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Antimicrobial stewardship practice in New Zealand’s rural hospitals
Jared K Green, Sharon J Gardiner, Sarah L Clarke, Lee Thompson, Sarah CL Metcalf, Stephen T Chambers

Antimicrobial stewardship (AMS; the judicious and guided use of antibiotics) is an important concept in modern healthcare but is under-explored in rural hospital medicine. Access to AMS education and support is inconsistent in rural hospitals. While AMS is perceived to be relevant in rural hospitals, the problems it aims to prevent, including antimicrobial resistance and antimicrobial overuse are more likely to be considered as urban or overseas issues. The development of AMS strategies for rural hospitals will require special consideration of the specific environment of rural hospitals, including resourcing constraints.

Reduction in surgical site infections in the Southern Cross Hospitals network, 2004–2015: successful outcome of a long-term surveillance and quality improvement project
Arthur J Morris, Tanya M Jackways, Adrienne Morgan, Rosaleen Robertson, Muriel McIntyre

Although surgical wound infections are uncommon when they occur, they have a significant impact on patients. Southern Cross Hospitals has reported a 59% decrease in surgical wound infection over 12 years. A surgical wound monitoring programme, in place since 2004, attributes this outcome to quality improvement initiatives. The programme confirmed the effectiveness of two key practices: the use of alcohol-based skin preparation and enhanced timing of antibiotics given to patients. Across the period, the wound infection rate dropped from 3.5% to 1.2%, a decrease of approximately 5% a year. The most frequent cause of wound infection was from Staphylococcus aureus, commonly referred to as ‘staph’, an organism often found up the nose and from there transferred to a person’s skin or wound. Southern Cross Hospitals continues to promote practices to reduce wound infections even further.

Healthcare-seeking behaviour of people with sexually transmitted infection symptoms attending a Sexual Health Clinic in New Zealand
Hayley J Denison, Lisa Woods, Collette Bromhead, Jane Kennedy, Rebecca Grainger, Annemarie Jutel, Elaine M Dennison

Untreated sexually transmitted infections (STIs) can lead to serious health complications and may be transmitted to uninfected individuals. Prior to this study, time to presentation for STI symptoms and risk of transmission in this period had not been assessed in New Zealand. This research surveyed people attending a sexual health clinic (SHC) in Wellington, New Zealand. In total, 243 people took part. The most common reason for seeking healthcare was experiencing symptoms. 41.7% of people with symptoms waited more than seven days to seek healthcare. Almost a third of people with symptoms had sex after they first thought they may need to seek healthcare. This work suggests more could be done to help people attend healthcare quicker when they experience symptoms suggestive of an STI. Some possible options could be a public health campaign explaining why taking swift action is important, or providing support and guidance to help people navigate the healthcare system.
100 years since the 1918 influenza pandemic—progress made, yet questions remain. A synopsis of the 4th New Zealand Influenza Symposium, February 2018

Nadia A Charania, Nikki M Turner

Influenza pandemics cause devastating social and economic destruction worldwide, while seasonal (annual) outbreaks of influenza cause substantial illness and death that burdens healthcare services every year. The Immunisation Advisory Centre (IMAC) hosted the 4th New Zealand Influenza Symposium (NZiS) in February 2018 in Wellington. The event attracted international and national experts to discuss current influenza-related policy, immunisation practice and research. Key topics discussed were how to better prepare for the next influenza pandemic and strategies to improve policy and vaccine delivery mechanisms to better protect people, particularly vulnerable groups, against influenza.

Pro-equity climate change and environmental sustainability action by district health boards in Aotearoa/New Zealand

Hayley Bennett, Paula King

As outlined in the 2018 ‘Letter of Expectations’ from the Minister of Health, climate change action is now expected of DHBs. We argue that this - and all other - DHB action must be pro-equity to achieve fair health outcomes for Māori and Pacific populations. Three scenarios are proposed in the areas of DHB energy use, transport and purchasing where climate pollution could be reduced, and health determinants and outcomes for Māori and Pacific peoples improved. The scenarios show that by taking a sustainability and equity perspective, it is possible for DHBs to move beyond disease treatment to create health and equity solutions.

Implementing HIV pre-exposure prophylaxis (PrEP): Let’s not get caught with our pants down

Peter J Saxton, Massimo Giola, Edward P Coughlan, Joseph G Rich, Sunita Azariah, Adrian H Ludlam, Christy O’Toole, Mike Pohl, Jason M Myers

PrEP is a hugely promising new tool in the HIV prevention toolkit but it won’t stop transmission if it’s sitting on the shelf. Our concern is that people most at risk of HIV don’t know about PrEP; sexual health clinics are struggling from underfunding; GPs aren’t offering PrEP to their eligible patients; and we aren’t monitoring PrEP roll-out well enough. HIV diagnoses have been rising in NZ so getting PrEP implementation right is critical. Our grave concerns about slow PrEP implementation are reflected in two recent news stories: the congenital syphilis scandal; and poor coverage of sexuality in medical school curricula.
‘That Terrible Time’: Reflections on the 1918 Influenza Pandemic in New Zealand

Geoffrey W Rice

The report in this issue on the 4th New Zealand Influenza Symposium held in Wellington in February this year is a timely reminder of this country’s greatest peacetime disaster and its worst public health crisis. In November various events will mark the centenary of the so-called ‘Spanish’ influenza pandemic, known here as the ‘Black Flu’ of 1918, in which at least 9,000 New Zealanders died in the space of less than two months, mostly from the pneumatic complications of virulent pandemic influenza. This figure is about half the total mortality of New Zealand soldiers in the four years of the First World War, and vastly overshadows the death tolls from more familiar disasters such as the Napier earthquake or the Mt Erebus crash. The best estimates of global mortality from the three waves of the 1918–19 flu are close to 60 million, or three times the estimated total of deaths caused by the First World War.

Why should we bother to remember something that happened a century ago? Quite apart from the necessity for any civilised society to remember its past, the main reason is that the risk of another influenza pandemic is now greatly enhanced by mass jet travel, as we saw in 1997 and 2009. Some of the lessons from 1918 are still relevant today, and have been incorporated into New Zealand’s current Influenza Pandemic Plan. As the philosopher George Santayana famously warned, those who forget the past are condemned to repeat it.

New Zealand was the first country in the world to have its 1918 influenza victims analysed from individual death certificates. Death registration was virtually complete for the Pakeha population, but only about two-thirds of Māori flu deaths were registered, some not until the early months of 1919. Recent research on overseas deaths from influenza among the military has raised the Pakeha death toll to 6,671 while the estimated Māori death toll has risen to 2,500. The combined total of 9,171 New Zealand victims yields a death rate of 7.9 per 1,000, which is moderate by world standards. However, this masks the striking difference between Pakeha and Māori death rates: 6.0 per 1,000 for Pakeha and 48.9 per 1,000 for Māori.

Why did Māori die at eight times the rate of Pakeha in the 1918 flu? There is no simple single answer. The Māori population in 1918 was predominantly rural, and some remote settlements may have missed the protective effect of the mild first wave of the flu in September–October 1918. Yet high death rates were also reported from districts such as South Taranaki where Māori lived in close proximity to their Pakeha neighbours. A variety of factors combined to create a ‘perfect storm’ for a vulnerable population. Poverty, poor nutrition and poor housing were probably contributing factors, but high rates of TB and other respiratory infections, along with widespread tobacco smoking, made Māori highly susceptible to the severe second wave of the 1918 pandemic.

The impact on the Pakeha population was extremely diverse. Some larger towns and cities such as Nelson, Timaru and Dunedin came through with very low death rates, while smaller towns such as Inglewood, Dannevirke, Taumarunui, Taihape, Invercargill and Nightcaps suffered high death rates. The latter all had high influenza morbidity and a shortage of volunteers.
to help the sick. Recent work comparing
Wellington and Christchurch suggests that
differences in response, community organi-
sation, availability of nurses and volunteers,
and medical treatment in the temporary
hospitals could account for a significant
contrast in death rates.7

International research on the virology
and epidemiology of the 1918 flu pandemic
has grown enormously over the last thirty
years, and some of the greatest puzzles
about this exceptional event are starting
to be solved. Experiments on macaque
monkeys with a reconstructed A/H1N1 flu
virus have suggested that the 1918 flu was
unusually penetrative, bypassing the body's
normal defences to lodge deep in the lungs,
causing massive inflammation and severe
pneumonic infections.8 Unusual symptoms
of the 1918 flu included epistaxis, cyanosis
and hair loss. The victims' bodies were
often so deeply cyanosed that they turned
black upon death, and rapid decomposition
required urgent burial.

The most striking peculiarity of the 1918
pandemic was that it killed mostly young
adults in the age-groups between 20 and
45 years. This puzzle has been partly
resolved by research on individual death
records in North American cities, where two
independent teams reached similar conclu-
sions.9,10 They noticed a uniform peak in the
age of victims at 28 years. That cohort was
born in 1890, in the midst of the world's
previous influenza pandemic, the 'Russian'
or 'Asiatic' flu of 1889–92. The hypothesis
is that babies and young children exposed
to that virus (probably A/H3N8) suffered
damage to their immune systems, so that
when as young adults they encountered a
different flu virus in 1918 their dysregulated
T-cells overreacted and triggered a 'cytokine
storm'. New Zealand data tends to support
this hypothesis,11 though recent work on
precursor waves suggests a more complex
pattern.12

While this is a neat and plausible expla-
nation, it does not answer all of the puzzles
about the 1918 flu. Why did Pakeha males in
the worst-affected age-groups die at almost
double the rate of females, while the Māori
age-specific death rates for males and females
were almost identical? Why did Japan record
a moderate death rate, similar to that of New
Zealand, while the rest of Asia recorded some
of the worst known death rates?

There is much that we may never know
about the 1918 influenza pandemic. Little
is known about China, Central Asia and
most of Africa for simple lack of evidence,
but wherever records have survived and
are available for analysis, the death totals
continue to go up, as shown by recent work
in Mexico, South America and Spain. Opti-
mists doubt that the world will ever see a
repeat of the ‘Spanish’ flu pandemic, unless
we have a novel avian flu virus unleashed in
the midst of another world war.13 However,
it is better to be prepared than caught
unawares, or as unprepared and complacent
as the New Zealand Department of Public
Health was in 1918. We may derive some
comfort from the news that the Ministry
of Health now has stockpiles of antibiotics
and anti-viral drugs, along with 20,000 body
bags. But we should not forget the salient
lesson of the 1918 flu. Hospitals and medical
personnel were quickly overwhelmed,
and most flu patients were nursed in their
own homes. We need better education of
the general public in such matters as home
nursing, especially of pneumonias, and the
revival of neighbourhood support groups.
We also need more memorials to remind
future generations of how many died in
1918, and more New Zealand history taught
in schools to tell them how we coped with
the country’s last great pandemic.
Competing interests:
Nil.

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Government climate and health equity priorities must prompt a deeper re-think of health and healthcare for the 21st century

Alex Macmillan, Rhys Jones

This year, in an historic move, the Minister of Health issued letters of expectation to all DHBs which included a directive for action by DHBs to address climate change, together with a priority to reduce health inequities. The new climate change requirement recognises that the health sector is not only a major contributor to the greatest public health issue facing us, but also has the potential to show leadership in addressing climate change in ways that protect and promote health. It can be put in the context of healthcare ethics, particularly that it is unethical to provide healthcare while also harming health through environmental pollution. For this reason, accounting for environmental impacts of healthcare is enshrined in the legislation governing District Health Boards.

The Minister’s directive does not come out of the blue; rather it is the result of a decade of joint advocacy by hundreds of individual health professionals and their professional colleges and organisations, led by OraTaiao: The NZ Climate & Health Council. This advocacy has culminated in the creation of a specific ministerial portfolio on climate change and health. It is built on a growing body of evidence about the impacts of climate change, health and health equity, as well as the potential for multi-solving for health and health equity in climate change mitigation. The directive also responds, belatedly, to the WHO Commission on the Social Determinants of Health’s call “to bring the two agendas of health equity and climate change together”.

In this issue of the Journal, Bennett and King outline what DHBs can do to respond to this expectation, alongside the Minister’s priority to reduce health inequities. They provide four practical examples, based on experiences from the many DHBs who are already taking action to reduce their greenhouse gas emissions, and to adapt to the climate change impacts which are already locked in through our past inaction. The fact that the authors use ‘blue-skies thinking’ to come up with the four scenarios demonstrates how little research attention has thus far been given to this important topic globally and in New Zealand. It’s clear that bringing together the evidence base about what works to reduce greenhouse gas emissions and what works to reduce health inequities in New Zealand is a much-needed next step.

Together with others (such as OraTaiao, the Sustainable Health Sector National Network and hundreds of health care workers who have signed a letter of petition to the government), Bennett and King call for the Ministry of Health to set up a centre similar to the UK’s Sustainable Development Unit and to require DHBs to measure, report on and reduce their greenhouse gas emissions.

A UK-style Sustainable Development Unit would be flawed in a New Zealand context, partly because the UK’s approach has not yet tackled the intertwined nature of equity and sustainability. What Bennett and King ably demonstrate is that actions to reduce emissions while also addressing health equity are context dependent, and need to
be designed with local communities, particularly in partnership with hapū, iwi and Māori communities. While it has been a challenge to measure the successful reductions in greenhouse gas emissions as a result of the UK SDU work, a complex extension of evaluation will also need to be incorporated to measure impacts on social and health equity.

The Minister’s letter, and Bennett and King’s article, also represent a first step towards a crucial wider conversation about what we mean by ‘health’ and ‘healthcare’ in the context of a full planet—one in which successful human population growth has overwhelmed the ability of most other species to flourish—and a planet on which humans are now affecting the Earth’s systems fundamentally in ways that warrant our own eponymous geological epoch—the *Anthropocene*.5,6

Climate change is just one of the Earth’s ecosystem limits we have exceeded. Steffen and colleagues describe in detail nine important and interlinked system limits, of which humans have caused the breaching of at least three, (the nitrogen and phosphorous cycles, and biodiversity being the most severe, Figure 1).7 In Aotearoa New Zealand, we have pushed the limits of all three of these, with severe consequences for land use, freshwater quality and native biodiversity.

It is no coincidence that the breaching of these boundaries is the culmination of decades of relentless Western neoliberal free market capitalism, which has assumed that maximising economic growth through de-regulation of economic markets is the only pathway for improving human well-being—through the exploitation of natural and human ‘resources’. Concerningly, the same paradigm of commodification is being used to suggest “tepid market-based solutions”8 to climate change, which fail to adequately reduce greenhouse gas emissions while also often having negative consequences for other health, equity and sustainability outcomes.

Until recently, New Zealand governments across the political spectrum have flown the flag for this flawed economic model, and it has filtered into every aspect of New Zealand life, including health. The results have included increasing social and health inequities, and unacceptable pressures on natural systems, such as fresh water, clean

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**Figure 1:** Planetary boundaries to guide human wellbeing on a changing planet.
air, biodiversity and the climate. A ‘market’ approach to health has led us to value individual extensions of life expectancy through advanced technologies in tertiary care over safeguarding these fundamental building blocks of health for future generations.

A serious conversation about equitable and sustainable health and healthcare therefore requires significant reorientation. This is occurring globally in a number of guises. The UN Sustainable Development Goals set out 17 interlinked health, environmental and economic targets for countries at all stages of economic development. New Zealand has signed up to meeting these goals but has yet to incorporate them into policy and action. Meanwhile, in Western public health, there is a renewed understanding that health, social and health equity, and global ecosystem sustainability are intertwined. Most recently, the Lancet’s deft repackaging of a range of existing ideas gave rise to the concept of Planetary Health—a multi-disciplinary endeavour to promote sustainable and equitable consumption, reduce population growth and place human health in the context of well-functioning natural systems.

While these ecological approaches linking health, healthcare, equity and environmental sustainability feel new to Western health practice, they approximate and to some degree echo the unbroken fundamental world views of indigenous peoples’ globally, including Māori models of wellbeing. These models explicitly which situate human wellbeing within the health of local ecosystems. By accepting both the dominant market-based solutions to climate change and imported health paradigms, we continue to silence and devalue voices of indigenous leadership. By doing so, we are missing crucial pieces necessary to re-orient and transform towards health equity and sustainability.

The root causes of unsustainability and health inequities in Aotearoa New Zealand are intimately linked to processes of colonisation and colonialism, which have set up the social and economic structures of natural resource exploitation, constrained indigenous health development and over-ridden holistic concepts of hauora Māori.

All three of Bennett and King’s scenarios emphasise strong partnership working with Māori to ensure action to reduce healthcare greenhouse gas emissions are translated into improvements in hauora Māori, and Māori health equity. A critical examination is needed of how our health system reinforces colonialism, perpetuates inequalities and is conceptually unsustainable. The re-structuring of our health system that must now occur (and for which a government review is currently underway) needs to dismantle systems and structures that further entrench the status quo, and centralise Māori knowledges, governance partnerships and self-determination.

Competing interests:
Nil.

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Infectious disease and sepsis: not gone, not forgotten

Paul Huggan, Robert Martynoga

Every era in healthcare has its own defining issues which shape public, professional and political dialogue. In sociologic terms these take the form of ‘discourses’ which provide order to the world in which we operate, attach meaning to the work that we engage in and allow us to communicate its importance to others.1 “Discourses are ways of seeing the world. They act like lenses or filters, and they make it possible for us to say some things but not others”.1 A discourse is held to be the best approximation of the truth until it is accepted to be wrong and replaced by another. For example, a dominant miasmatic discourse determined that London’s epidemics of cholera in the mid-19th century arose from polluted air even after John Snow’s observations in relation to the Broad Street water pump were widely publicised.2 London’s sewer system was commissioned solely to deal with its intolerable ‘miasma’, not its faecally contaminated water.

With World Sepsis Day marked on the 13th September, what is the state of our current discourse with respect to infectious diseases and their complications? In the second half of the 20th century, the advent of the antibiotic era led to hubristic determinations that the “war on infectious disease has been won”. For years this quote was mistakenly attributed to the US Surgeon General William H Stewart based on a series of misunderstandings, but was widely taken up by others in academia around the time that Omran’s transition theory was first proposed.3 This asserted that chronic non-communicable diseases will replace infections as the main threat to population health as growing incomes and trade permit food security and effective programs of public health.4 Have chronic diseases replaced infectious disease as the dominant cause of morbidity and mortality? Are infectious diseases “gone but not forgotten”? This question was tested empirically by Michael Baker and others, who demonstrated that infectious diseases still accounted for 1 in 4 hospital admissions in New Zealand in 2008, and had actually increased from 1 in 5 admissions in 1989.5

A feature of infectious disease and sepsis epidemiology globally is the increase in incidence among indigenous peoples and those who experience high levels of socio-economic deprivation and exclusion. Between 2003 and 2013, New Zealand’s ‘rock star’ economy was not one that could prevent a 19% relative increase in the proportion of Māori and Pacific earners in the lowest quintile of incomes (compared with a 3.6% rise among New Zealand Europeans).6 The effect of being Māori in relation to infectious disease risk (compared with non-Māori) is remarkably consistent. In the study by Baker et al, Māori people were 2.15 times more likely than non-Māori to be hospitalised with infection.5 In the Waikato District Māori are 3.2 times more likely than non-Māori to be admitted with sepsis, the most serious complication of infection.7 Against this backdrop of inequality, it is arresting but perhaps unsurprising to read of the strong association between scabies and impetigo. Impetigo and skin infections are common among Māori and Pacific young people. If as suggested there is a 93% overlap between scabies and impetigo, more work is clearly needed to understand the interaction of scabies infestation with streptococcal and post-streptococcal disease. Infectious diseases associated with socio-economic disadvantage may be largely forgotten (or under-reported) but are by no means gone.

