miss Aroha, who had a tā moko (traditional Māori tattoo), on the paediatric ward after undergoing an open appendectomy. As I entered the room, I greeted them with kia ora (hello). Although they currently reside in Nelson,

they identified with the Ngāpuhi* iwi (tribe) in Northland (on the paternal side).

Whakawhānaungatanga (making a connection). Given this was my first encounter with Hahona and his mother, I was slightly nervous as to how to approach interviewing him. I thought it was important to review the medical notes to familiarise myself with his admission details. I had learned from the notes that Hahona identified as New Zealand Māori. I proceeded to develop a relationship with Hahona's mother by enquiring about where they were from to explore components of both whenua (land) and migration (components of the IHF). This led to a discussion about Hahona's whānau Marae and I was able to reciprocate

within the interaction by sharing with the whānau that I had visited a local Marae as part of my medical training.

As the interview went on, it became a little easier to relate to the patient and share experiences, which I reflected had been made easier using the Hui process.² During this encounter, I became more confident to use Te Reo Māori (the Māori language) when referring to body organs and by mirroring Aroha's use of Māori words throughout the consultation. This was key in connecting with Hahona and his family; using Māori words put Hahona at ease and created an atmosphere of trust. This enabled for the exchange of further clinical information and improved the flow of the interview. Hahona mentioned how he felt sad and was missing his whānau up in Northland. I again was able to further establish my relationship with him as I mentioned that I could relate to this as my family is overseas.

Kaupapa (purpose of the encounter).

Hahona was admitted with a week's history of increasing abdominal pain, fevers, anorexia and lethargy. This was associated with diarrhoea and vomiting. Although Hahona had no cough, shortness of breath or chest pain, a general practitioner prescribed antibiotics for a possible chest infection two days before admission. On admission he was afebrile, however, the abdomen was moderately distended and tender, especially over the left iliac fossa. Investigations showed markedly elevated inflammatory markers. Appendicitis was suspected, and he underwent a routine open appendectomy. The post-operative course was unremarkable.

Poroporoaki (closing the session). I

thanked them both for allowing me to be part of their stay in the hospital. After a careful assessment by other members of the multidisciplinary team (eg, social worker), a comprehensive discharge plan was devised for ongoing care and support in the community. Hahona and his mother were advised to see their GP in one to two weeks' time for a routine review.

Marginalisation data

Marginalisation data is defined as knowledge of current Māori health status, which includes health disparities and gains.² Increased awareness of the epidemiology and outcomes of diseases affecting Māori

children may direct health professionals to choose a different, more favourable line of management.

Abdominal pain is one of the most common symptoms of children brought to the attention of health professionals. Best practice guidelines recommend primary care providers to urgently refer children under 12 years with moderate to severe pain to secondary care for specialist management.⁴ During 2006–2010, abdominal pain was one of the top 10 leading reasons for acute hospital admissions among Māori children aged 0–14 years in New Zealand.⁵ However, data on misdiagnosis of paediatric abdominal pain by ethnicity is lacking in New Zealand.

Readmission has been found to be a strong predictor of one-year all-cause mortality among medical patients in New Zealand.⁶ Studies from New Zealand^{6,7} and overseas⁸ identified factors associated with medical readmissions, which include male sex, older age, low level of education, polypharmacy and certain ethnicities. In New Zealand, surgical readmissions in patients undergoing elective procedures were found to be associated with men, older age, and Māori and Pacific people.⁹

Analysis of Whakatere options (navigation and clinical reasoning)

Existing literature regarding disparities in emergency surgical readmission and mortality among Māori children is very limited. Surgical and medical readmissions are thought to be preventable.⁶ Providing optimal in-hospital care, effective discharge planning and adequate post-discharge care and follow-up in the community could potentially prevent subsequent readmission.⁷

Given this information, the medical team caring for Hahona made sure that all issues that may precipitate a readmission, both medical and social, were carefully addressed.

Discussion

From the TI's perspective, the utilisation of the IHF facilitated effective patient-doctor communication, and provided a framework for a wider range of assessment questions (inclusive of Nga Hau e Wha), which led to an optimal assessment for readiness for discharge to the community. This resulted

in avoiding a potential hospital readmission (no admission was recorded 12 months after discharge).

This case study outlines how the IHF, alongside the Calgary-Cambridge model, broadened the TI's knowledge of certain aspects of Māori health and enabled him to address existing disparities in Māori health through effective communication and a clear structure of how to implement cultural competency into his practice through the Meihana Model.² Early in the interview, the TI was able to establish Whakawhānaungatanga and engage with the patient and his whānau; and appropriately identify and explore values and experiences of importance to the patient and their whānau member. The use of Te Reo during the encounter, and the sharing

of personal information related to their experiences during the Whakawhānaungatanga process contributed immensely in connecting with the patient and his family at a personal level. Establishing a therapeutic relationship as well as being equipped with Māori health information related to surgical hospital readmission influenced the way the TI approached this case. In addition to providing optimal inpatient care, the appropriateness of discharge back to the community was assessed and measures were put in place to prevent hospital readmission.

To conclude, we, the authors of this article, urge healthcare professionals, hospital and community based, to utilise the above-described framework when working alongside Māori patients.

Competing interests:

Nil.

Acknowledgements:

The authors would like to thank the patient described in this report for giving us written permission to discuss his case.

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Factors influencing the smoking status of ex-prisoners reintegrating into the community after release: a pilot study

Sarah Logan, Sarah Twine, Georgia Bromiley, Holly Curtis, Jude Ball, Richard Edwards

Smoking remains the leading cause of preventable illness and death, and is hugely prevalent among people entering prison. In the most recent prisoner health survey in 2005, 67% of prisoners self-reported as smokers. In 2011, New Zealand became the first country to introduce a nation-wide smokefree prison policy, providing an opportunity to improve the health status of this vulnerable group. A smokefree prison evaluation by the Department of Corrections in August 2012, about a year after the implementation of the smokefree policy, indicated that prisons were indeed smokefree,¹ however prisoners' perspectives have not been investigated, and the proportion who remain smokefree upon release is unknown. Evidence from other countries suggests that prison smoking bans alone are not sufficient to support prisoners to remain smokefree long-term, and most relapse within days or weeks of release.²⁻⁴

Our pilot study aimed to provide preliminary data on;

1. the smoking environment within prison,
2. factors that influence ex-prisoners' smoking status,
3. how ex-prisoner reintegration programmes could better help ex-prisoners remain or become smokefree.