If due to the effects of poverty, ageing and chronic co-morbid illness we are admitting more people with infection, it should follow that the health of our population is increasingly affected by their most severe manifestations. In the world of research into sepsis epidemiology, admissions with primary ‘infectious disease’ codes that are...
associated with secondary organ failure are extracted from hospital discharge statistics and matched to census population data. Applied to acute hospitalisations in the Waikato, this approach has shown that around 1 per 1,000 of the population are hospitalised with sepsis annually, accounting for 2% of all admissions in 2017/18 (Moosa S, personal communication). Sepsis is therefore commonly experienced and well understood by frontline healthcare workers, with the spectre of untreated or undertreated disease proving difficult to balance against efforts to preserve antimicrobial efficacy through programs of stewardship. Green et al provide insights into the other personal and environmental factors creating the conditions for antimicrobial overuse and misuse in public hospitals. To the practitioners surveyed, broad spectrum antimicrobials (clindamycin, quinolones and 3rd generation cephalosporins) were widely available without prescribing advice or restriction; audit and education were patchy; antimicrobial stewardship (AMS) efforts were felt to be important but more at a national than a personal level; most practitioners had faced the difficulties of managing multi-drug resistant bacterial disease or *Clostridium difficile* infection. To borrow the words of the authors, sustainable AMS strategies in rural and tertiary practice in New Zealand will “depend on bespoke solutions and fostering a sense of personal and local importance”. Greater efforts are needed to equip the healthcare workforce with the knowledge, skills and support services necessary to blend effective management of infection and sepsis with antimicrobial parsimony.

Looking to infection prevention at a population level, it is clear that chronic diseases interact with health behaviours and the environment to increase the risk of serious infection. Almost all of the conditions worthy of recording in a patient’s past medical history are associated with an increased risk of hospitalisation with infection and/or sepsis. For this reason it is encouraging that the New Zealand government has funded several programs of treatment and prevention for chronic viral infections. Large-scale implementation of pre-exposure prophylaxis (PrEP) is associated with significant reduction in new HIV infection. The justifications for PrEP are clearly laid out by Peter Crampton, with the opportunity to prevent transmission coming at a time of rising incidence among those groups most at risk. While it might be tempting to look to a future where the complications of HIV are a thing of the past, there are other potential pathogens on the horizon for which we may be less well prepared. Illustrating this well, Charania and Turner summarise the principal effects of the 1918–19 influenza pandemic for the Journal’s readership, demonstrating not only the potential global effects of epidemic viral illness but also the disproportionate impacts that fall on developing countries, marginalised populations and underfunded health systems.

In summary, thanks to well-funded public and primary health programmes focusing on hygiene, food safety and vaccination, the infectious disease landscape in New Zealand is no longer dominated by the epidemic infectious diseases of the early 20th century. However, infection and sepsis still stalk people made vulnerable by age, poverty, co-morbidity and well-intentioned medical therapy. Our response needs to be reflected in a new public and professional discourse emphasising that infectious diseases and their severe sequelae are not gone, and not forgotten. To this end, at the 70th World Health Assembly in May 2017, a resolution was adopted requiring member governments to improve the prevention, diagnosis and treatment of sepsis. The resolution recognises the crucial overlaps between improving sepsis care, preventing infection and preserving available antimicrobial therapy. These are “wicked problems” that need to be tackled by multi-disciplinary, multi-sector and multi-agency approaches. None of these will emerge without professional and political leadership. For example, the World Health Organization recommends facilitation and funding for a national sepsis action plan, something which has already been achieved in Australia. Given the findings presented in this edition of the Journal and their broader context, a sepsis action plan to complement antimicrobial stewardship, public health and infection prevention efforts should be an essential component of our approach to contemporary infectious disease challenges.
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Antimicrobial stewardship practice in New Zealand’s rural hospitals

Jared K Green, Sharon J Gardiner, Sarah L Clarke, Lee Thompson, Sarah CL Metcalf, Stephen T Chambers

The Infectious Diseases Society of America (IDSA) defines antimicrobial stewardship (AMS) as coordinated interventions designed to improve and measure the appropriate use of antimicrobial agents by optimising their selection and dosing regimens.1 Despite a growing volume of stewardship research, AMS practice in non-specialist and rural hospital settings is under-explored. Internationally, research conducted to date has focused on institutional surveys, with a handful of papers exploring the introduction and potential benefits of AMS by telemedicine in geographically remote hospitals.2–3 Although interest in AMS is increasing in New Zealand, practice is highly variable, even in larger centres.4

In the only published insight into rural hospital antimicrobial use in New Zealand, a study of antimicrobial consumption suggested relatively high use of antimicrobial agents in Hawera hospital at 117.6 DDD per 100 bed days, compared to 65.8 for Taranaki DHB as a whole.5 While it is unclear whether this reflects the case mix of the hospital or suboptimal antimicrobial use, it does warrant further investigation. In contrast, a DDD study looking at outpatient antimicrobial prescribing in Tairāwhiti suggested comparatively low rates of prescribing to rural residents regional rather than individual DHB antimicrobial guidelines and a national antimicrobial resistance strategy.6,7 In this context, study of what is likely to exist at the margins of any new strategy warrants discussion, including developing insight into issues faced by rural prescribers and rural AMS activities to ensure that these aspects are incorporated into mainstream AMS planning.

ABSTRACT

AIMS: We aimed to describe how antimicrobial stewardship (AMS) is practised in New Zealand’s diverse rural hospital network.

METHODS: Rural hospital medical practitioners were surveyed to estimate the utilisation of prescribing resources and specialist support for AMS, and attitudes towards AMS. Questions reflected recommended strategies for AMS programmes.

RESULTS: The response rate was 80.8% (122/151) from 29 rural hospitals (3–114 beds). While 78.7% reported access to local antimicrobial prescribing guidelines, discordant answers from practitioners at the same institution were common. The practice of approval for access to broad-spectrum antimicrobial agents was uncommon. Most respondents had cared for a patient with a multi-drug resistant organism in the preceding 12 months. Only 34.8% of respondents reported receiving formal education on AMS principles, with at least 90% believing it was relevant irrespective of the clinical context considered. Respondents were more likely to believe that antimicrobial overuse and resistance were more relevant at sites distant from the context of rural hospital practice.

CONCLUSION: While AMS is perceived as relevant for rural hospital medicine, many of the building blocks of AMS systems are absent in this environment. This presents an opportunity for development as AMS strategies evolve in New Zealand.
when compared to residents of Gisborne.\textsuperscript{10} Limited research has suggested that rural hospitals elsewhere are likely to have fewer infectious diseases resources available and are less likely to have established AMS programmes.\textsuperscript{2–3} To contribute to grounding research in this area, a mixed methodology study targeting New Zealand’s rural hospital doctor workforce was undertaken.

Materials and methods

A 33-item, electronic survey was created using the SurveyMonkey\textsuperscript{TM} platform (SurveyMonkey Inc. Palo Alto, California, USA). This incorporated multiple-choice questions, Likert scales and free text boxes, enabling collection of quantitative and qualitative data. The survey was designed to assess perceptions of AMS and access to key and supplemental AMS strategies as outlined by the IDSA.\textsuperscript{11} It also incorporated questions to assess hospital and practitioner demographics and exposure to multi-drug resistant organisms (MDROs). Free text boxes asked participants to explain what they believed AMS to involve, how they believe it could be improved in the rural hospital environment, and to provide any additional comments. Using the questions as a broad frame, a thematic analysis was performed within each, employing the Framework method, as described by Ritchie and Spencer.\textsuperscript{12} This consists of five stages: familiarisation with the data; establishing a thematic framework; indexing/coding; charting; and mapping and interpretation. This was conducted by two authors (JG, SC) independently. While the analysis followed a largely theoretical or deductive pattern, as detailed by Braun and Clarke, attention was paid to the existence of potential latent themes, in addition to those more explicit in the text.\textsuperscript{13} Verbatim free-text comments are used to illustrate the themes in the results section.

A hospital was considered rural if it was classified as such by the Royal New Zealand College of General Practitioners’ Division of Rural Hospital Medicine.\textsuperscript{14} Hospitals were excluded if they did not provide acute care.

We attempted to survey all doctors who had practised in a rural hospital in the preceding 12 months. A senior clinician or manager was approached at each of the 29 eligible hospitals to identify potential participants. The Division of Rural Hospital Medicine was contacted to identify eligible rural hospital medicine trainees. On 10 September 2014, an electronic link to the survey was emailed to each potential participant, with three reminders sent periodically to non-responders until the survey closed. Responses were de-identified, then downloaded to Microsoft Excel\textsuperscript{TM} (quantitative data) or Microsoft Word\textsuperscript{TM} (qualitative data; Microsoft Corporation; Redmond, Washington, USA) for analysis.

The research team engaged in consultation with Canterbury District Health Board’s (CDHB) Te Komiti Whakarite. It subsequently received ethics approval from the CDHB/University of Otago research committee (reference #14128) and the Ngāti Porou Hauora research office (Gisborne, New Zealand; http://www.nph.org.nz).

Statistical methods

Descriptive methods were used to analyse the results, which were expressed as percentages using the number of responses to that question (variable) as the denominator.

Results

Population characteristics

Senior clinicians and managers from 29 rural hospitals (Figure 1) agreed to participate in the survey, and a total of 151 eligible practitioners were identified. Of these, 122 responded giving a response rate of 80.8\% (Table 1). Most of the respondents (84.4\%) identified themselves as senior medical officers and the most common scope of practice was rural hospital medicine (RHM) alone, or in combination with another specialist domain such as general practice (GP; 67.3\%) (Table 1).
Figure 1: Location of participating hospitals in New Zealand.

Key: Each circle denotes the location of a participating rural hospital.

Hospital context

The median number of beds per hospital was 20 (range 3–114). One third of rural hospitals were administered by non-governmental organisations (NGOs, such as community or Māori health trusts [34%; (10/29)]. The model of practice varied, with 41.4% (12/29) reporting their model of care as most consistent with that of an integrated health centre (with a co-located GP clinic, visiting specialist service, diagnostic testing and hospital facility). Only 44.8% (13/29) reported following a more traditional New Zealand public hospital model while 44.8% (13/29) did not have an emergency department (Table 1). Twenty-four hospitals (82.8%) had a medicines service provided by their base hospital (7), a community pharmacy (15) or a mixture of the two (2).
Seventeen hospitals (58.6%) reported that they had access to ward pharmacy services including chart review, while only seven (24.1%) reported having on-site laboratory microbiology (Table 1).

**Access to prescribing resources and advice**

Most (78.7%) practitioners (96/122) reported having access to antimicrobial guidelines from their own hospital or DHB, but 9.0% (11/122) denied having a local guideline, and 12.3% (15/122) were unsure if local guidelines existed. There were discordant responses to this question from half of the hospitals from which more than one response was received (11/22). With respect to external resources, 68.0% (83 of 122) had made use of a guideline published by another DHB, 51.6% (63 of 122) had used the Best Practice Advocacy Centre’s (BPACTM) Antimicrobial recommendations for primary care, and 63.1% (77 of 122) had used UpToDateTM for antimicrobial guidance.15,16 Rural hospital doctors reported using a mean of 3.5 different prescribing resources in the past year (Figure 2A).

Respondents were most likely to solicit antimicrobial prescribing advice by telephone from specialists who are based at other hospitals or DHBs. If antimicrobial advice was required, infectious diseases physicians were contacted most frequently (80.3%; 98/122). Rural hospital doctors were likely to engage rarely or never with most advisors of antimicrobial prescribing, and to do so by telephone, suggesting that most interactions are likely to be ad hoc [Figure 2B]. Rural hospital practitioners generally agreed that their local processes for obtaining antimicrobial treatment advice were satisfactory (59.3% 70/118) and that it was easy to contact infectious diseases and microbiology services for advice (79.7%; 94/118).

**Table 1: Hospital and participant demographics.**

<table>
<thead>
<tr>
<th>Hospital characteristics:</th>
<th>Number</th>
<th>Percent or range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Median bed number (range)</td>
<td>20</td>
<td>3–114</td>
</tr>
<tr>
<td>DHB* ownership</td>
<td>19</td>
<td>66%</td>
</tr>
<tr>
<td>NGO** ownership</td>
<td>10</td>
<td>34%</td>
</tr>
<tr>
<td>On-site microbiology service</td>
<td>7</td>
<td>24%</td>
</tr>
<tr>
<td>Ward pharmacy service</td>
<td>17</td>
<td>59%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Participant characteristics:</th>
<th>Number</th>
<th>Percent or range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Senior medical officer</td>
<td>103</td>
<td>84.4%</td>
</tr>
<tr>
<td>Resident medical officer</td>
<td>12</td>
<td>9.8%</td>
</tr>
<tr>
<td>No response</td>
<td>7</td>
<td>5.7%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Scope or speciality of practice:</th>
<th>Number</th>
<th>Percent or range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rural hospital medicine (RHM) only</td>
<td>34</td>
<td>27.9%</td>
</tr>
<tr>
<td>General practice (GP)</td>
<td>18</td>
<td>14.8%</td>
</tr>
<tr>
<td>RHM and GP</td>
<td>30</td>
<td>24.6%</td>
</tr>
<tr>
<td>RHM and another scope</td>
<td>18</td>
<td>14.8%</td>
</tr>
<tr>
<td>Emergency medicine</td>
<td>11</td>
<td>9.0%</td>
</tr>
<tr>
<td>Internal medicine</td>
<td>4</td>
<td>3.3%</td>
</tr>
<tr>
<td>General surgery</td>
<td>3</td>
<td>2.5%</td>
</tr>
<tr>
<td>No response</td>
<td>4</td>
<td>3.3%</td>
</tr>
</tbody>
</table>

Key: *District health board; **Non-governmental organisation.
Figure 2: Access to prescribing resources, advice and practice of approval.

a) Estimated frequency of use of prescribing resources.

- Hospital/DHB Guideline
- Departmental protocols
- Guidelines from another DHB
- BPAC
- UpToDate

b) Sources of prescribing advice and estimated frequency of engagement.

- Infectious Diseases Physician
- Clinical Microbiologist
- General Physician
- Specialist Registrar/Resident
- Pharmacist
- Local Rural Generalist

c) Is pre- or post-approval sought when prescribing broad spectrum antimicrobials?
Exposure to MDROs

In the preceding year, most clinicians (90.9%; 111/122) reported caring for a patient infected with or colonised by an MDRO or *Clostridium difficile*. Most respondents reported encountering methicillin-resistant *Staphylococcus aureus* (77.0%; 94/122). Extended-spectrum beta-lactamase producing Enterobacteriaceae (ESBL; 59.0%; 72/122), *C. difficile* (47.5%; 58/122) and vancomycin resistant enterococci (VRE; 15.6%; 19/122) were encountered less frequently.

Prescribing and seeking approval for the use of restricted antimicrobials

Participants were asked if they would seek approval if they prescribed from a range of restricted antimicrobials. All the antimicrobials listed [Figure 2C] were restricted to infectious diseases/clinical microbiology specialists by the New Zealand Pharmaceutical Management Authority (PHARMAC™) except ceftriaxone (may be subject to DHB restrictions) and piperacillin/tazobactam (respiratory medicine specialists can also approve use). Approval was unlikely to be sought if practitioners prescribed ceftriaxone (1.7%; 2/115), ciprofloxacin (14.4%; 17/118) or clindamycin (30.4%; 32/105), but was more likely for piperacillin/tazobactam (50.5%; 47/93), ceftazidime (51.9%; 27/52) and meropenem (74.6%; 50/67) (Figure 1C). If approval was sought, respondents would most frequently consult an infectious diseases physician (71%; 69/97) or clinical microbiologist (46%; 45/97).

Access to prospective audit and education

A minority of rural hospital doctors reported that they had received education on the principles of AMS (34.8%; 40/115). While most respondents reported that their pharmacy service did not provide feedback on antimicrobial prescribing (63.9%; 76/119), most of those who had received feedback had found it valuable at least some of the time (94.4%; 34/36).

Perceptions of AMS, antimicrobial resistance, and antimicrobial resistance

At least 90.0% of respondents agreed that AMS was relevant irrespective of the potential setting (Figure 3B). In contrast to this, antimicrobial overuse and antimicrobial resistance were more likely to be perceived as national or international issues, rather than rural or regional ones. The Likert scales exhibited a gradient effect in which more respondents were likely to agree that these were problems the further removed the hypothetical context was from their individual practice location (Figures 3B and 3C).

Themes

Only 34.8% (40/115) of respondents reported that they had received education about AMS, but 92.1% (93/99) of free text answers (representing 76.2% of total responses) demonstrated some awareness of AMS principles. The dominant theme related to ensuring appropriate use of antimicrobials. This was addressed in 61.6% (61/99) of responses.

- “Responsibility to prescribe the right antibiotic for the right infection.”
- “Responsible use of antibiotics, limiting the use of high-end, broad spectrum antibiotics.”

Interestingly, many more responses related to the optimal initiation of an antimicrobial prescription rather than de-escalation of the prescription based on microbiological feedback (40.8% vs. 8.2%). As such, it appeared that starting a prescription in a rational fashion was a more intuitive AMS activity than the need to revise and narrow prescriptions.

Tying into the themes of responsibility and appropriateness of antimicrobial prescribing were those of specialist input, guidelines and prescriber education. Most of these related to static input such as guideline generation or ad-hoc consultation, while few suggested that stewardship was a dynamic intervention.

- “A coordinated service to establish set therapeutic antibiotic guidelines to aid in appropriate patient care, within the realm of local and regional bacterial patterns, and prevent resistance.”

Sixty-four participants offered thoughts on how they believed AMS in rural hospitals may be improved. They most commonly expressed opinions that shared the theme...
Figure 3: Perceptions of antimicrobial stewardship.

a) Perceived relevance of AMS.

- To personal practice
- To this hospital
- At nearby hospitals
- In New Zealand
- Internationally

b) Perceived relevance of the problem of antimicrobial overuse.

- To personal practice
- At my hospital
- At nearby hospitals
- In New Zealand
- Internationally

c) Perceived relevance of the problem of antimicrobial resistance.

- To personal practice
- At my hospital
- At nearby hospitals
- In New Zealand
- Internationally
of accessibility to stewardship resources. Emphasis was placed on the need for prescribing resources and guidelines to be visible and readily accessible. Where prescribing guidelines were noted to be available, the ability to access them was thought to be difficult.

- “The biggest problem I had was finding the guidelines.”
- “The main thing to do would be to make people aware that there is an ID physician [available] to call.”

Whether urban guidelines should be applicable in rural contexts appeared to be a point of debate, with respondents both acknowledging and refuting whether the specific context of rural medicine should be acknowledged when prescribing resources are designed.

- “Some base hospital (secondary or tertiary referral centre) guidelines specify antibiotics we don’t stock.”
- “(Published antimicrobial susceptibility patterns) are not related either to our specific population nor our prescribing habits.”

Infrequency of contact with Infectious Diseases or Clinical Microbiology clinicians was noted to be an issue faced by rural hospital doctors. This was perceived to be a two-way lack of engagement. Communication between rural staff also emerged as a challenge to rural AMS. In part, this concern appeared to relate to vulnerable staffing levels, particularly upon reliance on locum staff and their perceived unfamiliarity with local pathways and protocols. In addition to issues related to orientation, uncertainty about clinical leadership was also noted.

Discussion

This is the first study to provide comprehensive insight into existing AMS practice in rural hospitals in New Zealand. Among the strengths of this study are the breadth of data collection, high penetration into the rural hospital medicine community and its mixed methodology enabling simultaneous collection of quantitative and qualitative data. One challenge we faced is that the definition of ‘rurality’ is not standardised in rural hospital research and caution must be exercised when comparing different rural health literatures. The definition we chose was pragmatic and largely follows the rural hospital medicine community's own definition, consistent with other recent research in rural New Zealand health. It is reassuring that our survey identified a similar number of rural practitioners as included in a recent New Zealand rural hospital workforce survey. One of the major limitations of this study is that it measures individuals’ perceptions of their own behaviours and exposures, rather than observational data.

While most rural hospital doctors reported having access to local antimicrobial prescribing guidelines, lack of internal consistency among responses from some hospitals and regions suggests that awareness of existing resources may be suboptimal. This issue does not appear limited to rural New Zealand as relatively low rates of awareness of existing guidelines have been noted in studies elsewhere.

The likely ad-hoc nature of most stewardship interactions in rural New Zealand is a source of potential clinical risk. Prior research in the urban hospital setting in the US has identified that 31–48% of telephone calls made to AMS professionals contain errors in the information provided by the caller. These include incorrect microbiological and physiological data, which may affect antimicrobial prescriptions.

The format of the free text sections may have steered respondents towards providing brief, ‘sound bite’ style responses. However, it did reveal that some aspects of AMS are either well understood or self-evident. This is despite the limited AMS education that the survey population reported receiving. Responses were heavily weighted towards rational and optimised prescribing practice, with fewer responses related to value and the avoidance of antimicrobial-related harm. When viewed from an inductive perspective, it appears that the need to “start well” is intuitive, but the relative paucity of responses that mention de-escalation or microbiological testing suggests that the transition from syndromic to targeted antimicrobial prescribing is not accorded the same degree of importance. This would appear concordant with survey results in diverse locations that suggest that revision of initial prescriptions is not always a practice priority, when compared to following guidelines for syndromic prescribing.
In addition to understanding at least some of the principles of AMS, most rural hospital doctors appear to believe that AMS is relevant in any clinical context. While this could suggest that the rural medicine community is a receptive environment for the introduction of AMS, it is also possible that this represents the tendency to give socially acceptable or desirable responses in qualitative research.\(^{20,23,24}\) Despite AMS’s perceived relevance, antimicrobial overuse and prescribing were less likely to be regarded as personal or local issues. Similarly, in European studies, 91–98% of practitioners reported that antimicrobial resistance is a problem at a national level, while fewer (63–74%) reported it to be an issue in their daily practice.\(^{20,24,25}\)

Despite being perceived as relevant to the rural hospitals, AMS may have a marketing problem in this environment, including inconsistent awareness of referral pathways, the existence of guidelines and orientation to available resources. While passive devices like education and guidelines may have an immediate impact on antimicrobial prescriptions, this tends to wane, and downstream interventions like prospective audit and feedback, while labour intensive, create a more sustainable change on prescribing patterns.\(^{11}\) No respondents mentioned the potential for a local champion for AMS, as mentioned in some studies of rural stewardship, rather than reliance on experts at a distance.\(^{2,26}\)

It would be difficult to introduce a conventional AMS strategy in New Zealand’s rural hospital environment. Lack of resources, personnel and AMS education have been cited as presenting barriers to the implementation of AMS programmes in rural and regional hospitals overseas.\(^{2,27}\) As this survey demonstrates, most rural practitioners have limited access to AMS education and prescribing feedback, and have infrequent contact with professionals who would be considered core members of an AMS team, such as infectious diseases physicians. This needs to be taken into consideration as regional and national AMS programmes are developed. Formulary restriction may be the highest yield strategy in hospitals with limited staffing, however lack of pharmacy resources will likely challenge its implementation rurally.\(^{2}\) Organised telemedicine AMS interventions have been trialled overseas. While data are limited, high degrees of practitioner satisfaction and reductions in prescriptions of broad spectrum antimicrobials have been reported.\(^{2,3}\) In fact, the implementation of an organised AMS strategy may actually increase the rate at which rural doctors solicit specialist input.\(^{3}\)

Srinavasan wrote that the use of the term “antimicrobial stewardship program” may have created a misperception that optimal inpatient antimicrobial use is only possible in settings with formal stewardship programs that are staffed by infectious diseases physicians and subspeciality pharmacists.\(^{28}\) Rather than trying to recreate tertiary AMS teams in miniature, successful development of a rural hospital AMS strategy would likely require addressing this cognitive barrier, and diversifying the skill sets of existing generalist staff and optimising the interface with larger institutions and specialists. Where they have been implemented overseas, AMS strategies in small and rural hospitals may require that AMS professionals take on multiple roles, in contrast with their urban counterparts.\(^{2,28}\) Sustainable AMS strategies in rural New Zealand will depend on bespoke solutions and fostering a sense of personal and local importance. Rural hospital prescribers have an appetite for more interaction with stewardship services and further education. Attention to fostering a relationship between the rural hospital and the AMS team that includes orientation to guidelines and prescribing resources may be beneficial. Potential targets for stewardship interventions in this setting could be the transition from syndromic to targeted prescribing, de-escalation of antimicrobials and optimised microbiological testing strategies.
Competing interests:
Nil.

Acknowledgements:
We thank Dr Kingsley Logan, Dr Kati Blattner, Dr Erin Coleman and Dr Garry Nixon for reviewing the pilot survey. Aspects of these data have been presented, in poster form, at the Australasian Society of Infectious Diseases Annual Scientific Meeting (Auckland, 2015), and orally at the Rural General Practice Network's annual meeting (Wellington, 2017). No external funding was received for this research.

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Reduction in surgical site infections in the Southern Cross Hospitals network, 2004–2015: successful outcome of a long-term surveillance and quality improvement project

Arthur J Morris, Tanya M Jackways, Adrienne Morgan, Rosaleen Robertson, Muriel McIntyre

ABSTRACT

AIM: To report on the reduction in the surgical site infection (SSI) rate in the Southern Cross Hospitals network over a 12-year period, 2004–2015, following active surveillance and quality improvement actions.

METHODS: Ten hospitals in the network performed prospective SSI surveillance using standard definitions across a range of ten surgical procedure groups. Data was manually collected on a standardised form and entered into a bespoke database. Information collected included timing and dose of surgical antibiotic prophylaxis, type of surgical site skin preparation used, and patient information on smoking, diabetes and body mass index (BMI). Patients were contacted 30 days after their elective surgery to detect SSIs presenting after discharge from hospital. Surveillance results were widely reported to infection control and clinical review committees. Quality improvement activities to increase use of best practice interventions for surgical antibiotic prophylaxis and alcohol-based skin preparations were initiated during the surveillance period.

RESULTS: 42,792 procedures performed in ten hospitals were analysed. There were 932 (2.2%) SSIs. The SSI rate decreased from 3.5% in 2004 to 1.2% in 2015, r<0.0001, a decrease of 59%, approximately 5% a year. Rates decreased in seven of the 10 hospitals, p<0.02 for each, and in five of the ten procedure groups, p<0.02 for each. Diabetic patients, odds ratio (OR) 1.4 (95% confidence interval (CI) 1.1–1.9), obese patients (BMI>30), OR 2.0 (95% CI 1.6–2.4), and those with a surgical risk score of ≥1 OR 1.3 (95% CI 1.1–1.6) had higher SSI rates. These three patient risk factors increased during the 12-year period. The use of alcohol-based skin preparations increased during the period from 63% to 84% in the first two and last two years respectively, p<0.0001. Use of an alcohol-based skin preparation was associated with a reduction in SSIs OR 0.54 (95% CI 0.47–0.62). On time prophylaxis improved from 72% to 95% over the 12 years, p<0.0001, and on time prophylaxis was associated with a reduction in SSIs, OR=0.62 (95% CI 0.51–0.75). The use of 2g doses of cefazolin increased significantly after 2010, p<0.0001. The most common cause of SSI was Staphylococcus aureus which was present in 54% of cases with a positive culture.

CONCLUSIONS: This long-term surveillance and quality improvement programme has made a significant contribution to the overall reduced rate of SSIs in Southern Cross Hospitals. This reduction occurred despite patient risk factors for SSI increasing. Further reduction is possible with higher adherence to best practice and interventions aimed at reducing S. aureus SSIs.
Healthcare associated infections (HAIs) cause significant morbidity, contribute to mortality and divert healthcare resources. Auckland District Health Board (DHB) data from the late 1990s estimated that the annual cost of hospital-acquired infections among surgical and medical admissions to all public hospitals in New Zealand was $136 million. In secondary and tertiary care hospitals surgical site infections (SSIs) usually cause approximately 20% of HAIs, in a network of elective surgical hospitals like Southern Cross Hospitals SSIs represent almost all HAIs. Approaches to reduce SSIs therefore assume greater importance for our patients.

Active surveillance of HAI and feedback of the information to those responsible for care is associated with a significant reduction in HAIs. The New Zealand Health Quality and Safety Commission (the Commission) recently sponsored a cost-benefit analysis of contemporary international studies on the benefit of surveillance and intervention programmes in reducing SSIs. This showed a reduction in SSIs when surveillance results are disseminated, with a mean reduction of approximately 8% a year. In addition there are well described interventions which reduce SSIs, eg, the correct timing of surgical antibiotic prophylaxis.

We therefore began a programme with the aim of improving patient outcomes. The programme included surveillance and reporting of SSI rates to our hospitals’ senior management, nursing employees and credentialed medical specialists. From 2010 quality improvement actions were introduced to improve adherence to practices known to reduce the rate of SSIs. This report details the results of our surveillance, reporting and intervention programme over the 12-year period, 2004–2015.

Methods

The SSI surveillance programme was developed over 2002–2003 at three hospitals and involved a small numbers of procedures. In 2004, after education and training, all 10 network hospitals started surveillance for SSIs. Hospitals that joined the network in the latter part of the period were excluded from analysis as they were performing mainly orthopaedic procedures and their inclusion would have artificially reduced the SSI rate by changing the case mix. To ensure a consistent case mix small volume procedures with wide variations in the number performed each year, eg, vascular procedures, were excluded from analysis; as were procedures which were introduced in the later part of the period which would have significantly altered the case mix and/or SSI rate, eg, arthroscopic orthopaedic procedures.

The USA National Healthcare Safety Network (NHSN) definition for the occurrence of a SSI was used except that the assessment for infection was made 30 days after the procedure. Patients were informed during their stay that they would be contacted by either mail or phone to seek information on their wound. Responses suggesting a SSI were followed up with the patient’s primary care provider and/or surgeon to obtain relevant details. A SSI was only recorded if the signs and symptoms met the NHSN definition; eg, a stitch abscess (minimal inflammation and discharge confined to the points of suture penetration) did not meet the SSI definition. For cases when there was doubt about the presence of an SSI, authors experienced in applying the definitions (AJM, TMJ, AM) were contacted for advice. If patient feedback was not obtained, we recorded the procedure as not having a SSI.

Patient surgical risk score was calculated using the NHSN method; ie, ASA risk score (ASA >2, score 1) + surgical wound score (contaminated or dirty wounds, score 1) + operation duration score (procedure taking more than its cut off time, score 1).

Continuing education on NHSN definitions and surveillance methods was provided to hospital Infection Prevention and Control Nurses at yearly network infection control training workshops. Quality improvement training on using the Plan, Do, Study, Act (PDSA) improvement model to develop, test and implement changes leading to improvement was also provided at the workshops.

Data was collected prospectively on the procedures chosen to be included by the network hospital. Procedures reflected the hospital’s case mix and were consistent during the period. Details recorded included: patient demographics (including
smoking history and diabetes), procedure, date of procedure, details of surgical antimicrobial prophylaxis (the antibiotic, dose and timing), type of skin preparation used for the incision site, duration of surgery, American Society of Anaesthesiologists (ASA) physical status score, body mass index (BMI), presence of SSI, type of SSI (superficial, deep incisional or organ space), and from 2011 the infecting organism(s). All details were entered into the bespoke database. Six-monthly reports were produced and circulated to all participating hospitals and the National Infection Prevention and Control Committee. These reports presented the SSI rate by hospital and procedure type along with comments on antimicrobial prophylaxis and type of skin preparation used.

Procedures were classified into 10 groups (Table 1). Breast surgery included mastectomy, reduction and other procedures. Hysterectomy procedures included abdominal and vaginal approaches, the latter also including laparoscopic assisted operations. Orthopaedic surgery included hip, knee and other joint replacements and other procedures eg, pin or plate removal or insertion. Bowel procedures were mainly on the colon, eg, anterior resections 32% and right-sided colectomies 33%, and a minority were on the small bowel 14%.

The SSI rate and, from 2010, adherence to recommended surgical antimicrobial prophylaxis, eg, cefazolin dose and timing, and use of alcohol-based skin preparation for the incision site results were widely circulated within the network. This included each hospital’s Infection Control and/or Safety, Quality and Risk Committee, the hospital General Manager and the Hospital Clinical Medical Committee. Articles on surgical prophylaxis were included in network newsletters to all credentialed medical specialists.

Local quality improvement activities, using PDSA cycles and the model for improvement, included three key change projects designed to: improve adherence with prophylactic antibiotic dose of 2–3g of cefazolin, rather than 1gm when it was used, promoted from late 2009; administer prophylaxis ‘on time’, ie, within 60 minutes of knife to skin (KTS), and ideally not less than five minutes before KTS; and promote the use of an alcohol-based skin preparation for procedures with skin incisions, ie, alcohol with either chlorhexidine or povidone-iodine. All three interventions were promoted from 2010. When hair removal was needed its removal with clippers, not by shaving, was promoted.

From 2011 SSI culture results were recorded. In 2016 procedures using aqueous skin preparations were audited to record the types of procedures they were being used in.

Regression analysis was performed to test whether patient risk factors changed over time.

Run analysis is a common approach used to follow quality improvement processes, and based on probability theory, and was used to map the SSI rate change over time.10,11 It uses the ‘shift rule’ which states a statistically significant sustained change has taken place when a run of continuous points either side of the median line occur. At the shift point, a new median is drawn until another shift takes place.10,11 For our set of 24 data points a run of six was taken to indicate a shift.10 Contingency tables were used to determine Pearson’s chi-squared functions, odds ratios and 95% confidence intervals (CI) were calculated, and regression analyses performed, using VassarStats (vassarstats.net). P values <0.05 were considered statistically significant.

The reduction in additional hospital days with a reduced SSI rate was estimated. A conservative estimate for the increase in length of stay for deep and organ space SSIs was taken as being 10 days.2 All admission days for the unknown proportion of readmitted superficial SSIs were ignored.

**Results**

Over the 12-year surveillance period, January 2004 to December 2015, 42,792 procedures were followed in the 10 network hospitals, Supplementary Table 1. There were 932 SSI, 2.2% (95% CI 2.0–2.3); 754 (81%) superficial, 129 (14%) deep and 49 (5%) organ space SSIs. Most SSIs, 874 (94%) declared themselves after patient discharge and were identified by our 30-day follow-up process. The median patient response rate at 30-days was 88% (range 81–97%), with a higher response rate later in the time period (p=0.02, data not shown). The SSI
rate by procedure type is shown in Table 1. The highest SSI rates were observed following abdominoplasty, breast and bowel procedures, the lowest following thyroid/parathyroid and orthopaedic surgery (Table 1). Most orthopaedic procedures, 85%, were joint replacements. Hip and knee arthroplasty revision procedures had higher SSI rates than primary arthroplasties; 2.3 vs 0.9%, p<0.01, and 4.6 vs. 1.6%, p<0.02, respectively.

There were two changes in the overall SSI rate from an initial median rate of 3.2% to December 2006, 2.4% to December 2010 and 1.6% to December 2015, see run chart analysis, Figure 1. The apparent shift points were tested using chi-square to test the difference in proportion of procedures that resulted in an infection before and after the apparent shift points in January 2007 and January 2011. The proportion of procedures that had an SSI, as indicated by the shift points, fell significantly, p<0.001 (Table 2). The decrease in mean SSI rate was 59%, approximately 5% a year. Regression analysis also showed a significant reduction in the SSI rate over time, 3.5% to 1.2%, r²=0.865 (95% CI-0.94–0.71), r=0.748, p<0.0001, Figure 2. The SSI rates vary slightly between Figure 1 and Table 2 as the former is the median rate for the time period whereas the mean is calculated in Table 2.

A statistically significant decrease in the SSI rate occurred in seven of the ten hospitals performing surveillance and interventions, all p<0.02 (data not shown) and in 5 of the 10 procedure groups; bowel, breast, herniorrhaphy, orthopaedic, and varicose vein procedures (Table 1). There was a trend for a reduction in cholecystectomy procedures (p=0.08). Four of the procedure groups without a SSI rate reduction had the lowest numbers of procedures. For hysterectomy procedures an alcohol skin preparation was only used 38% of the time for abdominal hysterectomies vs. 73% for all other procedures, p<0.0002.

The use of an alcohol-based skin preparation increased from 63% in 2004–05 to 84% in 2014–15, r=0.847, r²=0.72, p<0.0001, Supplementary Figure 1. The use of alcohol-based skin preparations was associated with a reduction in the SSI rate, OR 0.54 (95% CI (0.47–0.61) (Table 3).

In 2016 there were 703 procedures where an aqueous skin preparation was used to prepare the incision site; while 280 involved a mucosal surface there were 423 (60%) procedures without a contraindication to using an alcohol-based agent.

Timing of prophylaxis was known for 40,221 (94%) procedures. On time surgical prophylaxis steadily improved over the 12 years from 72% to 95%, r=0.953 (95% CI

<table>
<thead>
<tr>
<th>Procedure group</th>
<th>n</th>
<th>SSIs</th>
<th>Rate % 2004–15</th>
<th>95% CI</th>
<th>Rate % 2004/5</th>
<th>SSI decrease, p value</th>
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<tbody>
<tr>
<td>Abdominoplasty</td>
<td>369</td>
<td>35</td>
<td>9.5</td>
<td>6.8–13.1</td>
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<td>11.1</td>
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<td>Bowel surgery</td>
<td>1,300</td>
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<td>5.5–8.3</td>
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<td>Breast</td>
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<td>143</td>
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<td>4.0–5.6</td>
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<td>Cholecystectomy</td>
<td>502</td>
<td>11</td>
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<td>1.2–4.0</td>
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<td>General surgery — Other</td>
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<td>0.8–3.4</td>
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<td>4,768</td>
<td>74</td>
<td>1.6</td>
<td>1.2–1.9</td>
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<td>0.98</td>
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<td>Hysterectomy</td>
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<td>3.3</td>
<td>2.8–3.8</td>
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<td>1.7</td>
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<td>Orthopaedic</td>
<td>24,770</td>
<td>318</td>
<td>1.3</td>
<td>1.2–1.4</td>
<td>1.8</td>
<td>0.9</td>
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<tr>
<td>Thyroid/parathyroid</td>
<td>499</td>
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<td>0.6</td>
<td>0.2–1.1</td>
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<td>Varicose veins</td>
<td>2,113</td>
<td>88</td>
<td>4.2</td>
<td>3.4–5.1</td>
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<td>42,792</td>
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<td>2.2</td>
<td>2.0–2.3</td>
<td>3.5</td>
<td>1.2</td>
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</table>

Table 1: SSI rates by procedure type, 2004–2015.
Figure 1: Run chart analysis of SSI rate in Southern Cross Hospitals 2004–2015.