Methods

A short online survey and semi-structured interviews were used to gather data. Participants included 13 clients enrolled in the Salvation Army Reintegration Programme and 10 key informants professionally

involved in tobacco control, Corrections, or ex-prisoner reintegration. The clients of the Salvation Army Reintegration Programme completed a short closed-question online survey about their smoking behaviours before, during and after their most recent imprisonment. Subsequently, five clients and 10 key informants took part in a short, semi-structured telephone interview which explored their thoughts and opinions on smokefree prisons, factors that influence smoking post-release and supports available in and out of prison for smoking cessation and relapse prevention. Interviews were transcribed, coded and analysed using a thematic approach.

Results

Our findings suggest tobacco is still present in New Zealand prisons, with four out of the nine clients whose most recent prison sentence was entirely served since 2011 (when smokefree prisons were introduced) reporting they had smoked in prison. Several key informants corroborated this, saying they were aware that some level of tobacco use had continued in prisons despite the ban.

Seven out of 13 clients (54%) reported they were smokers at the time they most recently entered prison. Of these, two were smokefree upon release and had remained smokefree at the time of the survey (1-3 months post-release). A further two were smokefree at release but had since relapsed, despite a stated desire to be smokefree. Three had an ongoing smoking habit before, during and after imprisonment.

Of the six (46%) who were smokefree at the time they most recently entered prison, four had remained smokefree in prison and post-release, but two had become smokers in prison and continued to smoke post-release.

The majority of clients said they wanted to be smokefree, including three out of the seven who were smokers at the time of the survey.

Clients and key informants reported multiple challenges that ex-prisoners face to become or remain smokefree upon release from prison, including inadequate continuity of healthcare between prison and the community, returning to environments in which many friends and whānau smoke, stress of reintegration, and impaired access to smoking cessation support. Staying smokefree during the reintegration process was seen as difficult, and a challenge many were unprepared for: *"...I would have thought it [staying smokefree] would be quite a lot easier, as I managed to kick it when I was in prison."* (Client 2)

Discussion

This pilot study suggests that New Zealand prisons continue to be settings for the uptake or continuation of smoking for many prisoners, including those with a stated desire to be smokefree. The smokefree prisons policy seems to be helping some prisoners to quit, but relapse soon after release appears to be common. This is disappointing but unsurprising given the challenges to remaining smokefree highlighted by this study, including reintegration into environments where smoking is the norm and an apparent lack of relapse-prevention support in the pre- and post-release period.

This was a small pilot study, and therefore the findings may not reflect the experiences and views of ex-prisoners or key stakeholders as a whole. A larger survey is needed to provide precise estimates of smoking rates in current and ex-prisoners. Further research on the health needs of ex-prisoners in the post-release period is also needed, along with research to identify the most acceptable and effective smoking cessation and relapse-prevention supports for this population.

Recommendations

We suggest a review of the smokefree prison policy and a reorientation towards prisoners' long-term smoking cessation goals. Increasing the availability of proven long-term smoking cessation supports, such as NRT, counselling services such as Quitline, behavioural therapy and peer support during imprisonment could help increase quit rates and prevent later relapse. Furthermore, to assist with integration back into society, we suggest providing a 'discharge pack' upon release. This could include a supply of NRT to cover the first few weeks of reintegration, as well as smoking cessation and relapse prevention pamphlets and contacts for local stop smoking providers, presented in a way that is culturally appropriate and engaging.

Training for Corrections staff and reintegration programme workers around relapse-prevention, smoking cessation and the available sources of smoking cessation support is recommended. This may help to increase the support available to prisoners in the pre- and post-release period, thus reducing the risk of relapse among those who wish to remain smokefree.

Currently, the primary focus of reintegration programmes is on reducing rates of recidivism. However, we suggest incorporating a focus on health to strengthen these programmes. Reintegration programmes need a whānau ora approach, as they are not only reintegrating the ex-prisoner into the community, but also reuniting the whānau with the ex-prisoner. Enlisting the help and services of marae and other community support groups may help to ensure long-term integration and inclusion of ex-prisoners into their community, which is likely to have positive impacts on both health and recidivism rates. Greater investment in community-based and whānau-focused smokefree initiatives may help ensure that ex-prisoners who want to be smokefree return to an environment that supports that aim.

We also suggest action should be taken to bridge the gap between prison and community health services. For example, reintegration programmes or Corrections could organise a free or subsidised GP appointment with a local practice for all ex-prisoners early after release.

Future research should focus on the most effective approaches to helping prisoners to become and remain smokefree while in prison and after their release; how to decrease smoking rate disparities between Māori and non-Māori prisoners and how to improve the health of this high need population more broadly. The last Prisoner Health Survey was conducted in 2005, therefore we suggest this is repeated to get up-to-date data on prisoner health.

There is a real opportunity to work with this vulnerable population, to address their health needs, reduce health inequities and ultimately work towards a smokefree Aotearoa 2025. This study adds to a limited pool of research into prisoner and ex-prisoner health in New Zealand and suggests possible areas of improvement for delivery of programmes for smoking cessation and relapse prevention.

Competing interests:

Nil.

Acknowledgements:

The authors would like to acknowledge the research participants, the support of the Salvation Army and the contribution of the other students in the research team: NA Kahar, K Blackmore, B Dunne, C Gordon, M Haji Ahmad Ghazali, L Harrison, M Janes, Y Lee, L McGruddy, J Nicholson, J Roberts, L Sandbrook, D Van, M Whiley.