Figure 2: Regression analysis of SSI rate in Southern Cross Hospitals 2004–2015.

Table 2: Southern Cross Hospitals SSI rate over three time periods detected by run chart analysis.

<table>
<thead>
<tr>
<th>Period</th>
<th>Dates</th>
<th>Procedures</th>
<th>SSIs</th>
<th>SSI (%)</th>
<th>95% CI</th>
<th>P value, chi-square</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Jan 2004–Dec 2006</td>
<td>9,814</td>
<td>316</td>
<td>3.2</td>
<td>2.9–3.6</td>
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<tr>
<td>B</td>
<td>Jan 2007–Dec 2010</td>
<td>21,533</td>
<td>466</td>
<td>2.2</td>
<td>1.9–2.4</td>
<td>A vs. B,&lt;0.0001</td>
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<tr>
<td>C</td>
<td>Jan 2011–Dec 2015</td>
<td>11,445</td>
<td>150</td>
<td>1.3</td>
<td>1.1–1.5</td>
<td>A vs C,&lt;0.0001; B vs. C,&lt;0.0001</td>
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</table>
0.89–0.98, $r^2=0.91$, $p<0.0001$, Supplementary Figure 2. The proportion of prophylaxis given <5 minutes before KTS decreased from 14% to 6%, $r=-0.81$ (95% CI -0.92–-0.61), $r^2=0.66$, $p<0.0001$. The SSI rate for those receiving prophylaxis on time, 730/36224 (2%, 95% CI 1.8–2.2%) was lower from those not on time, 129/3,997 (3.2%, 95% CI 2.7–3.8), OR 0.62 (95% CI 0.52–0.75), $p<0.0001$ (Table 3).

Cefazolin was used as prophylaxis in 30,047 (70%) procedures. One gram doses were used until the end of 2009 then the proportion of procedures where 2–3g doses were used increased from 13% in 2010 to 80% in 2015, $r=0.971$, $r^2=0.97$, $p<0.0001$, Supplementary Figure 3. While patient weight was not recorded the BMI was for 9,906 procedures using 1g of cefazolin; 2,886 (29%) patients were obese, BMI ≥30, with 667 (9.3%) and 259 (2.6%) having a BMI ≥35 and ≥40 respectively suggesting under dosing in these patients.

During 2010 to 2015 the proportion of procedures complying with all three key interventions, ie. ≥2g of cefazolin when cefazolin was used, on time prophylaxis and an alcohol-based skin preparation increased from 6% to 57%, $r=0.966$ (95% CI 0.72–0.99), $r^2=0.933$, $p<0.0002$. Over this time period the SSI rate for procedures meeting all three interventions was lower than other procedures not meeting all three, 1.2% (83/7130) vs. 1.9% (282/15,099) respectively, OR 0.62 (95% CI 0.48–0.79), $p<0.0002$ (Table 3).

For the period 2011 to 2015, there were 288 SSIs and 153 (53%) had positive cultures; *Staphylococcus aureus* was the most common pathogen and was isolated from 82 SSIs (28% overall, 54% of those with a positive culture), 69 in pure culture and 13 in mixed cultures. Only one *S. aureus* was known to be methicillin resistant (MRSA).

The BMI was recorded for 18,451 (43%) patients. Diabetic, obese (BMI ≥30) and patients with higher surgical risk scores had higher rates of SSIs, smokers did not (Table 3).

Regression analysis found the proportion of patients who smoked decreased over time $r=-0.687$ (95% CI -0.85–-0.39), $r^2=0.468$, $p=0.0002$. All three characteristics with higher SSI risk increased over time: diabetes 3.8% to 5.4%, $r=0.652$ (95% CI 0.34–0.84), $r^2=0.423$, $p=0.0006$; obesity (BMI ≥30) 29% to 36%, $r=0.805$ (95% CI 0.59–0.91), $r^2=0.648$, $p<0.0001$; and surgical risk score ≥1 10% to 15%, $r=0.621$ (0.29–0.82), $r^2=0.385$, $p=0.0012$.

If there had been no reduction in the SSI rate the number of SSIs in 2015 would have been 124 (3,560 procedures at 3.5%, the SSI rate in 2004), ie, an additional 81 SSIs over the 43 observed in 2015. Overall 19% of our SSIs are deep or organ space meaning 15 of the 81 would have been deep or organ space SSIs which would have been readmitted. Taking a conservative estimate of 10 additional days for such SSIs it is estimated that 150 additional hospital days, and their attendant costs, prevented as well as significant patient harm avoided.

**Table 3**: Unadjusted risk factors for SSIs in Southern Cross Hospitals 2004–2015.

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>SSI rate (%)</th>
<th>Odds ratio (95% CI)</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alcohol-based skin preparation vs aqueous</td>
<td>1.8 vs 3.2</td>
<td>0.54 (0.47–0.61)</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>On time prophylaxis vs early/late prophylaxis</td>
<td>2.0 vs 3.2</td>
<td>0.62 (0.51–0.75)</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>On time prophylaxis, 2g of cefazolin and alcohol-based skin preparation vs less than three interventions</td>
<td>1.2 vs 1.9</td>
<td>0.62 (0.48–0.79)</td>
<td>&lt;0.002</td>
</tr>
<tr>
<td>Diabetic vs non-diabetic</td>
<td>3.0 vs 2.1</td>
<td>1.4 (1.1–1.9)</td>
<td>0.006</td>
</tr>
<tr>
<td>Obese (BMI ≥30) vs non-obese</td>
<td>3.1 vs 1.6</td>
<td>2.0 (1.6–2.4)</td>
<td>0.001</td>
</tr>
<tr>
<td>Surgical risk score ≥1 vs score &lt;1</td>
<td>2.7 vs 2.1</td>
<td>1.3 (1.1–1.59)</td>
<td>&lt;0.002</td>
</tr>
<tr>
<td>Smoker vs non-smoker</td>
<td>2.6 vs 2.1</td>
<td>1.2 (0.98–1.54)</td>
<td>0.08</td>
</tr>
</tbody>
</table>
Discussion

Private surgical hospitals perform more than 170,000 operations a year representing approximately 50% of elective procedures in New Zealand. Approximately one-third of Southern Cross Hospitals procedures are at times funded by DHBs and the Accident Compensation Corporation usually through contracting arrangements. Despite this significant proportion of elective procedures, most local reports on SSIs and their costs are DHB focused. To the best of our knowledge this is the first large prospective study reporting on patient outcome following procedures performed in New Zealand private surgical hospitals.

Our major finding was a significant reduction in SSIs over the 12-year period. The run chart is a commonly used quality improvement tool and provides a simple representation of change over time. The ‘shift’ rule identified two occasions where our rate improved. The proportion of procedures that had an infection fell from 3.5% to 1.2%, a 59% reduction, p<0.0001, approximately 5% a year. The time to our first shift, three years, is similar to the two and a half years observed in the Commission sponsored national orthopaedic programme. The initial fall in SSIs followed surveillance and SSI result reporting to those responsible for care. The second decrease, after 2010, coincided with the promotion of best practices, for surgical antibiotic prophylaxis and use of an alcohol based surgical site skin preparation, and associated quality improvement projects.

The reduction occurred despite the three identified patient risk factors for higher SSIs, ie, diabetes, obesity and surgical risk score, all increasing over the 12-year period.

The reduction in SSIs was not due to a change in just a small number of hospitals or procedures. We observed a reduction in seven hospitals and five procedure groups. This implies a general change within the hospital network. The reason why a reduction was not observed in five procedure groups is not known but four of these procedure groups had low numbers of procedures performed and abdominal hysterectomies had significantly less use of alcohol-based skin preparations. While the rate reduction is in part due to the uptake of the key interventions, eg, alcohol-based skin preparation, and prophylaxis timing other changes may have had impact as well, eg, home-use of chlorhexidine wipes before orthopaedic surgery, surgical safety check list sign in and time out prompts for antibiotic prophylaxis and timing, wound dressing protocols, blood glucose and patient temperature control, and theatre traffic control. Another contributor could have been the hand hygiene programme which started in 2011, which raised the compliance rate for the ‘5 moments’ from 65% to 75% at the end of 2015 (data not shown) and currently sits at 83%.

In a prospective study at the Mayo Clinic the SSI rate was more than halved after the rapid deployment of 28 interventions associated with SSI reduction. It appears that numerous small adjustments are required in a patient's pathway to achieve the lowest possible SSI rate. There is no single solution.

The SSI rate was determined using a 30-day review involving patient feedback. Most SSIs declare themselves after hospital discharge. While it is recognised that post-discharge surveillance is required to estimate the true SSI rate there are no well validated accepted methods for how this surveillance should be conducted. Without our 30-day review more than 90% of our SSIs would have been missed. Before recording a SSI we obtained as much information as possible and applied the NHSN definitions. We acknowledge that we have not recorded deep or organ space SSIs which occurred beyond 30 days. Regular educational updates for employees collecting the data and applying the definitions were in place to build consistency in the surveillance programme. Resource intensive validation processes in other surveillance programmes seldom find errors in applying definitions by hospital teams. We believe that the 30-day protocol, with consistent application of the NHSN definitions, gives a reliable estimation of the network SSI rate. The process has been constant over the 12-year period and therefore allows us to draw valid conclusions about the SSI rate and its reduction over time.

Although the SSI rate has reduced significantly there are still improvements that can be made. While an alcohol-based skin preparation was used 84% of the time; the
2016 audit found that when an aqueous skin preparation was used an alcohol product should have been, 60% of the time. Five percent of patients do not get prophylaxis on time and six percent of those that do receive it on time get it <5 minutes before KTS. This, challenges the aim of having adequate tissue levels at the time of incision. Our updated surgical antimicrobial prophylaxis guideline suggests prophylaxis be given at least 10 minutes before KTS. Too many patients receiving cefazolin only get 1g and a significant proportion of these are obese. While we do not remove hair from surgical sites by shaving, occasionally patients present for admission having shaved their operation site. A co-design approach is proposed, ie, empowering patients to be engaged in their care,24,25 to improve our current pre-admission advice regarding not shaving. There is also a need to understand why the SSI rate did not drop in some procedure groups and ensure that other best practice interventions are applied to reduce SSIs, eg, patient normothermia, perioperative supplemental oxygen, triclosan-coated sutures where appropriate26,27 as well as engaging clinical pharmacological advisory services.

Almost 60% of procedures in the surveillance programme are orthopaedic and there is scope to reduce their SSI rate further. *S. aureus* is our most common isolate and a recent literature review concluded that a bundle comprising nasal and skin agents could reduce orthopaedic SSIs by approximately 50%.28 The Commission has recently started a collaborative to evaluate the benefit of an ‘anti-staph bundle’ and Southern Cross Hospitals are involved in this initiative.29

The Commission has recently reported the successful reduction of SSIs in orthopaedic surgery.30 Our report confirms and extends the Commission’s findings. We also show that a network of hospitals can successfully institute interventions to reduce SSIs and extend the observation by showing that SSIs can be reduced in several procedural groups. The Commission’s Orthopaedic Programme has reported that BMI is a key risk factor for deep SSIs following primary hip and knee arthroplasty.31 We extend this by reporting the impact of obesity in a wider range of procedure groups.

In summary we have shown that surveillance and reporting SSIs and the introduction of an intervention programme can make a significant contribution to the reduction of SSIs resulting in reduced healthcare costs and patient morbidity. There is scope however to reduce the rate further by greater adherence to our surgical prophylaxis and skin antisepsis interventions. The integration of an ‘anti-staph bundle’ into our patient pathway for orthopaedic surgery offers another opportunity to reduce SSIs.
## Appendix

### Supplementary Table 1: Number of procedures included in SSI surveillance in Southern Cross Hospitals, by hospital 2004-2015.

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<td><strong>Grand total</strong></td>
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### Supplementary Table 1 continued: Number of procedures included in SSI surveillance in Southern Cross Hospitals, by hospital 2004-2015.

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<td>262</td>
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<td>D</td>
<td>43</td>
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<td>F</td>
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<td>185</td>
<td>170</td>
<td>192</td>
<td>554</td>
<td>205</td>
<td>217</td>
<td>232</td>
<td>192</td>
<td>229</td>
<td>187</td>
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<td>G</td>
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<td>176</td>
<td>145</td>
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<td>380</td>
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<td>204</td>
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<td>266</td>
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<td>I</td>
<td>141</td>
<td>156</td>
<td>102</td>
<td>110</td>
<td>73</td>
<td>42</td>
<td>50</td>
<td>51</td>
<td>66</td>
<td>88</td>
<td>88</td>
<td>71</td>
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<tr>
<td>J</td>
<td>2</td>
<td>248</td>
<td>125</td>
<td>142</td>
<td>186</td>
<td>162</td>
<td>187</td>
<td>162</td>
<td>214</td>
<td>327</td>
<td>280</td>
<td>304</td>
</tr>
<tr>
<td><strong>Grand total</strong></td>
<td>1,634</td>
<td>1,700</td>
<td>1,833</td>
<td>1,719</td>
<td>2,276</td>
<td>1,622</td>
<td>1,698</td>
<td>2,195</td>
<td>1,993</td>
<td>1,999</td>
<td>2,015</td>
<td>1,545</td>
</tr>
</tbody>
</table>
Supplementary Figure 1: Increase in the use of alcohol-based skin preparations in Southern Cross Hospitals 2004–2015.

Supplementary Figure 2: Increase in “on time” prophylaxis in Southern Cross Hospitals 2004–2015.
Supplementary Figure 3: Increase in the use of 2–3g doses of cefazolin in Southern Cross Hospitals January 2010 to December 2015.


Competing interests:
Adrienne Morgan and Tanya Jackways report payment for Infection Control advice to Southern Cross Hospitals. Rosaleen Robertson is employed by Southern Cross Hospitals as Chief of Clinical Governance, and is a member of the Health Quality and Safety Commission Safe Surgery NZ Advisory Group. Dr Morris is a Trustee of the Southern Cross Trust and a director for Southern Cross Hospitals. He also received payment for infection control advice to Southern Cross Hospitals. Muriel McIntyre is employed by Southern Cross Hospitals as National Quality and Risk Coordinator.

Acknowledgements:
We recognise the committed involvement of the Infection Prevention and Control Nurses in the network who have collected data, introduced interventions and monitored change in practice. We also acknowledge the contributions of the surgical teams, who have adopted the changes and interventions. We acknowledge all the network hospital General Managers who have supported and resourced the programme and interventions. They have been assisted by their Infection Control and/or Safety, Quality and Risk Committee, as well as their Hospital Clinical Medical Committee. The involvement of a wide range of employees has been an important enabling factor for this surveillance and quality improvement project. We thank the large number of patients who participated in the surveillance programme and the feedback they provided on their wound. This valuable feedback continues to inform quality improvements for future patient care.

Dr Phil Hider provided valuable comments on a draft of this paper.

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REFERENCES:


Healthcare-seeking behaviour of people with sexually transmitted infection symptoms attending a Sexual Health Clinic in New Zealand

Hayley J Denison, Lisa Woods, Collette Bromhead, Jane Kennedy, Rebecca Grainger, Annemarie Jutel, Elaine M Dennison

ABSTRACT

AIMS: Untreated sexually transmitted infections (STIs) can lead to serious health complications and may be transmitted to uninfected individuals. Therefore, the early detection and subsequent management of STIs is crucial to control efforts. Time to presentation for STI symptoms and risk of transmission in this period has not been assessed in New Zealand to date.

METHODS: All new clients presenting to an urban sexual health clinic (SHC) were invited to complete a questionnaire, which included demographic information, sexual health history, and details about the clinic visit.

RESULTS: Of 331 people approached, 243 (73.4%) agreed to complete the questionnaire. Four incomplete questionnaires were excluded, leaving 239 participants (47.3% female and 52.7% male, 43.8% under the age of 25). The most common reason for seeking healthcare was experiencing symptoms (39.4%) and 41.7% of people with symptoms waited more than seven days to seek healthcare. Around a third (30.6%) of people with symptoms had sex after they first thought they may need to seek healthcare. Infrequent condom use was reported more often by people who had sex with existing partners (84.6%) than by people who had sex with new partners (10.0%).

CONCLUSIONS: This is the first study to quantify healthcare-seeking behaviour for STI in New Zealand. Delayed healthcare-seeking (defined as waiting more than seven days) was common and almost a third of people reported engaging in sex while symptomatic. Enabling prompt healthcare-seeking is crucial to minimise transmission risk. Structural barriers such as the financial cost of STI tests must be removed and education around symptom recognition and healthcare system navigation should be provided.

Sexually transmitted infections (STIs) can lead to serious health complications including pelvic inflammatory disease, infertility and adverse pregnancy outcomes, as well as increased susceptibility to further STI acquisition including human immunodeficiency virus (HIV). Non-diagnosis of any STI also increases the likelihood that an infected individual will transmit the infection to a sexual partner. Therefore, early diagnosis and treatment is a central issue in the control of STIs.

International studies have shown that 20% to 60% of adults visiting health services for STI symptoms had waited longer than seven days before seeking care. Studies have also reported that many people continue to have sex after noticing symptoms, potentially transmitting infection to others. While it is assumed that delayed healthcare-seeking is associated with a higher likelihood of sex while symptomatic, few studies have directly assessed the association.
The time to presentation for STI symptoms has not been quantified in New Zealand other than for those with genital warts, and there has been no assessment of sexual behaviour while symptomatic. It is therefore not known whether delayed health-care-seeking for STI symptoms is common in New Zealand and whether it has a potential role in STI transmission. This is important because diagnosis rates of common STIs such as chlamydia and gonorrhoea are high in New Zealand.

The objectives of this study were to quantify time to presentation for STI testing in people with STI symptoms and assess whether delayed healthcare-seeking poses a transmission risk.

**Methods**

**Study design**

A cross-sectional single-centre observational study design was used to investigate healthcare-seeking behaviour and associated factors.

**Setting and sample**

The study was conducted at an inner-city public sexual health clinic (SHC) in Wellington, New Zealand, which provides STI testing, treatment and advice, emergency contraception and sexual assault care. Services are free of charge.

Only new clients to the clinic were sampled to avoid including people who were attending for follow-up treatment or for a test of cure, as the study outcome measures were related to healthcare-seeking behaviour for new symptoms.

**Recruitment**

All new clients attending the SHC between 1st September and 30th November 2015 were given a study pack by the reception staff before their consultation, which included a Participant Information Sheet and a copy of the questionnaire. Those who agreed to take part in the study filled out the questionnaire in the waiting room and returned the completed copy to reception staff. No names were recorded, and the clinic patient number was used to link the answers from the questionnaire to STI diagnosis/es. Participants were also given the option to complete the questionnaire online using secure encrypted surveying software, although only one participant chose this route. All refusals to take part were recorded by reception staff on the top of the questionnaire and filed separately for collection by the study coordinator. Participants were offered the option of being entered into a draw to win a grocery voucher of small value (NZ $100) as compensation for their participation. An item at the end of the questionnaire asked for consent to be entered into the draw using a tick-box, and an email address was requested for the purposes of notifying the winner.

**Measures**

The questionnaire was adapted from a published questionnaire used in the ‘Patient Access and the Transmission of Sexually-transmitted Infections’ (PATSI) and ‘Maximising STI Control' (MSTIC) studies in the UK. The draft questionnaire was refined to fit the New Zealand context in consultation with clinic staff. The questionnaire included items on basic demographics, sexual health history including previous STI testing and previous diagnosis, and details about the patient’s visit to the clinic. The primary outcome measures for this study were the participants’ reasons for testing, the number of days between symptom onset and contacting health services (whether walk-in or phoning for an appointment), the sexual behaviour of symptomatic respondents between noticing symptoms and seeking help, and STI diagnosis/es.

Participants were asked their age and responses were grouped into three categories for analysis (<25 years, 25–34 years, and 35+ years). Ethnicity was self-identified and included an option for those who would prefer not to answer. Multiple ethnicities could be selected. If an individual identified with multiple ethnicities a prioritisation approach was used to allocate individuals to a single group using the hierarchy Māori>Pacific peoples>Asian>other groups except New Zealand European>New Zealand European, as is common in New Zealand. Participants were asked to indicate the highest qualification or level of school they had completed. Answers were collapsed into a binary variable of lower education (high school qualification or less) and higher education (tertiary qualification eg, degree, post-graduate diploma).

Participants could select their reason(s) for testing from a list of ten possible answers, or...
write in their own reason. Multiple answers were allowed (Table 2). Those who indicated they were experiencing or had experienced symptoms were asked how many days the symptoms were present before they contacted any health services. Delay was defined as waiting more than seven days to contact health services after the onset of symptoms, as this is the most common definition of delay found in the literature.7,8,10,11,14 Participants reporting symptoms were also asked if they had visited another health provider before coming to the clinic, if they had attempted any self-treatment in this time, whether they’d had sex since first thinking they may need to go to a clinic or health services, and with how many total partners and new partners. Lastly, participants were asked to indicate how often they had used condoms in this period using a five-point scale ranging from ‘none of the time’ to ‘all of the time’. This scale was then categorised into two groups; frequent condom use (‘all of the time’, ‘more than half of the time’) and infrequent condom use (‘half of the time’, ‘some of the time’, ‘none of the time’).

Data linkage
The questionnaire included an item which asked for consent to access the participants’ STI results for use in the study. When consent was given, a member of the clinical staff accessed the patient records and recorded any positive diagnosis/es. Infections were restricted to bacterial or viral STIs and the protozoal infection trichomoniasis.

Statistical analysis
Chi-square goodness-of-fit tests were used to compare the demographic characteristics of the study sample to the patient population. Binary logistic regression was used to investigate the association between delay behaviour and sex while symptomatic, as well as other selected associations. Where data was missing for an item, the participant was excluded from the particular analysis. The analyses were conducted with Statistical Package for the Social Sciences (SPSS) Statistics version 22 and p-values <0.05 were considered statistically significant.

Ethical approval
Ethical approval was granted by Victoria University of Wellington Human Ethics Committee (ref: 20504).

Results
Of 331 new patients who were approached to take part, 243 (73.4%) agreed. Four respondents completed less than 50% of the questionnaire and so were excluded from the analysis, leaving 239 (72.2%) responses in the final dataset. The sample was split relatively evenly between females (47.3%) and males (52.7%), with 43.8% under the age of 25 (age range 17-70 years, median 25 years) (Table 1). Almost two-thirds (60.3%) of participants reported a tertiary level qualification.

The clinic provided anonymised routinely collected data on all participants who attended the clinic during the study period. This was used to compare the gender, age, and ethnicity of those who completed the questionnaire with those who attended the clinic in the same period but did not participate in the study. Chi-square goodness-of-fit tests revealed there were more females and more under 25 year-olds in the study sample than would be expected ($\chi^2(1)=4.69$, $p=0.03$ and $\chi^2(2)=60.66$, $p<0.01$, respectively). There was also a significant difference in ethnicity between the study sample and the whole clinic population ($\chi^2(4)=17.80$, $p<0.01$), where the ‘other ethnicity’ group was overrepresented in the study sample and the New Zealand European group was underrepresented.

The most common survey-reported reason people attended the clinic for an STI test was because they had developed STI symptoms (Table 2). Other common reasons included a partner having symptoms or testing positive, having had unprotected sex with a new partner, or just wanting a check-up.

Many people reported in the survey that they had been tested before ($n=146$, 62.4%), and females were more likely to report having had a previous STI test than males after adjustment for age (57.1% of males, 65.5% of females, OR=1.906, $p=0.03$). Of those who reported having previously had a test, 58 (40.8%) said they had been diagnosed with an STI; this corresponds to 24.3% of the sample having been previously diagnosed with an STI (24.6% of men, 23.9% of women, no significant difference). The most common STI that people reported being previously diagnosed with was chlamydia (64.9% of the 37 people who reported which STI(s) they had ever been diagnosed with).
### Table 1: Demographic characteristics.

<table>
<thead>
<tr>
<th></th>
<th>Total N</th>
<th>n (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Gender</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>113</td>
<td>(47.3)</td>
</tr>
<tr>
<td>Male</td>
<td>126</td>
<td>(52.7)</td>
</tr>
<tr>
<td><strong>Age (years)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;25</td>
<td>103</td>
<td>(43.8)</td>
</tr>
<tr>
<td>25-34</td>
<td>94</td>
<td>(40.0)</td>
</tr>
<tr>
<td>35+</td>
<td>38</td>
<td>(16.2)</td>
</tr>
<tr>
<td>*<em>Ethnicity</em></td>
<td>236</td>
<td></td>
</tr>
<tr>
<td>New Zealand European</td>
<td>110</td>
<td>(46.6)</td>
</tr>
<tr>
<td>Māori</td>
<td>16</td>
<td>(6.8)</td>
</tr>
<tr>
<td>Pacific peoples</td>
<td>3</td>
<td>(1.3)</td>
</tr>
<tr>
<td>Asian</td>
<td>13</td>
<td>(5.5)</td>
</tr>
<tr>
<td>Other</td>
<td>94</td>
<td>(39.8)</td>
</tr>
<tr>
<td><strong>Education</strong></td>
<td>239</td>
<td></td>
</tr>
<tr>
<td>Lower education</td>
<td>95</td>
<td>(39.7)</td>
</tr>
<tr>
<td>Higher education</td>
<td>144</td>
<td>(60.3)</td>
</tr>
</tbody>
</table>

*If an individual identified with multiple ethnicities, a prioritisation approach was used to allocate individuals to a single group using the hierarchy Māori>Pacific peoples>Asian>Other>New Zealand European, as has been previously used in New Zealand Ministry of Health publications.

### Table 2: Reasons for attending for current test, previous testing behaviour and previous diagnoses.

<table>
<thead>
<tr>
<th></th>
<th>Females</th>
<th></th>
<th>Males</th>
<th></th>
<th>Total</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N</td>
<td>n (%)</td>
<td>N</td>
<td>n (%)</td>
<td>N</td>
<td>n (%)</td>
</tr>
<tr>
<td>Reason for seeking a sexually transmitted infection (STI) test (multiple answers were allowed)</td>
<td>110</td>
<td>(38.2)</td>
<td>121</td>
<td>(40.5)</td>
<td>231</td>
<td>(39.4)</td>
</tr>
<tr>
<td>Developed genital symptoms</td>
<td>42</td>
<td>(29.8)</td>
<td>49</td>
<td>(32.4)</td>
<td>91</td>
<td>(29.9)</td>
</tr>
<tr>
<td>Partner has symptoms or tested positive</td>
<td>15</td>
<td>(13.6)</td>
<td>29</td>
<td>(24.0)</td>
<td>44</td>
<td>(19.0)</td>
</tr>
<tr>
<td>Had unprotected sex</td>
<td>33</td>
<td>(30.0)</td>
<td>36</td>
<td>(29.8)</td>
<td>69</td>
<td>(29.9)</td>
</tr>
<tr>
<td>Intends to have unprotected sex</td>
<td>10</td>
<td>(9.1)</td>
<td>23</td>
<td>(19.0)</td>
<td>33</td>
<td>(14.3)</td>
</tr>
<tr>
<td>No symptoms, just a check-up</td>
<td>29</td>
<td>(26.4)</td>
<td>30</td>
<td>(24.8)</td>
<td>59</td>
<td>(25.5)</td>
</tr>
<tr>
<td>Being referred or called in</td>
<td>5</td>
<td>(4.5)</td>
<td>2</td>
<td>(1.7)</td>
<td>7</td>
<td>(3.0)</td>
</tr>
<tr>
<td>Other</td>
<td>10</td>
<td>(9.1)</td>
<td>6</td>
<td>(5.0)</td>
<td>16</td>
<td>(6.9)</td>
</tr>
<tr>
<td>Had an STI test before</td>
<td>110</td>
<td>(67.3)</td>
<td>124</td>
<td>(58.1)</td>
<td>234</td>
<td>(62.4)</td>
</tr>
<tr>
<td>Previously diagnosed with an STI (of those who had tested before)</td>
<td>73</td>
<td>(37.0)</td>
<td>69</td>
<td>(44.9)</td>
<td>142</td>
<td>(40.8)</td>
</tr>
</tbody>
</table>
For those who reported symptoms (n=91), the median length of time reported between symptom onset and contacting health services was 5.5 days (range 0–750 days). The distribution of delay times is shown in Figure 1. Of those experiencing symptoms, 41.7% waited more than seven days from symptom onset to contacting health services according to the participant survey responses (Table 3).

Of those with symptoms who answered the section on sexual behaviour (n=85), 26 (30.6%) reported they had continued to have sex after symptom onset (26.1% of men and 35.9% of women) (Table 4). Of those who reported sex while symptomatic, 13 had had sex with their existing partner and 10 people had had sex with at least one new partner (three did not report whether the partner(s) were new or existing) (Table 4). Among the 26 people who reported sex while symptomatic, infrequent condom use was reported more by those who had sex with existing partners (84.6%, n=11) than by those who had sex with new partners (10.0%, n=1). Those who waited more than seven days to contact health services were more likely to

Table 3: Healthcare-seeking behaviour of symptomatic respondents.

<table>
<thead>
<tr>
<th></th>
<th>Females</th>
<th></th>
<th>Males</th>
<th></th>
<th>Total</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N</td>
<td>n (%)</td>
<td>N</td>
<td>n (%)</td>
<td>N</td>
<td>n (%)</td>
</tr>
<tr>
<td>Previously visited a health provider for this set of symptoms</td>
<td>41</td>
<td>11 (26.8)</td>
<td>46</td>
<td>11 (23.9)</td>
<td>87</td>
<td>22 (25.3)</td>
</tr>
<tr>
<td>Attempted self-treatment</td>
<td>39</td>
<td>13 (33.3)</td>
<td>46</td>
<td>9 (19.6)</td>
<td>85</td>
<td>22 (25.9)</td>
</tr>
<tr>
<td>Waited longer than 7 days to visit a health provider</td>
<td>38</td>
<td>17 (44.7)</td>
<td>46</td>
<td>18 (39.1)</td>
<td>84</td>
<td>35 (41.7)</td>
</tr>
<tr>
<td>Days between symptom onset and contacting health services (Median (IQR))</td>
<td>38</td>
<td>6.5 (3.0–30.0)</td>
<td>46</td>
<td>5.0 (3.0–14.0)</td>
<td>84</td>
<td>5.5 (3.0–18.0)</td>
</tr>
</tbody>
</table>
have sex with any partner (existing or new) than those who waited less than seven days (OR=3.25, 95% CI 1.23 – 8.62, p=0.02).

In total, 146 (61.1%) participants gave permission for their STI test results to be extracted from the clinic records for use in the study. There were no demographic differences between participants who consented to linkage and those that did not. Of the 63 people who reported seeking an STI test due to experiencing STI symptoms and gave consent to access their results, 25 (39.7%) were positive for at least one STI. There was no statistically significant difference in the likelihood of delaying seeking help for symptoms for those who tested positive compared to those who tested negative (OR=0.56, 95% CI 0.19–1.66, p=0.30). Among symptomatic participants with a positive STI result, clinic records showed 32% had a \textit{C. trachomatis} infection, 24% had genital warts, 16% had genital herpes and 16% were cases of non-specific urethritis. Among asymptomatic patients who were diagnosed with an STI (n=8), the majority (75%) were due to \textit{C. trachomatis}.

To our knowledge, this is the first study examining healthcare-seeking delay for STI symptoms and sexual behaviour while symptomatic in New Zealand. A previous study of 66 clients assessed time to presentation of patients with genital warts at the Auckland Sexual Health Service, but the study did not include data from patients with other symptoms suggestive of an STI and did not assess whether patients continued to have sex while symptomatic.\textsuperscript{12}

The proportion of people waiting longer than seven days to seek healthcare for STI symptoms (41.7%) is consistent with that reported in recent studies from other developed countries. For example, a recent study in the USA found that 38% of men and 39% of women with symptoms delayed seeking care for more than seven days.\textsuperscript{17} In a study by Mercer and colleagues in the UK, 45.7% of genitourinary medicine (GUM) clinic patients had been symptomatic for more than seven days before seeking care, although a subsequent study five years later indicated the median length of delay had decreased from seven to three days.\textsuperscript{14,18}

It is not known from this data what factors influenced the time taken to contact health services. However, previous research by the authors involving qualitative interviews with university students in New Zealand identified several barriers to STI testing.\textsuperscript{19} These were: underestimating the risk of acquiring an STI; perceiving STIs as not serious; fear of invasive procedure; self-consciousness in genital examination; being too busy; the financial cost of an STI test; clinician attributes (eg, gender) and attitude; and concern of being stigmatised. It is likely that these factors will have also played a role in the health-seeking behaviour for the participants in the current study. In addition, while a person may notice some symptoms, they may not initially ascribe the

### Discussion

The most common reason for seeking healthcare at the SHC among this cohort was the presence of STI symptoms. The length of delay was highly variable, with some people seeking healthcare immediately and others waiting for several months. The data showed that 41.7% had symptoms present for more than seven days before contacting health services. One third of people with symptoms reported they had had sex since they first thought they needed to go to a clinic or health services, and, as expected, the people that waited longer than seven days were more likely to have sex while symptomatic.
symptoms to a possible STI, which is likely to affect the time to presentation. This may be especially relevant among women, who may be more likely to ascribe their symptoms to natural bodily functions, such as regular discharge.9

The participants were asked how many days their symptoms were present before contacting health services, but provider delay was not queried in this study. It may be that the time between symptom onset and actually seeing a health professional was longer than recorded, due to appointment availability. Provider delay is an important aspect of timeliness to STI testing and may be influenced by a range of factors including staffing and triage processes. It would be useful to assess the extent and impact of provider delay in New Zealand, perhaps using clinical audit. It is also possible that the time to contact health services was affected by other health provider factors such as opening hours and distance to services. Further research should also be undertaken to assess these aspects of delay to healthcare.

In total, 26.1% of men and 35.9% of women reported having sex after the onset of symptoms. This is very similar to figures reported from the UK (25.2% of men 38.3% of women).18 That females are more likely to engage in sex while symptomatic than males is a consistent finding across many studies;9–11, 20 however, the number of participants in this study was too small to reliably test this association.

Engaging in sexual activity after the onset of symptoms poses a serious risk for transmission of infection. This study showed that those who delayed healthcare seeking were more likely to have sex while symptomatic. Although this association has been generally assumed, only a few studies have directly assessed the association.10,11,21 Of these, two studies reported that delay behaviour was associated with sex while symptomatic.11,21 Conversely, one study found that sexual activity while symptomatic was associated with attending healthcare quicker.10

As waiting longer than seven days to contact health services was associated with having sex after symptom onset, enabling prompt healthcare seeking may mitigate some transmission risk. Public health messages should emphasise early action for STI symptoms including the need to abstain from sex with all partners until healthcare has been sought and appropriate treatment and/or advice given. Additional interventions could involve providing education to improve STI symptom recognition, correcting myths about what an STI test involves,19 or providing support and guidance to navigate the healthcare system. Health funders and health providers in particular have a crucial role in minimising the structural barriers that may delay or prevent testing. Structural barriers include the location of health services, availability of appointments, the financial cost of getting an STI test, and the cultural responsiveness of the health provider.19,22

The main limitations of this research are the small sample size and the generalisability of the data. The sample size was a result of the short time frame available for recruitment (three months). Repeating this study in a larger sample would allow for comparison of demographic and sexual behaviour characteristics between people who delay seeking healthcare for symptoms and those who do not. This would enable identification of specific groups of people that could benefit from additional information and resources to aid them in seeking timely healthcare.

Attendees at SHCs are not representative of the general population, so these data should not be extrapolated to other groups.23 In addition, the sample was younger than the overall clinic population, and had a higher proportion of women and people reporting their ethnicity as ‘other’; therefore, results may not be representative of the overall clinic population. However, the study response rate was high at 73.4%. A large proportion of the group also had a tertiary level qualification, which is likely due to educated people experiencing better health and more healthcare, thus being more likely to attend the clinic and take part in research.

While the proportions of Māori, Pacific, and Asian people who took part in the study were similar to general attendance at the clinic, the actual numbers were small due to the overall study sample size being small. Laboratory data indicate that Māori and Pacific peoples experience a higher
prevalence of STIs.24 The reasons for this are unclear and likely complex, although accessing healthcare may be a potential contributing factor.25 Recent research involving young Māori in the Waikato identified discrimination and stigma as key barriers to accessing STI testing for Māori.22 More research into indigenous sexual health in New Zealand is needed.

A further limitation is that the questionnaire did not ask which symptoms the participants had experienced, or about symptom severity. It is probable that the type and/or severity of symptoms influences the speed with which an individual seeks healthcare. A previous study of people attending public clinics in Kenya found that women with genital ulcers or lower abdominal pain presented earlier than women with other complaints and men with genital ulcers presented later,11 although another study from the Netherlands found no relationship between type of symptoms experienced and delay behaviour.7 This is the first study to quantify delay behaviour for STI testing in New Zealand, and therefore provides original data for service planners and providers to work with. These data suggest that healthcare-seeking behaviour for STI symptoms could be improved in New Zealand, and that this could have a beneficial effect on the transmission of STIs.

Competing interests:
Nil.

Acknowledgments:
We thank the participants of this study for taking part in this research. We are grateful to the staff at the sexual health clinic in Wellington for their support of this work and their contribution to data collection. We also thank Hansa Patel for assisting with data entry for the study.

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100 years since the 1918 influenza pandemic—progress made, yet questions remain. A synopsis of the 4th New Zealand Influenza Symposium, February 2018

Nadia A Charania, Nikki M Turner

ABSTRACT

The year 2018 marks 100 years since the 1918 influenza pandemic that caused devastating social and economic destruction worldwide. Despite substantial progress made with influenza research and strategies to control disease outbreaks, influenza continues to be a global public health problem. This paper presents a synopsis of the 4th New Zealand Influenza Symposium hosted by the Immunisation Advisory Centre in February 2018. During this symposium, international and national experts and service providers convened to discuss strategies to mitigate the effects of seasonal influenza and prepare for the next influenza pandemic.

The Immunisation Advisory Centre (IMAC) hosted the 4th New Zealand Influenza Symposium (NZIS) with the support of the Ministry of Health in February 2018 in Wellington. IMAC, a national organisation based at the University of Auckland, is a hub for researching vaccines and vaccine-preventable diseases, training healthcare professionals and coordinating national immunisation service delivery. Similar to previous years, the event attracted international and national experts to discuss current influenza-related policy, immunisation practice and research. Building upon the three previous symposiums, discussions continued about strategies for improving policy and vaccine delivery mechanisms to better protect people, particularly vulnerable groups, against influenza. Recognising that it has been 100 years since the devastating 1918 influenza pandemic, this event also offered an opportunity to reflect on previous experiences and look forward with new energy to tackle the remaining unanswered questions—knowing that the next influenza pandemic is not a matter of if, but when. This paper presents a synopsis of the key topics discussed; the full programme and links to the speakers' presentations are available online.