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Ireland's new sugar tax: a step in the right direction

Frank Houghton, Sharon Houghton

In many ways, Dr Leo Varakar does not fit the traditional image of an Irish Taoiseach (Prime Minister). In a country usually portrayed as being fervently Catholic, parochial and traditional, he defies many expectations as the first openly gay Irish Prime Minister and son of an Indian immigrant.¹ Similarly, his social policy actions are not those that one would typically expect of a political party (Fine Gael) that stands to the right of centre in the political ideological spectrum.²

From a health perspective, the recent Irish government budget for 2018 includes a number of positive steps. These include an additional 1,800 extra frontline health service staff, the development of more social housing, an increase of 50 cents tax on each packet of 20 cigarettes, modest anti-poverty measures such as rises in social welfare benefits (five euros per week), reductions in medication prescription charges and an increase in tax (VAT) on using sun beds.³

However, perhaps the most significant development in his recent budget in relation to health was the introduction of a sugar tax on drinks.³ Although there is a long history of such taxes in several Scandinavian countries (eg, Norway),⁴ Ireland joins a growing number of countries and localities implementing such bans including Mexico, France, Hungary and Berkeley (California, US).⁵

The introduction of a sugar tax is hardly surprising given Ireland's obesity epidemic^{6,7} and rising rates of type 2 diabetes.⁸ As a physician and former Minister for Health, the new Prime Minister's health orientation is perhaps to be expected. It must be acknowledged that after a focus lasting decades on the adverse health impact of fat, this new health concentration on sugar

may be seen as righting an imbalance that resulted from suspect research funded by the sugar industry.^{9,10} It should perhaps also be acknowledged that, given the strength of the farming lobby in Ireland, the decision to introduce this tax was no doubt made easier thanks to European Union restructuring of the agriculture sector, which has meant that Ireland no longer has a sugar beet farming and processing industry.¹¹

What is notable about Ireland's new sugar tax is that, rather than being a perfunctory step in the right direction, it is a substantive tax on sugary drink that will undoubtedly have a positive impact.¹² The new tax will be 30 cents per litre on drinks with more than 8g of added sugar per 100ml, and 20 cents per litre on drinks with between 5g and 8g of sugar added per 100 ml.

The imposition of a sugar tax on drinks may be supported by other moves in the confectionary industry that may have the unintended consequence of also curtailing the consumption of high calorie sweets, and hence potentially reducing obesity. In an effort to maintain profits without increasing price, it has recently been noted that numerous manufacturers are reducing the size of chocolate bars (termed "shrinkflation"). Thus consumers are often paying the same price and yet receiving less calories.¹³

Ideally, taxes resulting from Ireland's new Sugar Tax should be ring-fenced to provide health and health promotion initiatives focused on tackling the obesity epidemic. However, even in the absence of such a commitment from Government, this new and substantive Population Health intervention is to be applauded. Given the extent of New Zealand's obesity epidemic, New Zealand should seriously consider following suit.

Competing interests:

Nil.

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Reply to Mr Ryan's paper: acupuncture, ACC and the Medicines Act

Kate Roberts, Tracey Lindsay, Scott Pearson, Paddy McBride,
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In the December 2017 issue, the *New Zealand Medical Journal* published an article entitled "Acupuncture, ACC and the Medicines Act."¹ Author Daniel Ryan investigated the websites of New Zealand acupuncturists to determine, in his opinion, whether they were breaching the Medicines Act 1981.² Ryan justifies his claims of alleged breaches of the Act by his assumption that acupuncture lacks evidence of efficacy in the treatment of conditions contained within the Act.

The landscape of evidence for acupuncture is fast changing. The Cochrane Register of Controlled Trials shows there are currently 9,088 published clinical trials on acupuncture.³ In January 2017, two large acupuncture reviews were published. The first, "The Acupuncture Evidence Project", published by the Australian Acupuncture and Chinese Medicine Association, draws on two prior comprehensive literature reviews; one conducted for the Australian Department of Veterans' Affairs in 2010 and another conducted for the United States Department of Veterans Affairs in 2013. Research identified by these reviews were pooled, and a search of further literature from 2013–2016 conducted. Trials were then assessed using the National Health and Medical Research Council levels of evidence, with risk of bias assessed using the Cochrane GRADE system. Results in this review have been tabulated to indicate not just the current state of the evidence, but to indicate how the quality and quantity of evidence has changed from 2005 to 2016.⁴

In this review, 122 conditions were identified. The authors concluded that "strong evidence supported the effectiveness of acupuncture for eight conditions, and moderate evidence supported the use of

acupuncture for a further 38 conditions." For the remaining 76 conditions there was weak or little evidence found and further research is warranted.

The second significant piece of work published in 2017 was a programme of research on acupuncture for chronic pain and depression funded by the National Institute of Health Research UK.⁵

The researchers carried out a series of systematic analyses on acupuncture research for five chronic pain conditions; headache, migraine, back pain, neck pain and osteoarthritis of the knee. Their data conclusively demonstrated acupuncture to be "more than simply a placebo as it was more effective than sham acupuncture ... Acupuncture was also found to be better than standard medical care for all of these chronic pain conditions".⁵

Systematic reviews on acupuncture for major depressive disorder (MDD) and dysthymic disorder stated acupuncture therapy appeared safe and effective for MDD and could be considered as an alternative option.⁶ Acupuncture for anxiety was positive but reported insufficient evidence.⁷ For PTSD, acupuncture performs as well as CBT and superior to waitlist control.⁸ However, acupuncture is consistently shown as a low risk and safe therapy. Indeed, incidence of adverse events was lower with acupuncture and sham acupuncture than with antidepressants (10.2% versus 40.4%).⁶ When compared to the evidence for other treatments, including pharmaceuticals, for many conditions, including pain, migraine and headaches, acupuncture's evidence is at least equal to if not stronger in terms of efficacy, effectiveness and understanding of mechanisms.

Acupuncture's effectiveness in the treatment of many conditions has not yet been fully researched and further quality research is vital. However, cumulatively current studies create a solid and growing basis of evidence of the efficacy of acupuncture.

Ryan asserts "that there is no evidential base for the concepts of qi, meridians and acupuncture points" and "that any improvement could well be due to the placebo effect". This assertion is directly contradicted by systematic reviews and meta-analysis demonstrating that acupuncture outperforms sham needling. Moreover, many studies demonstrate that acupuncture produces a variety of biochemical and physiological effects both centrally and peripherally.⁹⁻¹² While the use of traditional language deviates from western medical terminology, the argument is one of semantics rather than plausibility.