Pandemic influenza: past reflections and future preparations

Looking back: four previous influenza pandemics

An influenza pandemic is a global disease outbreak caused by a novel influenza A virus that has sufficient virulence to cause human disease and can be efficiently transmitted from human-to-human. Influenza pandemics are unpredictable and irregular,
but have occurred three to four times each century. There were three influenza pandemics in the 20th century, some informally named after their presumed site of origin, which differed in terms of the virus subtype, epidemiology and disease severity.7 The influenza pandemic of 1918–1919 was caused by a H1N1 virus subtype and quickly spread worldwide in multiple waves resulting in approximately one third of the population being infected and 50 million deaths.8 Although the virus was particularly virulent, the majority of individuals died during this pandemic due to secondary bacterial pneumonia since antibiotics were not available at the time.9 From 1957–1963, the “Asian” influenza pandemic was caused by a H2N2 subtype and resulted in approximately 1.5 million deaths worldwide.10 From 1968–1970, the “Hong Kong” influenza pandemic, caused by a H3N2 subtype, resulted in approximately one million deaths worldwide.10 Most recently, an outbreak of a severe acute respiratory infection occurred in Mexico causing the first pandemic of 21st century.11 The 2009 H1N1 influenza pandemic spread to more than 214 countries worldwide and resulted in at least 18,449 laboratory-confirmed deaths reported to the World Health Organisation (WHO) for the period up to August 2010.12 Global estimates later reported that the mortality rate was 15 times higher than laboratory-confi rmed deaths with an estimated 201,200 respiratory and 83,300 cardiovascular deaths associated with the 2009 H1N1 pandemic.13

The 1918 pandemic has been coined as the “mother of all pandemics” due to the vast devastation it caused, and because descendants of the 1918 virus caused subsequent pandemics.8 A defining feature of the 1918 pandemic was that it uncharacteristically impacted young adults rather than the very young and the elderly, resulting in an atypical age pattern of infl uenza-related deaths.8 Indigenous populations were especially vulnerable during the 1918 pandemic; reports indicate that these groups were disproportionately impacted due to socio-economic, geographical and community factors.14–16 The worldwide devastation caused by the 1918 pandemic was echoed in New Zealand. At the symposium, Professor Geoffrey W Rice shared compelling stories and pictures that represented an in-depth account of how families in New Zealand were impacted by the 1918 infl uenza pandemic.4,17 In a short period, there were approximately 9,000 deaths with Māori, the indigenous population of New Zealand, experiencing the greatest burden with a mortality rate at least seven times that of Europeans (Figure 1).17–20

Despite various scientifi c breakthroughs, notably the successful genome sequencing of the causative infl uenza virus, many questions about the 1918 pandemic remain that warrant future research. The origin of the 1918 virus is still highly debated, along with questions about why the outbreak was so fatal, the atypical epidemiologic features, and importantly, could a pandemic of this severity happen again and how do we best prepare ourselves for this possibility.8

Moving forward: preparing for the next pandemic

While it is impossible to predict the next infl uenza pandemic, robust global surveillance and coordination is required to monitor emerging and re-emerging viruses with pandemic potential. Among the many ongoing efforts worldwide, the WHO’s Research and Development (R&D) Blueprint identifi es priority diseases and enables rapid activation of R&D activities during epidemics, including vaccine and medicine development.21 Moreover, progress has been made with strengthening countries’ response capacities to infectious disease threats as part of the Global Health Security Agenda (GHSA).22 All of these activities are vital as researchers estimate that 62 million people would die if a pandemic similar to that of 1918 occurred in today’s population.23 Inequities between countries would be appalling, with 96% of the deaths predicted to occur in the developing world where health services and resources are already strained.23 These alarming fl gures emphasise the importance of rapid and coordinated global responses to disease outbreaks; however, it is arguably even more important to prevent outbreaks from occurring in the first place. Dr Tedros Adhanom Ghebreyesus, the Director-General of the WHO, stresses that the quest for a pandemic-free world will require addressing the root causes of health insecurity, namely lack of access to healthcare and absence of universal health coverage for the most vulnerable.24
To prepare for the next pandemic and minimise the associated societal and economic impacts, the WHO, which acts as the global lead agency during health emergencies, provides various guidance reports and checklists to assist nations in creating pandemic plans.25 As recommended by the WHO, New Zealand’s pandemic planning is embedded in the Civil Defence and Emergency Management framework.26 Mr Charles Blanch, Director of Emergency Management at the Ministry of Health, informed participants about the all-hazards and all-of-government approach to pandemic preparation and response outlined in the New Zealand Influenza Pandemic Action Plan (NZIPAP).4,27 In addition to a detailed national pandemic plan, recently updated from the 2009 H1N1 pandemic experience and extensive consultation, various inter-agency training, testing and simulation exercises are underway to review and revise plans with lead officials.27 Experts suggest many recommendations to further strengthen New Zealand’s plans, such as incorporating activities for a broad range of infectious diseases beyond notifiable diseases and influenza, and providing support to nearby Pacific Island countries.26 Given the impending threat of a future public health emergency, it is imperative that all nations continually review and refine their preparedness and response plans to contribute to a comprehensive and robust global effort.

Seasonal (epidemic) influenza: reducing inequities of disease burden

Seasonal (epidemic) influenza occurs every winter since viruses constantly evolve via antigenic variation to escape host human immune responses.28 Antigenic drift refers to frequent, gradual changes in the two genes that encode hemagglutinin (HA) and neuraminidase (NA), the key antigens that elicit an immune response in humans.6,10 These point mutations result in minor changes to these surface proteins and produces new virus strains that may not be recognised by pre-existing antibodies, thereby reducing the effectiveness of previous seasonal vaccines.28 Given this, surveillance is required to achieve a close antigenic match between circulating influenza virus strains and the seasonal influenza vaccine to provide optimal protection.

To collect data to better understand national influenza disease burden and guide vaccine strain selection, the Southern Hemisphere Influenza and Vaccine Effectiveness Research and Surveillance study has been underway in New Zealand.29 Dr Sue Huang, Director of the WHO National Influenza Centre at the Institute of Environmental Science and Research, updated participants on recent SHIVERS data, noting that the 2017 seasonal influenza epidemic was relatively mild and H3N2 was the predominant circulating subtype.4 A sero-epidemiologic population cohort study that
tested for hemagglutination inhibition (HAI) and neuraminidase inhibition (NAI) defined serological infection among an unvaccinated cohort (N=911) indicated that 35% (321/911) had either HAI or NAI seroconversion. Of those infected, 14% (46/321) were HAI-alone seroconverters and 31% (100/321) were NAI-alone seroconverters, inferring that measuring anti-NA and anti-HA antibodies is important in understanding the true influenza infection burden.

Annual seasonal influenza vaccination remains a key strategy to prevent influenza illness and related complications. Policy-makers and healthcare professionals shared their experiences with the 2017 seasonal influenza vaccination campaign in New Zealand. Similar to previous years since 2013, the Ministry of Health achieved its target of delivering 1.2 million doses. In 2017, efforts focused on increasing vaccine accessibility, particularly for the elderly and pregnant women, extending availability of the funded vaccine, introducing district health board (DHB) performance measures and improving infrastructure to collect data about vaccine distribution. The focus for the 2018 campaign will be on changing the vaccine strains, funding quadrivalent vaccines, managing the introduction of the funded zoster vaccine, and improving coverage among the elderly, particularly those of Māori, Pacific and Asian ethnicities, and healthcare workers. Representatives from DHBs with high vaccination coverage rates shared some helpful strategies to improve staff vaccination rates; they emphasised diligent preparation before the campaign, frequent communication and building relationships during the campaign, comprehensive weekly reporting to guide decision-making, and collaboration with internal stakeholders and union members.

More information and resources about the New Zealand vaccination campaign can be found at IMAC's website. The importance of reducing inequities of influenza disease burden and protecting vulnerable groups (eg, young children, the elderly, pregnant women) by ensuring they are appropriately vaccinated was highlighted. Conversations continued from last year’s symposium about novel vaccine technology, particularly for young children (eg, adjuvanted trivalent inactivated influenza vaccine [ATIV]) and the elderly (eg, ATIV and high-dose vaccines), and paradigms for influenza vaccination strategies (eg, individual protection, herd immunity).

**Conclusion**

The 4th New Zealand Influenza Symposium (NZiS) brought together various international and national experts and front-line service providers to discuss key areas of influenza prevention, findings from recent research studies and priority areas for future work. The event marked 100 years since the devastating influenza pandemic of 1918, thereby highlighting the continued need to prevent disease outbreaks and improve pandemic response plans in case a pandemic of that scale happened again. Seasonal influenza epidemics provide an annual opportunity to collect data to better understand the true influenza disease burden and inform disease control and management efforts. A key emerging theme was that vulnerable populations are disproportionately impacted by both pandemic and seasonal influenza. To reduce the inequitable influenza disease burden, efforts to improve accessibility and availability of influenza vaccines, along with developing more effective vaccines, for vulnerable populations should be a priority.
**Competing interests:**

Dr Turner reports affiliation with the SHIVERS study: CDC funded, outside the submitted work. The Immunisation Advisory Centre is funded by the Ministry of Health to promote the delivery and uptake of influenza immunisation as part of the national immunisation programme.

**Acknowledgements:**

The authors and the Immunisation Advisory Centre would like to thank the presenters and session chairs for their contributions: Michael Baker (University of Otago), Charles Blanch (Ministry of Health), Teresa Carrick (Northland District Health Board), Tim Dare (University of Auckland), Sue Huang (Institute of Environmental Science and Research), Louise Lewis (Compass Health), Raina MacIntyre (University of New South Wales), Barbara McArdle (Immunisation Advisory Centre), Caroline McElnay (Ministry of Health), Diana Murtß (Ministry of Health), Geoff Rice (University of Canterbury), Loretta Roberts (Immunisation Advisory Centre), Sally Roberts (Auckland District Health Board), Lone Simonsen (Roskilde University), Amanda Stanfield (Titahi Bay Pharmacy), Robyn Taylor (Karori Medical Centre), Nikki Turner (Immunisation Advisory Centre). We would also like to especially thank Theo Brandt, Communications Manager (Immunisation Advisory Centre), for his technical support.

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Pro-equity climate change and environmental sustainability action by district health boards in Aotearoa/New Zealand

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ABSTRACT

AIM: With current health ministerial directives to prioritise actions on reducing health inequities and district health board (DHB) greenhouse gas (GHG) emissions, we argue that all climate change and environmental sustainability actions by DHBs must be pro-equity, and explore how the two priorities can be addressed concurrently.

METHOD: Building on prior knowledge of climate change and environmental sustainability action in the health and disability sector, we undertook a visioning exercise to generate ideas for pro-equity GHG emissions reduction initiatives in the DHB context. Visioning was further informed by presentation and feedback discussion at an Annual Scientific Meeting of the New Zealand College of Public Health Medicine.

RESULTS: Three scenarios were envisioned in the areas of DHB energy use, transport and procurement where GHG emissions could be reduced, and health determinants and outcomes for Māori and Pacific peoples improved.

CONCLUSION: Current ministerial directives to address both health inequities and DHB greenhouse gas emissions present DHBs with the opportunity to ensure they systematically address both priorities at the same time. In doing so, Aotearoa/New Zealand has the potential to lead the world in demonstrating pro-equity climate change and sustainability action in health systems.

The reality and potential severity of human-caused climate change is now well known, along with an understanding of the inter-relationships between climate change and health. As global average temperature rises, negative health impacts from phenomena such as excess heat, extreme weather events, food insecurity and changes in infectious disease patterns will increase. The magnitude of these health impacts will vary by age, ethnicity, health status, geographic location and socioeconomic circumstances—with the greatest impacts falling on communities, including Indigenous peoples, who have contributed least to greenhouse gas (GHG) emissions.

For Māori in Aotearoa/New Zealand, climate change will intensify the adverse and inequitable burden of ill-health that is the result of historical and ongoing processes of colonisation. Unless there are urgent and substantial pro-equity policy changes both within and beyond the health and disability sector, climate change will exacerbate health inequities.

We argue that with the current ministerial directives to prioritise action on both health inequities and district health board (DHB) greenhouse gas emissions, DHBs have the opportunity to plan pro-equity climate and environmental sustainability actions that address both priorities. Pro-equity climate change and environmental sustainability action by DHBs will also fulfill legal mandates under the New Zealand Public Health and Disability Act 2000 for DHBs to 1) reduce (with a view to eliminating) health inequities by improving health outcomes for
Māori and other population groups; and 2) exhibit a sense of environmental responsibility by having regard to the environmental implications of their operations.14

Health and disability sector greenhouse gas emissions—impacts and opportunities

Greenhouse gas emissions from health systems in developed countries are substantial, making up around 3–10% of total national emissions.15–17 Hospitals in particular are very energy intensive, produce large amounts of waste, have large transport and procurement carbon footprints, and emit some gases with very high global warming potential (eg, anaesthetic gases).15–18

It is acknowledged that our health and disability sector is contributing to health-harming climate change, and that causing harm in this way is contrary to the fundamental purpose of promoting, protecting and restoring health and wellbeing.19 Those health organisations that face up to their responsibilities to reduce GHG emissions find that action to reduce emissions and improve environmental sustainability can bring co-benefits such as saving money, improving the quality and resilience of health services, and improving staff and community wellbeing more widely.20–25

Forward looking health systems around the world are acting now to reduce GHG emissions, improve sustainability and increase climate change preparedness.26–28 However, to date health organisations have not considered how they can ensure that their climate change and environmental sustainability actions align with the achievement of health equity.

Why climate change and environmental sustainability action by DHBs must be pro-equity

When poorly designed and implemented, health services and new health initiatives/programmes can maintain or make worse existing health inequities that stem from the inequitable distribution of resources that determine health.29 Aotearoa/New Zealand has several examples of health inequities being made worse by health organisations, as well as the introduction of new programmes locally or nationally. For example, inequities in the quality of primary and secondary health care for Māori,30–36 and ethnic inequities in participation rates for the Bowel Cancer Screening Pilot.37 If DHBs choose not to apply pro-equity thinking, planning and accountability mechanisms in the rollout of climate change and environmental sustainability actions, then there is a real risk of maintaining or worsening health inequities. For example, if cost savings resulting from interventions (eg, energy savings) were reinvested into existing primary and secondary care services as they currently operate, the inequities in health care for Maori would be perpetuated.30–36 However, the opposite could be possible if health equity underpins all climate change and environmental sustainability actions in the health and disability sector.

There is currently very little in the published literature about the deliberate pairing of climate change and environmental sustainability action in health systems with health equity goals; although large health organisations like the National Health System (NHS) in England and Kaiser Permanente in the US have linked sustainability in health organisations to wider ‘social value’.38–40

The NHS in England has a goal in its ‘Sustainable Development Strategy for the Health and Care System’ to take every opportunity to contribute to healthy lives, communities and environments.38,39 However, annual ‘Health Check’ reports on the strategy state that there has not yet been enough done to encourage and value innovation in health for sustainability and social value. Quality care, fair access and ‘supporting the marginalised’ are noted as factors that could be improved through a sustainable health system, but achieving health equity is not highlighted as a particular goal.38,39

Kaiser Permanente in the US has an environmental stewardship programme with goals including climate action, sustainable food and waste reduction. This is seen to be an integral part of their approach to emphasise the social, environmental, behavioural and clinical aspects that shape wellbeing.40 Benefits to ‘minority’ health are mentioned, for example, that procurement of local food is both environmentally sustainable and supports small, minority-owned businesses.41 Kaiser Permanente
also recognises that its environmental actions contribute to reducing those health inequities in the US that arise from the higher exposure of Indigenous and other marginalised populations to health-harming pollution and environmental toxins in living and working environments, compared to ‘white’ populations.42

In less developed countries, the relationship between the environmental performance of health organisations and increasing the resilience of local communities (who suffer considerable health inequities compared with people in developed countries) is well recognised. Improvement to energy, water and other infrastructure at Georgetown Hospital in the Caribbean as part of a World Health Organization ‘Smart Hospitals’ initiative in the Americas was noted to not only improve environmental performance (eg, a 60% reduction in energy use); but also resulted in better access and use of the health organisation by the local community; and full functionality following a severe storm in 2013 (which crippled other health services in the area). At that time, the hospital was also able to provide safe drinking water to the storm-affected community from its rainwater harvesting system.43

A vision for pro-equity climate change and environmental sustainability action by DHBs

Given the very few specific examples in the literature regarding the deliberate pairing of climate change and environmental sustainability action in health systems with health equity, we undertook a blue-sky visioning exercise to generate ideas for pro-equity initiatives by DHBs. Blue-sky thinking is defined as ‘creative ideas that are not limited by current thinking or beliefs’.44 The exercise was based on knowledge of GHG reduction and environmental sustainability initiatives occurring both internationally as prior discussed, and within DHBs in Aotearoa/New Zealand,45 and was further informed by presentation and feedback discussion at the 2016 Annual Scientific Meeting of the New Zealand College of Public Health Medicine. Rather than proposing that this method generates high-level evidence, we argue that the blue-sky visioning exercise is grounded within the current context of climate change and environmental sustainability activity occurring within DHBs, and the considerable evidence around the urgent need for pro-equity thinking within the health and disability sector in Aotearoa/New Zealand.46

Three DHB pro-equity GHG emission reduction scenarios are envisioned in the areas of energy use, transport and procurement which, according to NHS England analysis, are the biggest contributors to the GHG/carbon footprint of the health system in England.15,47

Pro-equity DHB GHG Emissions Reduction Scenario 1

DHB One implements a sustainable energy management plan with support from the Energy Efficiency Conservation Authority (EECA). This involves a lighting retrofit (LED and motion sensors) in hospital buildings, solar panels on the renal dialysis unit (which uses large amounts of electricity during daylight hours), computer sleep-mode across the hospital campus, and modernising the heating, ventilation and cooling (HVAC) systems, including replacing the hospital coal boiler with a biomass boiler. The ongoing annual energy cost-savings are re-invested into collaborative community projects that create healthy, warm, energy-efficient homes in communities with a high proportion of Māori and Pacific peoples. Together with local council funding, and support from local Iwi and the Whānau Ora Collective, this allows a number of homes to be weather-proofed, retrofitted with insulation, double glazed and provided with heat pumps and ventilation. Working with the Whānau Ora Collective means that participating whānau are supported to access social and other services that address further determinants of health. Pre- and post-monitoring of avoidable hospital admissions related to poor-quality housing shows reduced hospital admissions for Māori and Pacific peoples in the intervention areas.

Pro-equity DHB GHG Emissions Reduction Scenario 2

DHB Two implements a sustainable travel management plan for staff travel to a regional hospital that is 100km distant from the base hospital. Outpatient clinic starting and finishing times are harmonised, a ‘book a seat’ (instead of book a car) system...
is established, and a number of electric vehicles are introduced in place of petrol vehicles when the DHB fleet contract is renewed. Savings from fuel and car maintenance costs are reinvested into a tailored outreach service that improves access to care for a rural, predominantly Māori community. This service, designed and developed in partnership with the local community and Māori Health Provider, involves a shuttle service for first specialist appointments and a telemedicine service for follow-up appointments located in the Māori Health Provider clinic. Monitoring of Ambulatory Sensitive Hospitalisations (ASH) by ethnicity demonstrate a reduction in adult Māori ASH rates in the community following the initiative.