Ryan writes "The UK's National Institute for Health Care Excellence (NICE) no longer recommends using acupuncture for the treatment of any health conditions". This is incorrect. Acupuncture is recommended for both migraine and chronic tension-headache prophylaxis in the NICE guidelines.¹³

Early in 2017, the American College of Physicians published clinical practice guidelines for back pain based on current evidence. For acute back pain, they suggest heat treatment has the best evidence, followed by acupuncture, massage and manipulation. For chronic back pain, they recommend acupuncture as a first-line treatment, ahead of pharmacological treatment.¹⁴

Furthermore, the National Comprehensive Cancer Network guidelines for supportive care recommend the use of acupuncture as one of the non-pharmacological, integrative therapies for adult cancer-related pain, as an adjunct to pharmacological treatment as required.¹⁵

The entire remit of Ryan's article is that there is no evidence for the effectiveness of acupuncture and that, any claims made relating to conditions listed under Section 58(1) of the Medicines Act 1981 are therefore in breach of the law. However, section 58 (3) states:

*"It shall be a good defence in a prosecution for an offence against paragraph (a) or paragraph (b) of subsection (1) if the defendant proves that the matter claimed, indicated, or suggested in the advertisement is true."*²

The argument that acupuncture has an insufficient evidence base is contested here. Health law expert Adam Lewis said the 'The Acupuncture Evidence Project' appeared to be a strong piece of evidence in showing acupuncture was not just a "theatrical placebo". He said it was likely the Project would stand up in court as a defence to breaching the Medicines Act.¹⁶

New Zealand's two acupuncture regulatory bodies—Acupuncture New Zealand and the New Zealand Acupuncture Standards Authority—are in agreement that this article does highlight the need for continued education of all health professionals on their advertising responsibilities and the need to reference the evidence base, however, we refute the assertions made in the article regarding the evidence base of acupuncture and its position in clinical guidelines.

Competing interests:

Nil.

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Alcohol harm—who pays?

Sally Casswell

Emergency room doctors who regularly bear the brunt of alcohol intoxication have become frequent advocates for alcohol policy. A slightly different tack was taken recently by Dr Martin Than of the Christchurch Hospital Emergency Department. He suggested the cost of alcohol-related admissions shouldn't have to come from the public purse, and instead the bars and nightclubs, from which a lot of the intoxication-related harm comes, should make a financial contribution.

The hospitality industry was quick to respond, suggesting that purchase and consumption of cheap takeaway alcohol before going out (preloading) was the real culprit. There is truth in this—our surveys show frequent pre-loaders aged 18–19 years typically drink about eight drinks (eg, cans of beer or RTDs) before they go out. But what happens once they reach the bar? Does this call into question the implementation of the New Zealand law which prohibits sale of alcohol to intoxicated patrons?

But back to the financial issues: on premise, licenses in New Zealand already make some financial contribution in the form of a licensing fee, risk adjusted and ranging from \$140 per annum to \$1,250 for

the highest risk category. Whether this is enough to recompense local authorities for the job of licensing and adequately monitoring the licenses is open to question.

But for Dr Than's suggestion to be met and for there to be some significant contribution to meet the costs of alcohol (eg, to health, police, justice and corrections), funds need to go to central government.

There are two feasible options: first, increase alcohol excise tax (endorsed by WHO as a 'best buy'¹ intervention and described by NZ Treasury as a tax with relatively little loss of welfare); this was recommended by the New Zealand Law Commission in 2010² and immediately dismissed by the then PM; second, ensure the transnational corporations selling and marketing alcohol in New Zealand pay tax. In 2016 a NZ Herald investigative journalist revealed the 20 corporations most likely to be profit shifting to avoid paying tax in New Zealand—three of which were transnational alcohol corporations.³

The majority of the New Zealand population who drink little and pay via income taxes for the services needed to respond to alcohol harm are entitled to ask government to put in place a fairer system.

Competing interests:

Nil.

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New Zealand's revised Ethnicity Data Protocols must not become a shelved document: a challenge from Hei Āhuru Mōwai

Hei Āhuru Mōwai – National Māori Cancer Leadership Group

Māori New Zealanders suffer substantial inequities in health outcomes compared to non-Māori New Zealanders—and these inequities are perhaps most profound in the context of cancer. Māori are 20% more likely to get cancer than non-Māori, but 80% more likely to die from it.¹ Of the 21 cancer sites investigated in the comprehensive Cancer Trends study, more than 80% (17 cancers) had an excess mortality rate that was at least 10% higher for Māori compared to non-Māori.²

A health system that collects high-quality ethnicity data is able to measure and monitor healthcare and outcomes for ethnic groups within its population, and also to compare between ethnic groups to cast light on health inequities. In September 2017, our Ministry of Health published a revised version of their Ethnicity Data Protocols (hereafter 'Protocols'),³ which updated the original protocols.^{4,5} The 2017 version outlines "*a new set of minimum standards that apply across the health and disability sector to all organisations that collect, record and use ethnicity data*".³

Why is it important for our health system to have a set of protocols around the collection of ethnicity data, and why is it crucial that our district health boards follow-through on its implementation? The general need for ethnicity data has been well-covered by others (see Cormack and McLeod's 2010 report for a summary⁶), but the primary reasons are to ensure a) that ethnicity data is collected as a matter of routine, and b) that the ethnicity data that

is collected is as high-quality as possible. With respect to the latter, markers of quality discussed in the revised Protocols include **accuracy** (ie, the collected ethnicity data accurately captures ethnic affiliations for a given individual), **standardisation** (ie, that ethnicity data is always collected in the same way across the sector), **granularity** (ie, the collected ethnicity data is sufficiently detailed to allow for the reality of ethnic complexity) and **currency** (ie, that new ethnicity data is collected regularly for an individual, rather than once or twice in a lifetime). For the remainder of this letter, we will focus on the guidance provided within the revised Protocols around these factors.

With respect to **accuracy**, the Protocols make it clear that a respondent must identify their own ethnic affiliations: these cannot be inferred or guessed. If an individual is unable to self-identify due to incapacity, death or because they are a newborn/child, ethnicity data should be collected from the next of kin.³ The Protocols also make it clear that there is to be no collection of 'principal ethnicity': this practice further marginalises minority ethnic groups and almost certainly results in an undercounting of Māori. Rather, the Protocols state that an individual must be permitted to declare as many ethnic affiliations as they wish, and that a minimum of six (previously three⁴) of these affiliations must be stored.

With respect to the **standardisation** of ethnicity data collection, the Protocols make it clear that only the 2013 New Zealand

Census ethnicity question should be used to collect ethnicity data. In addition, the Protocols state that if an individual declares an ‘Other’ affiliation—that is, affiliation to an ethnic group that is not one of the options in the 2013 Census question—that the individual must be allowed to state what this ‘Other’ ethnic affiliation is. The absence of this ‘Other’ information undermines our ability to validly capture an individual’s ethnic affiliations—an important consideration, particularly given that many Māori also affiliate with one or more Pacific ethnic groups that may not be explicitly listed as part of the 2013 Census question.

With respect to **granularity**, the Protocols make it clear that ethnicity data must be categorised at Level 4, which is the most detailed classification possible. Previously, the minimum standard was Level 2. While this granularity does not impact on Māori affiliation—which remains a single classification across Levels—it is again important to ensure that our ethnicity data validly captures the ethnic groups that an individual affiliates with.

With respect to **currency**, the Protocols make it clear that new ethnicity data must be collected a minimum of every three years, but preferably as often as possible. The Protocols state that new ethnicity data could be collected at the same time as other personal details are collected, such as contact information. Given this directive, it is unacceptable for those who have contact with patients to rely on existing ethnicity data from a patient management system (or similar), given that this data may be considerably out of date (or based on previous inference). Ethnic affiliation may change

over time: the regular collection of ethnicity data ensures that the recorded information adequately reflects an individual’s ethnic affiliations, and reduces the reliance on historic health datasets, many of which have been shown to undercount Māori.⁷

The inequities in cancer care and outcomes shouldered by Māori New Zealanders are abhorrent and unacceptable. The collection of high-quality ethnicity data is crucial in allowing us to identify and monitor cancer care and outcome inequities, and also to adequately direct and monitor efforts to eliminate them. The new Ethnicity Data Protocols offer guidance on best-practice strategies for achieving these objectives. Hei Āhuru Mōwai considers that high-quality ethnicity data are a crucial cornerstone for improving outcomes for Māori, and we support the key elements contained within the revised Protocols.

Hei Āhuru Mōwai also issues two challenges to the Ministry and wider sector: firstly, we challenge the Ministry to exert the necessary leadership to ensure that these protocols do not become shelved documents, but rather an intrinsic part of business-as-usual across our district health boards and their associated services. If implementation strategies such as recurring training and resource provision are required to make this a reality,⁶ then these strategies must be adequately resourced and implemented. Secondly, we challenge our colleagues in the wider health sector who have the opportunity to influence and improve the quality of ethnicity data collection where they work to do so. We must all commit to collecting ethnicity data accurately, appropriately, and often.

Competing interests:

Nil.

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Type 2 diabetes in young adults in Central Auckland: demography and complications

Type 2 diabetes (T2D) in young adults is associated with a high risk of diabetes complications. The authors of this report have investigated the demography and the emergence of complications of young adults with T2D in the central Auckland region where there has been substantial immigration.

Three hundred and ten young adults with T2D were registered with the Auckland Diabetes Centre in 2015. Demographic, anthropometric, metabolic variables and the prevalence and emergence of complications were evaluated.

It was concluded that new migrants, New Zealand-born Pāsifika and patients with mental illness or an intellectual disability comprise the bulk of young onset T2D. The disease is aggressive, and by the age of 40, patients are already developing advanced complications.

Internal Medicine Journal 2018; 48:67–73

Continuous glucose monitoring in pregnant women with type 1 diabetes

Pregnant women with type 1 diabetes are a high-risk population who are recommended to strive for optimal glucose control, but neonatal outcomes attributed to maternal hyperglycaemia remain suboptimal.

In this international multicentre trial, the researchers' aim was to examine the effectiveness of continuous glucose monitoring (CGM) on maternal glucose control and obstetric and neonatal health outcomes.

Three hundred and twenty-five appropriate patients who were pregnant or planning pregnancy were randomised to CGM and routine capillary glucose monitoring or to capillary glucose monitoring without CGM.

The researchers report that use of CGM during pregnancy in patients with type 1 diabetes is associated with improved neonatal outcomes, which are likely to be attributed to reduced exposure to maternal hyperglycaemia. CGM should be offered to all pregnant women with type 1 diabetes using intensive insulin therapy.

Lancet 2017; 390:2347–59

Oxygen therapy in suspected acute myocardial infarction

Oxygen has been used routinely in the treatment of patients with suspected acute myocardial infarction and is recommended in clinical guidelines. However, the clinical effect of routine oxygen therapy in patients with suspected acute myocardial infarction who do not have hypoxemia at baseline is uncertain.

This Swedish study reviews this matter. Six thousand six hundred and twenty-nine patients with suspected myocardial infarction and oxygen saturation of 90% or higher were randomly assigned to receive either supplemental oxygen (six litres per minute for six to 12 hours, delivered through an open face mask) or ambient air. All-cause mortality at one year was 5% in the oxygen cohort and 5.1% in the ambient air group. Readmission rates for another infarction were similar.

Routine use of supplemental oxygen in patients with suspected myocardial infarction who did not have hypoxemia was not found to reduce one-year all-cause mortality.