**Pro-equity DHB GHG Emissions Reduction Scenario 3**

DHB Three implements an environmentally sustainable food plan. A policy is put in place that 80% of fresh food (eg, fruit, vegetables) in the hospital will be procured from the local region—thus reducing food-mile GHG emissions, as well as supporting local employment and income opportunities within the local food economy. Furthermore, working in partnership with the local urban marae, DHB food waste is collected and composted, then used in the marae community food garden. This reduces GHG emissions from food waste and supports food security for the wider community by harnessing and supporting knowledge on Indigenous food sovereignty and food production. As part of the policy, the DHB commits to being a purchaser of the food produced by the marae garden, thus supporting Māori economic development.

**Pro-equity DHB climate change and environmental sustainability action and resilience**

Pro-equity sustainability interventions have the potential to enhance the resilience of populations who will face significant climate-health impacts. Māori and Pacific peoples, children and young people, the elderly and those on low incomes are more vulnerable to the health impacts of climate change. This is not only because of existing health inequities, but because of other vulnerability factors such as poorer infrastructure (eg, housing, safe water supplies) and less financial resource to respond to damaging climate change-related events (eg, flood damage to homes with health implications related to cold temperatures, damp and mould).8–9

The reinvestment of energy cost-savings into improving community housing (Scenario 1) has the potential to not only improve health, but also means that the occupants would be more able to cope with future extreme weather events (eg, storms, heat waves) that could otherwise create a health risk. Reinvested savings from reduced DHB transport costs into a tailored outreach service (Scenario 2) contributes to the reduction of Māori health inequities, thus increasing community resilience for a population group that already bears the disproportionate burden of ill-health. Scenario 3 supports Indigenous food sovereignty and local food production. This would enhance the resilience of the community to future climate-change related changes in food systems (eg, food price spikes as food growing areas globally are affected by climate change).48,49

**Is this vision realistic?**

While these scenarios were generated via a ‘blue-sky thinking’ process, it is important to note that it is situated within concrete knowledge of what is already happening within health organisations within Aotearoa/New Zealand and overseas. For example, some DHBs have already made use of EECA loans and support to bring about six-figure annual energy savings which are available for reinvestment by DHBs.50 Indigenous food sovereignty is acknowledged as having considerable potential to promote to health, wellbeing, resilience and environmental sustainability.51,52

We acknowledge however that there are limitations. The visioning aims to outline in broad brushstrokes what might be possible if DHB climate change and environmental sustainability action are deliberately pro-equity, in order to avoid the real risk of the worsening of health inequities if they are not. The scenarios have not been costed; and the real-world challenges and barriers that are present within all large health organisations have not been explored. On the other hand, tackling complex challenges may well require, at least as a starting point, the type of unconstrained ‘outside the box’ thinking that blue-sky visioning encourages.
What we need to move forward

For these DHB pro-equity climate change and environmental sustainability actions to become a reality we need the Government and the Ministry of Health to follow up on their health equity and GHG reduction directives to DHBs with some concrete actions, for example:

- Directing DHBs to keep equity at the centre of climate change and environmental sustainability action, and ensuring partnership with Māori at every level in the planning, implementation, monitoring and reporting processes.
- Establishing a national ‘Sustainable Development Unit’ for the health and disability sector, and the establishment of sustainability managers with expertise in health equity in each DHB, so that existing action can be coordinated and a pro-equity lens consistently applied to all initiatives.
- Mandating that all DHBs measure, reduce and report annually on their GHG emissions in accordance with the International Organization for Standardization (ISO) standard, and that as part of the annual reporting there is:
  - Specific reporting on how GHG emission reduction actions have contributed toward the reduction of health inequities for Māori and Pacific peoples.

Conclusion

Unsustainable development, inequity and ill-health are all interlinked, and any comprehensive plan for better health and wellbeing for all peoples must take these interconnections into account.

Too often new health priorities and programmes are implemented without sufficient thought to their potential to worsen health inequities; and the climate change and environmental sustainability impacts of our health and disability sector have until recently been largely overlooked.

We argue that current ministerial directives to address both health inequities and DHB GHG emissions present an opportunity for the health and disability sector to systematically address both priorities at the same time. In doing so, Aotearoa/New Zealand has the potential to lead the world in demonstrating pro-equity health system climate change and environmental sustainability action.
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Implementing HIV pre-exposure prophylaxis (PrEP): let’s not get caught with our pants down

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ABSTRACT

HIV pre-exposure prophylaxis (PrEP) is a daily pill that prevents HIV acquisition. In March 2018, New Zealand became one of the first countries in the world to publicly fund PrEP for individuals at high risk. PrEP promises significantly improved HIV control but is unfamiliar to most health practitioners here, compromising its potential. In this article we review the rationale for PrEP and identify barriers to rapid implementation. The latter include: consumer and health practitioner awareness; acceptability; scale-up targets; prescribing and pharmacy bottlenecks; service capacity to manage follow-up; primary care training; monitoring systems for uptake and quality; equity; eligibility; risk compensation and policy. Many of these areas are ripe for research and innovation. By addressing these obstacles we can realise the potential of PrEP and move closer to ending HIV in Aotearoa/New Zealand.

HIV pre-exposure prophylaxis (PrEP) is a daily pill containing tenofovir disoproxil fumarate with emtricitabine (TDF/FTC) that almost entirely eliminates the risk of HIV acquisition if taken as prescribed. On 1 March 2018 New Zealand became one of the first countries internationally to publicly fund PrEP. Eligible populations include gay and bisexual men (GBM) and transgender individuals at high risk, and the partners of people living with unsuppressed HIV (Figure 1). PHARMAC’s decision is timely as New Zealand’s HIV epidemic expands in size and cost. Substantial reductions in HIV transmission are possible; New South Wales (NSW) has witnessed a 29% decline in newly-acquired HIV diagnoses following implementation of a large PrEP demonstration project.

PrEP may be the latest innovation in HIV prevention but is unfamiliar to most health practitioners and planners in New Zealand: we have brand new trousers, but no belt or suspenders. To achieve a good fit, we can learn from overseas programmes and replicate and adapt efficient systems locally, especially rapid scale-up. PrEP is also novel for New Zealand because it is a biomedical approach that shifts HIV prevention for HIV negative individuals from communities into the clinical setting and will therefore rely heavily on engagement by primary care, pharmacies and sexual health services.

In this viewpoint article we review the rationale for PrEP and raise initial uncertainties about implementation.

Rationale for PrEP

PrEP is effective if taken correctly

PrEP almost entirely eliminates the risk of contracting HIV sexually if taken as prescribed. Open-label prospective cohort studies in sexual health clinics found that PrEP reduced HIV acquisition risk among GBM by 86%. With correct timing and daily adherence this risk reduction approached 99%. Imperfect adherence (four or more times a week) still conveyed considerable if not complete protection, earning PrEP a reputation for being a “forgiving” medication – which is relevant when considering “real-world” use.
Effectiveness data at the population level is emerging, with NSW recording a 29% reduction.3 London reported a 32% decline in recent HIV cases after implementing large scale PrEP services although this coincided with increased HIV testing and prompt treatment of those infected.9 Mathematical modelling studies continue to be encouraging, a recent systematic review predicting ~95% reduction in HIV transmission if PrEP is effectively targeted and combined with existing interventions.10 Indeed PrEP has recently been described as a necessary public health intervention if HIV is to be controlled.11

PrEP is timely

PrEP comes at a pivotal moment in New Zealand’s HIV epidemic. On the one hand, HIV diagnoses have been rising with the increase mostly affecting GBM.12 On the other hand we have most people living with HIV diagnosed and on treatment and unable to transmit the virus.13 We have most GBM who are susceptible to HIV using condoms for casual sex.14 And we could have the small group of people who struggle with consistent condom use for receptive anal intercourse unable to acquire HIV if they are offered, accept and adhere to PrEP.

This pincer-like prevention approach closes down opportunities for HIV to spread. PrEP, like condoms, removes users from the potential network of transmission and leaves the virus with nowhere to go, akin to herd immunity. PrEP therefore promises both private and public health benefits: protecting the user and their future sexual partners. Taken together, condoms, increased HIV testing, treating HIV, and PrEP can enable New Zealand to regain control and work towards HIV elimination.2

PrEP is moral

We can anticipate that some people will have moral objections to the government subsidising PrEP for HIV prevention. People may be concerned that it endorses risky sexual behaviour or will increase transmission of other sexually transmitted infections (STIs). However, publicly funding tools that protect against the health and social consequences of sexual behaviour is not new. PHARMAC funds the Gardasil vaccine for human papillomavirus (HPV), funds contraceptive options, and funds condoms. In July 2017 PHARMAC also removed the CD4 threshold to prescribing funded antiretroviral treatment (ART) for people living with diagnosed HIV, recognising ART’s public health value in preventing HIV transmission. To withhold public funding for PrEP would be inconsistent with these historical decisions and raise valid questions about homophobia or heterosexism, given the need for PrEP and its effectiveness, as the majority of those benefiting from PrEP would be gay and bisexual men. We believe that PrEP is the latest in a procession of innovations arising from the HIV sector and could, in time, transform practices in other public health fields.15

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**Figure 1**: Eligibility criteria for initiating funded HIV PrEP (1 March 2018).

<table>
<thead>
<tr>
<th>Both:</th>
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</thead>
<tbody>
<tr>
<td>1. Patient has tested HIV negative; and</td>
</tr>
<tr>
<td>2. Either:</td>
</tr>
<tr>
<td>2.1 All of the following:</td>
</tr>
<tr>
<td>2.1.1 Patient is male or transgender; and</td>
</tr>
<tr>
<td>2.1.2 Patient has sex with men; and</td>
</tr>
<tr>
<td>2.1.3 Patient is likely to have multiple episodes of condomless anal intercourse in the next 3 months; and</td>
</tr>
<tr>
<td>2.1.4 Any of the following:</td>
</tr>
<tr>
<td>2.1.4.1 Patient has had at least one episode of condomless receptive anal intercourse with one or more casual male partners in the last 3 months; or</td>
</tr>
<tr>
<td>2.1.4.2 A diagnosis of rectal chlamydia, rectal gonorrhoea, or infectious syphilis within the last 3 months; or</td>
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<tr>
<td>2.1.4.3 Patient has used methamphetamine in the last three months; or</td>
</tr>
<tr>
<td>2.2 All of the following:</td>
</tr>
<tr>
<td>2.2.1 Patient has a regular partner who has HIV infection; and</td>
</tr>
<tr>
<td>2.2.2 Partner is either not on treatment or has a detectable viral load; and</td>
</tr>
<tr>
<td>Condoms have not been consistently used.</td>
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</table>
PrEP increases prevention options for the most vulnerable

The majority of most-at-risk individuals do use condoms for casual sex, but we need new options to prevent HIV acquisition and transmission in GBM who have difficulty sustaining condom use. Many struggle with condom use because they are vulnerable, as a result of substance addiction, poor mental health, or difficulties negotiating condom use with a sexual partner due to power asymmetry (interpersonal differences in language, age, sexual experience, openness about sexuality). Others struggle with condoms due to perceived reductions in intimacy or sensation, or because of erectile dysfunction or latex allergies. Publicly-funding PrEP can disproportionately benefit the neediest in our communities.

PrEP addresses health inequalities

Improving HIV prevention options for GBM via PrEP can help narrow health inequalities, as GBM in New Zealand are around 40 times more likely than heterosexual individuals to have HIV. Within GBM communities, publicly-funded PrEP can also help reduce inequalities for Māori, Pacific and Asian men, for younger men and for transgender individuals. These sociodemographic groups may face greater barriers to consistent condom use, and are likely to face disproportionate financial barriers if their only option is to pay the full price for PrEP or to import PrEP from overseas pharmacies.

PrEP can be cost-effective

PHARMAC already faces sizeable costs for New Zealand’s failure to eliminate HIV transmission, as treating HIV is lifelong and expensive. PHARMAC’s published spend on HIV antiretrovirals doubled in five years from $16 million in 2011 to $32 million in 2016 due to ongoing infections and low mortality. A well-targeted PrEP programme with high uptake will prevent HIV transmissions and limit PHARMAC’s burden. Savings can be redirected into funding other medicines and vaccines. The cost of PrEP should also decline over time as medicines come off patent and cheaper generics are negotiated. From 1 July 2018 the list price for PrEP medication Truvada dropped by 77% and further reductions are likely. The cost-effectiveness of a targeted programme like New Zealand’s is sensitive to the medication price, meaning PrEP could soon become cost-saving.

PrEP can improve HIV testing and outcomes for people living with HIV

PrEP is likely to increase HIV testing among individuals most at risk. Commencing PrEP requires a confirmed HIV negative result, and only half of all GBM test for HIV annually. Consequently PrEP can help reduce the pool of undiagnosed HIV, estimated at 21% of GBM infected. Furthermore a third to a half of individuals with newly diagnosed HIV are diagnosed late (CD4 count <350). Individuals whose HIV is not diagnosed and treated are infectious and they play a disproportionate role in sustaining ongoing transmission in the community. Offering PrEP can engage such individuals in sexual health services resulting in earlier diagnosis and treatment. PrEP can also protect the HIV negative regular partners of diagnosed positive individuals whose virus is not fully suppressed, sharing responsibility for avoiding transmission.

PrEP can improve STI testing and treatment

Similarly, PrEP will increase the frequency and comprehensiveness of STI check-ups in a population experiencing a high burden of STIs. Although PrEP itself offers no protection against non-HIV STIs, each three-monthly PrEP prescription requires an STI screen. This should diagnose and treat bacterial STIs early; and help break chains of STI transmission in the community.

Expert recommendations and international experience

Finally, targeted access to PrEP in New Zealand is consistent with international recommendations from WHO, CDC and agencies in Europe, Britain and Australasia. Policy change also reflects the HIV Consensus Statement in Aotearoa/New Zealand and the New Zealand AIDS Foundation’s (NZAF) Strategic Plan 2016–19. A small number of countries now appear to have funded PrEP programmes (Table 1). Several Australian States also have large-scale PrEP demonstration projects, including NSW, Victoria and Queensland.
Table 1: National and sub-national funded PrEP programmes. Note: GBM = gay and bisexual men.

<table>
<thead>
<tr>
<th>Location</th>
<th>Date</th>
<th>Funding type</th>
<th>Eligibility</th>
</tr>
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<tbody>
<tr>
<td>United States</td>
<td>2014</td>
<td>Not public per se but criteria inform health</td>
<td>1) GBM, 2) heterosexual men and women, 3) people who inject drugs*</td>
</tr>
<tr>
<td></td>
<td></td>
<td>insurance coverage</td>
<td></td>
</tr>
<tr>
<td>South Africa</td>
<td>2016</td>
<td>Funded PrEP offered to high risk patients</td>
<td>1) GBM, 2) sex workers (includes males, females, and transgendered individuals), 3) serodiscordant couples, 4) adolescent girls and young women, as per WHO guidelines*</td>
</tr>
<tr>
<td>France</td>
<td>2016</td>
<td>Funded by social security and state medical aid.</td>
<td>1) GBM, 2) transgendered individuals, 3) people who inject drugs, 4) sex workers engaging in unprotected sex, 5) any vulnerable person who has engaged in unprotected sex*</td>
</tr>
<tr>
<td>Oslo, Norway</td>
<td>Nov 2016</td>
<td>Funded for patients attending the Olafia Sexual</td>
<td>Individuals at significant risk of HIV*</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Health Clinic</td>
<td></td>
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<tr>
<td>Belgium</td>
<td>June 2017</td>
<td>Heavily subsidised on reimbursement from an</td>
<td>1) GBM, 2) people who inject drugs, 3) sex workers, 4) partners of people with HIV*</td>
</tr>
<tr>
<td></td>
<td></td>
<td>individual's health insurance provider</td>
<td></td>
</tr>
<tr>
<td>Scotland</td>
<td>July 2017</td>
<td>Funded via Scottish NHS</td>
<td>1) GBM, 2) transgender individuals, 3) partners of people with HIV, 4) case-by-case on opinion of specialist*</td>
</tr>
<tr>
<td>Ontario, Canada</td>
<td>Sep 2017</td>
<td>Funded for individuals: aged under 25; Ontario</td>
<td>1) GBM, 2) transgender individuals, 3) heterosexual men and women, 4) people who inject drugs*</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Drug Benefit; Non-insured Drug Benefits Program</td>
<td>for First Nations and Inuit. Discounted for: Private health insurance; Trillium Drug Program</td>
</tr>
<tr>
<td>Brazil</td>
<td>Dec 2017</td>
<td>Funded via 35 clinical sites</td>
<td>1) GBM, 2) sex workers, 3) people who inject drugs*</td>
</tr>
<tr>
<td>British Columbia, Canada</td>
<td>Jan 2018</td>
<td>Funded via BC Centre for Excellence Drug Treatment Program</td>
<td>1) GBM, 2) transgender individuals, 3) heterosexual men and women, 4) people who inject drugs*</td>
</tr>
<tr>
<td>New Zealand</td>
<td>Mar 2018</td>
<td>Funded via PHARMAC</td>
<td>1) GBM, 2) transgender individuals, 3) partners of people with HIV*</td>
</tr>
<tr>
<td>Australia</td>
<td>Apr 2018</td>
<td>Funded via Pharmaceutical Benefits Scheme</td>
<td>1) GBM, 2) transgender, 3) heterosexual men and women, 4) people who inject drugs, 5) case-by-case basis*</td>
</tr>
</tbody>
</table>

* http://www.get-prep.com/prep-costs
Implementation uncertainties

Acceptability
High risk GBM are interested in PrEP with 150 successfully enrolled in the NZPrEP demonstration project in Auckland. However the extent of PrEP awareness and acceptability in the broader GBM community in New Zealand is unknown and needs to be assessed and monitored. Demand for PrEP in this early phase has largely been driven by non-government agencies (NGOs) such as NZAF, through social marketing, community forums and media, in partnership with community activists and clinician-champions. This energy may not be sustainable without extra resources as it competes with condom promotion. A risk is that unbalanced marketing and advocacy will under-promote condoms, leading to behavioural risk compensation and cannibalising the prevention gains possible with PrEP.

Targets
PHARMAC estimated that 4,000 individuals would be eligible under the targeted publicly funded programme. Researchers have since revised this to 5,816 individuals using updated data, estimating that 17.9% of sexually active HIV negative GBM would meet the criteria. If 50% of GBM live in Auckland, 2,900 need access in that city alone. Such numbers are well beyond current sexual health service capacity, meaning PrEP delivery in primary care is crucial to meeting these scale-up targets.

Prescribing bottlenecks
Identifying efficiencies in the PrEP prescribing and care process would be a valuable area of innovation. Subsidised PrEP can only be prescribed on special authority from an approved HIV prescriber, currently found on a list of specialists managed by the Ministry of Health. This numbers around 45 prescribers, most of whom presently focus on treatment of adults living with HIV, not those at HIV risk. New Zealand only has 8.0 FTE sexual health physicians, with uneven regional distribution and many DHBs not employing sexual health specialists at all or sub-contracting from other DHBs. Ten of the 20 DHBs have no-one listed as an HIV prescriber, making access to HIV care and prevention inequitable.