N Engl J Med 2017; 377:1240–9

URL:

<http://www.nzma.org.nz/journal/read-the-journal/all-issues/2010-2019/2018/vol-131-no-1470-23-february-2018/7506>

Hospital Ships and German Infamy

February 1918



Wounded soldiers in stretchers being transferred to a hospital ship. Nevill, G T (Mrs), fl 1976 :Photographs collected by Sister Edith Jane Austen during World War I. Ref: PA1-o-026-34-9. Alexander Turnbull Library, Wellington, New Zealand. /records/22340768

The International Committee of the Red Cross, the headquarters of which is at Geneva, has issued to all the world the following indictment against German “culture”:

In attacking hospital ships one is attacking, not combatants, but defenceless people—wounded, mutilated or incapacitated by bullets, women devoting themselves to a work of help and charity, and men whose equipment is intended not to take the lives of their adversaries, but, on the contrary, is capable of saving those lives and relieving

to some extent their sufferings. Every hospital ship which is furnished with the exterior marks laid down by the international conventions and the employment of which has been regularly notified to the belligerents, has the benefit of a legal presumption and ought to be respected by the belligerents. The *Asturias* seems to have been torpedoed without anyone troubling about either its character or its destination. Even admitting the correctness of the facts on which Germany bases the justification of her declaration, the International Committee holds that nothing can excuse

the torpedoing of a hospital ship. Hence, considering the declaration of January 29 (in which Germany announced her intention of treating hospital ships bearing the marks of the Red Cross as vessels of war and attacking and sinking them as such, both in the North Sea and in a defined area of the Channel) “as being in disagreement with the international conventions, it expresses the desire that this declaration be not enforced in the future.”

It is noteworthy, also, that in November, 1916, the Federal Council of Switzerland expressed the opinion that “neutrality is not indifference,” and instructed the Swiss Minister in Berlin to call the attention of the German Chancellor to the fact that Swiss Public opinion is being unfavourably impressed by the wholesale deportation of Belgians.

URL:

<http://www.nzma.org.nz/journal/read-the-journal/all-issues/2010-2019/2018/vol-131-no-1470-23-february-2018/7507>

The proceedings of the 242nd meeting of the OMSRS

1 November 2017

Recycling of the epithelial sodium channel requires SNX1 and SNX2

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The epithelial sodium channel (ENaC) is located at the apical membrane of polarised epithelial cells. ENaC's function involves sodium absorption and regulation of salt and water homeostasis making it crucial for determining blood volume and, therefore, blood pressure. Regulation of ENaC number at the cell surface by delivery to and removal from the cell membrane is strictly controlled and increased surface ENaC causes Liddle's syndrome, a form of hypertension. A potential novel candidate involved in ENaC recycling to the cell membrane is retromer, an endosome-localised protein trafficking complex. This study aimed to investigate whether retromer is involved in the recycling of ENaC, focusing specifically on the SNX1 and 2 (sorting nexin) heterodimer retromer sub-complex.

To examine whether the SNX1 and SNX2 proteins are involved in ENaC recycling, siRNA knockdown (KD) was used and the effects on ENaC trafficking measured. Using transiently transfected FRT (Fischer rat thyroid) cells, western blots were used to visualise efficiency of the SNX protein knockdown. Using chamber experiments measured changes in ENaC's amiloride-sensitive short circuit current (I_{sc} -Amil), in control and KD cells.

Significant protein knockdown was obtained for

both SNX1 ($P < 0.0001$, $n = 3$) and SNX2 ($P < 0.0001$, $n = 3$) in FRT cells. The electrophysiological data demonstrated a ~50% reduction in I_{sc} -Amil with SNX1 KD ($P < 0.001$, $n = 6$), SNX2 KD ($P < 0.002$, $n = 8$) and SNX1/SNX2 double KD epithelia ($P < 0.001$, $n = 8$). Treatment of SNX1/SNX2 double KD cells with Brefeldin A (inhibits Golgi trafficking) had no significant effect on I_{sc} -Amil. This suggests that both SNX1 and 2 are required for recycling, but not synthesis or forward trafficking of ENaC.

This project signifies an important step towards understanding the mechanism of ENaC recycling, contributing to the understanding of and prevention of hypertension.

Modelling the climate impacts of meeting the NZ Eating & Activity Guidelines

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Under the 2015 Paris Climate Agreement, New Zealand committed to reducing greenhouse gas emissions: all major government policies should consider effects on the climate. Like other Western countries, the New Zealand eating pattern has large health and environmental impacts. This study modelled the climate impact of different dietary scenarios that conform to the Ministry of Health's Eating & Activity Guidelines (EAGs).

As there is currently no New Zealand-specific database of foods and their associated production emissions, a reference database from abroad

was selected and emissions estimates for each food item were modified according to the New Zealand context. Diet-related emissions were estimated by combining the modified food emissions database with consumption data from the most recent New Zealand Adult Nutrition Survey. Dietary scenarios meeting the EAGs were developed in consultation with the Ministry of Health; each scenario's impact on emissions was modelled by scaling consumption of individual food groups according to EAG recommendations.

Whole plant foods, including vegetables, fruits, legumes and whole grains, were found to be less emissions-intensive than most animal-based foods, particularly red and processed meats. Daily diet-related emissions for the average New Zealand adult were estimated to be 6.6kgCO₂e: equivalent to 11% of New Zealand's annual emissions on a population level. New Zealand adults could reduce their diet-related emissions while meeting the EAGs by as much as 50%, mainly by reducing meat, fish, egg and dairy intake, along with food waste.

There is significant overlap between health and environmental considerations as they relate to eating pattern choices. Increasing consumption of whole plant foods and reducing consumption of both animal-based and highly processed foods presents a significant opportunity to mitigate the impacts of climate change, while improving health outcomes. There is good evidence to support the inclusion of sustainability considerations within the EAGs.

Supported by an Otago Medical School Scholarship.

Genetic variants in the *SLC2A9* locus confer risk for hyperuricemia in Māori and Pacific Island individuals

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Hyperuricemia, elevated levels of serum urate, is a prerequisite for gouty arthritis. The solute carrier family 2 member 9 (*SLC2A9*) gene that encodes a urate transporter tops the list of hyperuricemic genes. It is a key genetic determinant of serum urate levels and explains about 3% of urate variance. Gout is highly prevalent in the New Zealand Māori and other Polynesian populations. As an attempt to understand the reason for this increased prevalence, this study focused on the identification and characterisation of Polynesian-specific genetic variants within the *SLC2A9* locus conferring susceptibility to hyperuricemia, using the rare variant analysis approach.

The *SLC2A9* locus was resequenced in 809 individuals comprising hyperuricemic cases and normouricemic controls. Based on self-reported ancestry, the cohort was split into two subsets (Polynesian, n=440 and European, n=369). All Polynesians were from New Zealand while Europeans were from New Zealand and the US. Association analysis was carried out to identify risk variants within the *SLC2A9* locus that confer risk for hyperuricemia. Multiple adjusted logistic regression analysis was carried out using R version 3.4.1.

A total of 3,964 variants were identified within the locus, with 100 variants found to be significant in the Polynesian population (OR [95% CI] = 0.10 [0.01;0.88] to 5.43 [1.93;15.33], $P_{OR} = 0.00028$ to 0.049, $MAF_{controls} = 0.014$ to 0.535, $MAF_{cases} = 0.002$ to 0.546). Twenty-five of these variants were found to be Polynesian-specific, among which 14 were found to be novel. These variants will be further analysed, replicated and functionally annotated in a larger

cohort as a continuation of this study.

This research would provide a greater insight into the genetic causes of gout. More importantly, the identification of penetrant variants could be applied in precision medicine and public health genomics to improve health outcomes for the target population.

Modulating the immune response to colorectal cancer in mice using a cancer vaccine

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Vaccines modulate the host's anti-tumour immune response and represent an area of emerging immunotherapy research for the treatment of cancer, including colorectal cancer (CRC). Murine subcutaneous injections of tumour cell lines are often used to test cancer vaccines for the treatment of CRC. However, we have shown that CRC can also be modelled by a microsurgical intracaecal injection of the tumour cell CT26, a murine colon adenoma carcinoma.

To determine if the immune response to CRC could be modulated with a cancer vaccine, mice were vaccinated with chitosan hydrogel gel alone, gel and the endogenous tumour peptide AH1, or PBS for the control. Mice were then challenged either subcutaneously or intracaecally with CT26 colon adenoma carcinoma. The immune cells: dendritic cells, macrophages (F480+ and CD11b+), T cells, (CD4+ and CD8+) and B cells were identified via flow cytometry at the tumour site (local immune response) and in the spleen (systemic immune response). Splenic T cell phenotype (antigen experience, memory/regulatory phenotype, cytokine production) was also analysed via flow cytometry.

The chitosan gel vaccine provided protection against tumour growth in both subcu-

taneous (not significant) and intracaecal models (n=8–9, One-way ANOVA with Tukey post-hoc, $P < 0.01$). In the subcutaneous model, there was no difference in the frequency of infiltrating macrophages, dendritic cells or CD4+ and CD8+ T cells; nor any differences in T cell phenotype; although these experiments need to be repeated. However, in the intracaecal model, protection was correlated with an increase in splenic tumour-antigen specific and IFN γ -producing T cells (n=4–5, One-way ANOVA with Tukey post-hoc, $P < 0.0001$). These cells have also been shown to be important in human CRC.

This work will help link animal models and human data, and potentially translate cancer therapeutics into treatments for human patients.

Secreted amyloid precursor protein-alpha and active peptide fragments regulate neuronal morphology

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Neurodegeneration in Alzheimer's Disease is thought to arise both from an excess of pathogenic amyloid-beta and a deficiency of neuroprotective secreted amyloid precursor protein-alpha (sAPP α). To understand more about the biology of sAPP α and two putative active peptide fragments, RER (Arg-Glu-Arg) and 16mer, on normal tissue, we characterised their effects on dendritic spine density (two measures of neuronal connectivity).

Primary cultures of rat hippocampal neurons were transduced with green fluorescent protein via lentivirus to enable visualisation, and treated with 1nM sAPP α , RER, 16mer or control peptides for 24 hours, or sAPP α for two hours. Phosphate-buffered saline (PBS) was used as a control. Cultures were treated, then fixed with paraformaldehyde after 21 days *in vitro*. Confocal imaging analysed dendritic complexity

and spine density. Immunofluorescence allowed quantification of functional synapses.

Dendritic complexity was significantly increased by 24-hour treatment with sAPP α ($F(1, 70)=4.22, P=0.044$), and 16mer and the control peptide scrambled 16mer ($F(34, 1717)=2.01, P<0.001$), compared to PBS. RER and two-hour sAPP α treatment did not affect dendritic complexity. Dendritic spine density (specifically of thin spines) was decreased after two-hour sAPP α treatment ($t(68)=2.21, P=0.03$), but matched control levels after 24-hour sAPP α treatment. RER and 16mer did not affect spine density. The proportion of postsynaptic densities forming functional synapses (defined as colocalised synaptophysin and PSD-95) was unchanged by any treatment.

Given 24-hour sAPP α -treated neurons had higher dendritic complexity but equal spine density compared to control neurons, it is likely the total spines per cell were increased. The sAPP α -mediated transient decrease in spine density may have been due to actin recruitment for subsequent dendritic outgrowth. Taken together, these data suggest that sAPP α and 16mer have potential as therapeutic agents for restoring or preventing loss of neuronal connectivity in Alzheimer's Disease.

Post-hoc epigenome-wide association analyses validating differential DNA methylation patterns related to age, diabetes and smoking

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Increasing evidence indicates that significant components of disease aetiology may lie in

complex epigenetic interactions between an individual's genome and environment. Epigenetic patterns, particularly DNA methylation, have significant potential to: broaden understanding of pathogenesis; identify diagnostic biomarkers; facilitate development of novel pharmacological interventions. Consequently, many recently conducted epigenome-wide association studies (EWAS) have investigated risk factors including age, type 2 diabetes mellitus (T2DM) and smoking exposure. We undertook an opportunistic post-hoc analysis of an Otago-based cardiovascular disease EWAS cohort in order to validate previously reported differential methylation at particular cytosine/guanine dinucleotide (CpG) sites purportedly associated with specific phenotypes.

Genome-wide DNA methylation profiles of 487 males were analysed using BeadChip assay, which assessed 456,279 CpG sites. Post-hoc case-control EWAS were conducted for a range of risk factors, including age, T2DM and smoking. Methylation data was analysed using principal component analysis and multivariate regression.

The age EWAS included individuals between 40 and 94 years. Concordant with published analyses, the most significant CpG sites associated with genes *ELOVL2* (cg16867657, $P<4\times 10^{-37}$; cg24724428, $P<9\times 10^{-25}$) and *FHL2* (cg22454769, $P<6\times 10^{-22}$). In the T2DM EWAS, which compared only 50 cases with 436 controls, our second top association (cg19693031 in *TXNIP*, $P<6\times 10^{-7}$) also matched the top association in all published diabetes-specific EWAS. Finally, numerous previous analyses have consistently reported a large number of differentially methylated CpG sites associated with smoking. We observed a highly concordant set of associations, including cg05575921 (*AHRR*, $P<6\times 10^{-52}$), cg03636183 (*F2RL3*,

$P<2\times 10^{-23}$) and cg19859270 (*GPR15*, $P<5\times 10^{-15}$).

Our dataset was not specifically designed to interrogate age, T2DM and smoking exposure, but we were able to show remarkable reproduction of previously reported results from EWAS. Such post-hoc EWAS validation of these published associations demonstrates the potential robustness of CpG site methylation as disease biomarkers.

Supported by the Maurice and Phyllis Paykel Trust Research Award in Medical Sciences Scholarship, and the AFJ Mickle Award.

Attitudes and barriers to physical activity and levels of physical activity in adults with obesity consuming very low calorie diets

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Physical activity for prevention and management of non-communicable diseases (NCDs) is supported by evidence, and is a core component of physiotherapy interventions. High BMI, associated with most NCDs, is the leading modifiable risk to health in New Zealand. A very low calorie diet (VLCD) is an effective and widely used weight loss intervention for adults with obesity. However, adverse effects include loss of lean tissue, strength and aerobic capacity. Regularly engaging in physical activity can attenuate these adverse effects and contribute to weight maintenance following VLCD. The level and perceptions of physical activity in New Zealand adults with obesity, consuming a VLCD, have not previously been investigated. This mixed-methods study aimed to identify attitudes and barriers to physical activity in adults with obesity consuming VLCDs and measure their physical activity levels.

Ten adults (mean age 44.3y, SD 12.3; BMI 40.8kg/m², SD 6.8) participated. Physical activity levels over seven days were measured with ActiGraph wGT3x-BT accelerometers and the Global Physical Activity Questionnaire (GPAQ). Participants' attitudes and barriers to physical activity were explored through thematic analysis of semi-structured interviews.

Responses to the GPAQ indicated that six participants engaged in less than 150 minutes of moderate activity/week. Seven days of accelerometer data were captured for eight of the 10 participants; five of these participants accumulated less than 150 minutes of moderate intensity activity. Themes identified included psychological and physical barriers, motivators, facilitators and positive feedback cycles. VLCD was perceived to be a facilitator of physical activity.

The majority of adults with obesity who were consuming a VLCD engaged in less moderate intensity physical activity than is recommended by the World Health Organization (150 minutes/week). VLCD was not a perceptible barrier: it facilitated physical activity. Physiotherapy interventions utilising physical activity, and VLCD may be mutually beneficial interventions in adults with obesity.

Curcumin derivatives as a novel strategy for overcoming crizotinib resistance in EML4-ALK+ lung cancer cell lines

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Lung cancer is an aggressive disease and is the most lethal cancer worldwide. Approximately 20–30% of lung cancers are caused by oncogenic receptor tyrosine kinases (RTK). The fusion of echinoderm microtubule associated protein like 4 (EML4) with anaplastic lymphoma kinase (ALK) produces an oncogenic RTK. Crizotinib is the current first-line treatment for this subtype of cancer, however, resistance usually develops after 12 months. One strategy to overcome resistance is to test existing compounds with anti-cancer properties. Curcumin has been previously shown to produce cytotoxic effects in other cancers, however, it has not been examined in this subtype of lung cancer. Curcumin has a poor pharmacokinetic profile, so derivatives have been developed. This project tested if curcumin deriv-

atives (RL66 and RL118) were potent in crizotinib-sensitive and crizotinib-resistant EML4-ALK+ cancer cells.

The sulforhodamine B assay was performed to investigate cytotoxicity and non-linear regression analysis was conducted to calculate the IC₅₀ ± SEM. The extra sum of squares F test was used to test for differences in IC₅₀s.

EML4-ALK+ H3122 cells exhibited significantly greater sensitivity to RL66 and RL118 (IC₅₀=0.97±0.05 and 0.70±0.02µM, respectively), when compared to EML4-ALK- A549 cells (2.65±0.12 and 1.15±0.10µM, respectively, P<.0001). The addition of an ALK agonist, pleiotrophen, did not significantly alter the cytotoxicity of the compounds (P>0.05). In the resistant cells (CR-H3122), RL66 and RL118 retained potency (IC₅₀ of 2.15±0.26 and 1.44±0.13µM, respectively) and produced smaller fold changes (2.2- and 2.1-fold increases) compared to crizotinib (13-fold increase).

We conclude that the mechanism of RL66 and RL118 toxicity does not involve direct effects on ALK. The potent cytotoxic effects of these compounds may be a promising treatment in crizotinib-resistant EML4-ALK+ lung cancer.

URL:

<http://www.nzma.org.nz/journal/read-the-journal/all-issues/2010-2019/2018/vol-131-no-1470-23-february-2018/7508>

Time for healthy investment

Scott Metcalfe, Sanji Gunasekara, Kate Baddock,
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Published: 27 October 2017 (Vol 130 No 1464)

In the first published version of this manuscript, two corrections for the above article were sent in post-publication:

In paragraph 8 and in the Supplementary Information section, the words “imputed values of life” should have been “imputed values of lives saved”.

This was resolved online and in the PDF on 13 February 2017.

URL:

<http://www.nzma.org.nz/journal/read-the-journal/all-issues/2010-2019/2018/vol-131-no-1470-23-february-2018/7509>