PHARMAC has addressed this by stating it is sufficient for a medical practitioner to have a documented recommendation from a named specialist, but it immediately raises questions about prescriber access, workload, service capacity and the consultation quality. In several centres, sexual health and infectious diseases physicians are facilitating virtual and remote consultations via e-referrals, and have developed a form for GPs to complete and return so an HIV prescriber can recommend approval if appropriate. However widening the range of PrEP prescribers at initial application, for example to include all sexual health physicians and registered medical doctors who have completed an accredited PrEP prescribing course, would better help reduce prescribing bottlenecks and improve access.

Pharmacy delays
Many pharmacies may be reluctant to carry stock due to Truvada’s currently high list price. Anecdotally, this is resulting in further delays, on top of some patients having to wait up to a week for a special authority to be processed before they can get a prescription (pers comm “PrePing NZ” closed Facebook group). This could be mitigated by GPs with high PrEP patient caseloads developing relationships with a local pharmacy to hold stock or couriering prescriptions overnight for remote patients.

Clinic capacity
Three-monthly repeats can be prescribed by GPs and nurse practitioners who have undertaken an accredited PrEP training course, but the patient has to be seen in person for the necessary STI screening, safety monitoring and risk reduction counselling. To meet the 5,816 scale-up target, health services must seek to minimise prescribing delays and manage the increased volume of initial and three-monthly repeat in-person patient appointments. For example, a 12-month PrEP programme for 5,816 patients would require 29,080 PrEP clinical encounters nationwide (initial plus four three-monthly reviews), or around 14,540 extra encounters in Auckland. Screening, scheduling and treating STIs are not factored into this time and should not be underestimated. Sexual
health service laboratory budgets may blow out due to increased NAAT testing, and high STI incidence among PrEP patients can erode clinicians’ time. Solutions include increased funding for sexual health staff and laboratory testing, and pooling laboratory specimens.

**Primary care training**

PrEP is also a sexual health care programme, not just a prescription. Improving primary care competencies in sexual health history taking, STI diagnosis and risk reduction counselling is fundamental as this is not currently well covered in medical or nursing training curricula. Worryingly, only half of GBM are “out” to their GP, many men report negative experiences when they do disclose their sexuality, and sexual orientation and gender diversity competencies are not well taught in medical school curricula. Addressing this will require a cultural transformation in the way primary care meets the needs of non-heterosexual and transgender patients. PrEP patients themselves have higher rates of prevalent and incident non-HIV STIs, hence three-monthly screening for gonorrhoea, chlamydia and syphilis infection is essential. One study estimated that 77% and 68% of STIs at three and nine months, respectively, after starting PrEP would have been missed if providers relied solely on symptom assessment.

ASHM has published local PrEP clinical guidelines, the Goodfellow Unit has provided training events, and NZAF have developed patient and prescriber pamphlets and an online PrEP-prescribing “doctor map”. New Zealand-specific guidelines will be needed next, addressing patient eligibility, screening and safety, and workforce training courses expanded, formalised and assessed. Innovative quick-reference PrEP prescribing aids for GPs would also be welcome. These could include assessment and management of STIs in an era of changing syphilis epidemiology, antimicrobial resistance in gonorrhoea and emergence of *M. genitalium*. PrEP providers with low caseloads may also wish to establish prescribing peer support networks to improve clinical decision-making, especially those who are isolated geographically or professionally. Patient adherence tools such as apps could optimise PrEP’s effectiveness in practice. In Christchurch, small group teaching sessions are held where GPs undergo an online course together followed by questions and answers. The Christchurch Sexual Health Service also provides patients with “PrEP Packs”. These include swabs and diagnostic order forms, enabling patients to perform urine, pharyngeal and rectal testing at home before visiting a laboratory for blood testing, making results available within two weeks of repeat scripts.

**Monitoring uptake, risk compensation, failures**

The speed and scale of PrEP implementation can only be gauged by fit-for-purpose monitoring systems. Pharmacy dispensing data on Truvada special authority prescriptions will measure uptake of funded PrEP, but not self-imported generic PrEP by individuals ineligible for public funding. It is imperative that behavioural surveillance is funded among the GBM community to estimate overall PrEP uptake and, critically, uptake among GBM disaggregated by behavioural risk (eg, those eligible for PrEP) and among equity populations (eg, younger Māori, Pacific and Asian GBM). Behavioural surveillance would also evaluate whether behavioural risk compensation is emerging in response to PrEP as risk perceptions change (eg, lower condom use, more sexual partners), both among PrEP users and particularly among the wider GBM community not using PrEP. Four PrEP failures have been documented internationally and drug resistance is a concern, albeit low probability; these too should be anticipated and surveillance systems prepared.

**Equity**

PrEP should benefit those most at risk, not those most able to navigate healthcare systems. Non-European minority GBM are less likely to access and adhere to PrEP in overseas studies. In NSW, minority ethnic communities have experienced slower PrEP uptake and consequently the reduction in HIV has been uneven: among Australian-born GBM incident HIV declined by 49% compared to 21% among Asia-born GBM. In New Zealand, Māori, Pacific and Asian GBM are not more likely to acquire HIV, but evidence does suggest later diagnosis, implying barriers to clinical services. PrEP
implementation here must ensure multiple entry points and appropriate follow-up, potentially including community-led and pharmacy-led delivery models, to avoid generating inequalities. Although PrEP is fully funded for those most at risk, visiting a GP every three months is not free and this will disproportionately deter some GBM.

**Promoting confidence in condoms**

Why do otherwise low-risk patients feel so vulnerable to HIV? Is it overestimation of personal risk? Or lack of confidence in condoms? Promoting the value of pharmaceuticals such as PrEP should not result in scaring people or exaggerating HIV risks, making GBM feel powerless or that they lack agency without the medication, or that effective interventions such as condoms are now inadequate, passé or unsophisticated.

In New Zealand, local HIV transmission is concentrated among GBM who account for 89% of diagnoses. Condoms prevent transmission 100% of the time if used consistently and correctly and they remain intact. Condoms also possess many qualities not shared by PrEP, such as reducing transmission of undiagnosed STIs which are endemic among sexually-active GBM, and being visually verifiable, meaning sexual partners don’t have to rely on full and accurate disclosure of sexual history, STI and medication status prior to casual sex. These messages should be reinforced in consultations with patients, safe sex social marketing and in policy formulation.

**Policy**

At the time of writing the Government had no HIV or sexual health action plan to guide planning, workforce training, delivery or research into PrEP. Jurisdictions such as NSW cite government leadership as central to their rapid successes in deploying PrEP, including aspirational targets with short time frames (eg, Ending HIV by 2020). Here, DHBs and PHOs will also play an important role by ensuring that sexual health services have adequate capacity and expertise and by training primary health care to be PrEP-ready.

**Conclusion**

Now that biomedical PrEP for HIV prevention is funded, we should aim to implement it with a “hit early and hit hard” mentality. Non-biomedical community-based and behaviour-change approaches like condom use should continue and PrEP should be matrixed within these. That promises the best impact but requires a short-term, deliberate, focused and energetic response across the health sector, not merely HIV and
sexual health agencies alone. After sustained annual increases, new HIV diagnoses in 2017 declined by 21% — a glimpse of what’s possible.12 International observers will be watching to see if New Zealand displays the same verve behind implementing PrEP as we did to fast-track funding. Let’s not get caught with our pants down.

Competing interests:
Gilead Sciences has funded study medication, extra laboratory costs and a research nurse on the separate NZPrEP demonstration project at Auckland Sexual Health Service (lead PI Dr Azariah). PHARMAC has provided salary support for behavioural analysis on NZPrEP (Dr Saxton).

Acknowledgements:
The New Zealand AIDS Foundation Fellowship funded Dr Saxton’s time on this work. The authors acknowledge the efforts and perspectives of many HIV and sexual health clinicians, GPs, NGO staff and gay community members surrounding PrEP in New Zealand that have informed this viewpoint.

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Blind Pouch Syndrome in Gastrojejunostomy

Jophia Kommunuri, Suheelan Kulasegaran, Peter Stiven

ABSTRACT

Blind pouch syndrome is a rare complication of a gastrojejunostomy. Its presentation may differ from blind pouches at other locations in that a small pouch can cause significant symptoms of mechanical obstruction before it is large enough to develop bacterial overgrowth. The effect of a small pouch may be overlooked at endoscopy and a high clinical index of suspicion is required. Here we present a case report of Gastrojejunostomy Blind Pouch Syndrome to highlight this clinically distinct entity.

Blind pouch syndrome is the set of signs and symptoms caused by intestinal content stasis and consequent bacterial hyperproliferation in a segment excluded from the intestinal flow after surgical anastomosis.1 Its occurrence is not well documented though considered rare.1,2,5 It typically occurs following a side-to-side anastomosis which inherently leaves a small blind pouch on either end of the bowel anastomosed, and may also occur with end-to-side anastomoses such as in a gastrojejunostomy. An end-to-side gastrojejunostomy is commonly performed as part of a Roux-en-Y reconstruction after a subtotal gastrectomy or for weight loss. A blind pouch of sufficient size to cause symptoms may occur either by technical error or subsequent dilation of a smaller pouch. The exact size a blind pouch needs to be before symptoms develop has not been established. Stagnation of intestinal contents within the pouch can result in bacterial proliferation.1,2 Bacterial proliferation can result in a variety of symptoms and signs ranging from non-specific abdominal pain, fevers and intermittent constipation to major nutritional deficiencies and mechanical complications. The bacterial overgrowth can lead to vitamin B12 or iron deficiency, inflammation, oedema, ulceration, gastrointestinal bleeds, and even perforation.1-4

The pattern of presentation in Gastrojejunostomy Blind Pouch Syndrome may differ from that of entero-entero or entero-colic anastomoses. With a gastrojejunostomy, a small pouch may cause symptoms of obstruction due to selective filling of the pouch with subsequent angulation of the enteral limb before it is large enough to cause problems related to bacterial overgrowth. Gastrojejunostomy Blind Pouch Syndrome may therefore present with specific symptoms of reflux, outflow obstruction, post-prandial epigastric pain, early satiety, and excess weight loss.

Case

A 65-year-old female presented with nausea and vomiting, upper abdominal pain, bloating after meals, and gradual weight loss. A midline incisional hernia was noted on examination. Six years prior she had undergone an emergency distal gastrectomy with Roux-en-y reconstruction for a perforated peptic ulcer. Blood tests showed normal electrolytes. A gastroscopy and contrast swallow showed two long jejunal limbs arising from the gastrojejunostomy though one was blind. The blind pouch measured approximately 45x60mm (Figure 1).
The patient underwent laparoscopic converted to open surgical revision of the gastrojejunostomy. The blind limb was mobilized and laid alongside the enteral limb. Enterotomies were made in both limbs and a linear cutting stapler was used to create a single pouch in continuity with the enteral limb.

The patient made a good post-operative recovery. One month post-surgery her symptoms had mostly resolved, and she was eating well and gaining weight.

**Discussion**

This case highlights that blind pouch syndrome in a gastrojejunostomy may cause symptoms of mechanical obstruction. As opposed to gastric outlet obstruction, symptoms may be mild and major electrolyte imbalances have not been reported. There was a significant time interval from initial surgery to presentation, which has also been found by other investigators.²,⁴,⁵

Blind pouch syndrome following gastrojejunostomy may be a technical issue at the
time of anastomosis. Physiological changes in side-to-side and end-to-side anastomoses may also play a role. Interruption of the circular muscle fibers of the gut in anastomotic surgery result in disruption of the normal peristaltic contractions and antegrade propulsion of food. Motor complex propagation in the proximal part of the anastomosed intestine is altered, resulting in a change in the direction of migration usually toward the blind end, resulting in dilatation of the blind loop.\textsuperscript{2,7}

Investigation is typically endoscopic and imaging based.\textsuperscript{5,6} We found endoscopy useful to exclude other mechanical causes such as anastomotic stricture and ulceration though radiological contrast study was invaluable to assess functional aspects such as preferential pouch filling and the effect pouch filling had on emptying via the enteral limb. CT is more useful for assessing blind pouch syndrome of more distal anastomoses.\textsuperscript{2,5,8}

The management of blind pouch syndrome generally requires surgical revision of the offending anastomosis.\textsuperscript{2,3,5,6} Surgical resection of the blind pouch has been advocated by some though revision by entero-enterostomy anastomosis between the blind loop and the efferent loop is an effective alternative (Figure 2).\textsuperscript{6,9}

Meticulous technique should be practiced when forming any side-to-side or end-to-side anastomosis to minimise the size of any blind pouch and thereby minimise the potential to develop this complication. The transverse diameter of the blind pouch in documented cases of entero-enterostomy blind pouch syndrome ranges between 3.7cm to 11cm. However, we found no reference to how big an abnormal pouch was in a gastro-jejunal case.\textsuperscript{5,8} It is suggested that when forming a side-to-side entero-enterostomy, a blind pouch should be no more than 2.5cm to avoid occurrence of the syndrome.\textsuperscript{3} We found no size recommendation specifically for gastro-jejunal anastomosis. Measurements involving the intestine are fraught with inaccuracies given its highly dynamic nature. Hence liberal interpretation is required for all measurements. Angulation of the blind pouch in relation to the gastrojejunostomy may also play a role in preventing Blind Pouch Syndrome. Techniques to create a favorable angulation include suturing the blind pouch vertical to the staple line which secures the blind pouch perpendicular and superior to the entero-enterostomy. Another technique is to form a vertical stapled gastrojejunostomy which again secures the blind pouch superior to the anastomosis. Neither

Figure 2: Illustration contrasting the path of gastric contents before (left) and after (right) blind pouch resection.
of these techniques have been critically appraised for their impacts on the development of Blind Pouch Syndrome.

Gastrojejunostomies have increased significantly over recent years with the increase in Roux-en-Y Gastric Bypass (RYGB) procedures being performed. Considering the significant time lag to presentation of Gastrojejunostomy Blind Pouch Syndrome, patients who develop symptoms may no longer have any contact with their original surgeon and may instead present to their general practitioner or be referred to a gastroenterologist or general surgeon without upper gastrointestinal expertise. Hence it is important a broad range of doctors are aware of this syndrome.

Competing interests: 
Nil.

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Is impetigo a missed opportunity for scabies treatment?

Simon Thornley, Gerhard Sundborn, Mark Arbuckle, Belinda Loring, Maryann Heather, Edwin Reynolds

Impetigo is a common condition which presents most frequently in Māori and Pacific children. It is characterised by pustules and yellow crusted sores. Analysis of hospital data shows that between 2006 and 2010, 732 admissions occurred in New Zealand hospitals, at a rate of 0.16/1,000 children per year in children aged 0 to 14 years. Primary care rates of treatment are likely to be much higher. Rates of hospitalisation for the more general category of skin infection have been slowly rising, particularly so for Māori and Pacific young people, whose rates are two to four times that of New Zealand Europeans. Impetigo admission rates are likely to underestimate the true incidence of the disease, as most disease is managed in primary care. Evidence also suggests that skin disease is often normalised, and not recorded, in high prevalence settings.

The treatment of impetigo in New Zealand has centred on bacterial infection, with a recent article summarising treatment guidelines. Topical fusidic acid and hydrogen peroxide have been recommended for minor impetigo and oral antibiotics for more major lesions. The paper heavily references a Cochrane review of treatments for impetigo. This systematic review, although acknowledging scabies as a cause of impetigo, focuses almost exclusively on evidence for the efficacy of anti-bacterial treatments: either topical or systemic antibiotics, or anti-septics.

Scabies infestation is commonly linked to impetigo in Australia and Fiji. The Australian Aboriginal population has a high prevalence of scabies, like indigenous Fijians. In a Fijian national survey, the link between scabies and impetigo was dramatic. The authors reported: “The presence of impetigo was strongly associated with a diagnosis of scabies (relative risk, RR, 58.6, 95% CI 48.7–70.5). The population attributable risk of scabies as a cause of impetigo based on the national survey was 93.1%.”

The strength of association is such that the nature of the link between the conditions may be difficult to grasp. Effectively, the authors of the study are presenting evidence that scabies and impetigo go hand-in-hand. Figure 1 shows a representation of the data from the study (from Table 4) as a scaled rectangle diagram. The area of the outer rectangle is proportional to the total study population, with the red inner rectangle representing subjects with impetigo and the blue represents those with scabies. The overlap of the two groups is marked and represents the strong reported association.

Scabies can be a difficult disease to diagnose, even in experienced hands. No test is reliably sensitive and overseas studies indicate that misdiagnosis is common. The Pacific region is one of the highest prevalence areas in the world, and the most recent survey conducted in New Zealand in the late 1970s indicated a high prevalence of the disease in Māori (~10%) and Pacific (~18%) people. A more recent study conducted as part of a school health programme in South Auckland (Mana Kidz), reported that the most common skin infection encountered was impetigo (122/183; 67%), with 19% of skin infection cases having scabies.

This finding is at odds with a number of reports, including the one already referred to from Fiji and another in East-Timor.
which demonstrate that the two conditions frequently co-occur.\textsuperscript{13,14} Review papers also indicate that scabies and impetigo are commonly linked.\textsuperscript{10} Scabies, skin infection and rheumatic fever are strongly linked. Community trials conducted in Fiji and the Solomon Islands of scabies treatment show a sharp reduction in impetigo commensurate with the drop in scabies prevalence from the programme.\textsuperscript{15,16} Recent evidence from Auckland shows that scabies is strongly associated with the incidence of acute rheumatic fever.\textsuperscript{17} Historic studies from Trinidad strengthen the evidence for a causal link between the two diseases, by describing an outbreak of acute rheumatic fever (and post-streptococcal glomerulonephritis) which immediately followed an outbreak of scabies.\textsuperscript{18} Further evidence comes from a recent population survey from Ethiopia. This survey showed an association between a history of scabies and “definite” echocardiographic evidence of rheumatic heart disease in a cross-sectional analysis (calculated odds ratio: 3.39; 95% confidence interval: 1.35 to 8.50, comparing those with a history of scabies to those without).\textsuperscript{19}

In view of this evidence, several responses are possible. It may be argued that the family of children presenting with impetigo be routinely offered treatment for scabies, since co-infection with scabies is possible? If not, it seems prudent to at least examine patients carefully for scabies when impetigo is diagnosed. To help distinguish between these courses of action, we believe a study is needed to accurately investigate the prevalence of scabies and impetigo and the degree of association between these conditions in this country.

\textbf{Figure 1:} Scaled rectangle diagram, illustrating the nature of the association between scabies and impetigo in a national survey of the diseases carried out in Fiji.
RESEARCH LETTER

Competing interests:
Nil.

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Mitigating the demand for overseas organs through an ethical lens

Phillipa Malpas

I would like to thank Professor Stephen Munn for his considered response\(^1\) to my paper.\(^2\)

One of the central challenges facing researchers seeking to clarify ‘accurate data about current practices within China’\(^3\) is the shifting landscape regarding the number of transplant surgeries undertaken in China. The China Organ Harvest Research Centre’s Report published last month notes that, ‘... after forced organ harvesting first gained international scrutiny in 2006... transplant data and relevant online information have been either removed or deflated, often by an order of magnitude.’\(^3\) They detail the deletion of hospital websites, cases of under-reporting, and the falsification of transplant data from a number of named institutions. They conclude that the true number of transplant surgeries carried out in China ‘may forever remain unknown.’\(^3\) Their conclusions are consistent with the findings of David Kilgour, David Matas and Ethan Gutmann.\(^4\)

In my paper I refer to Liver International’s retraction of the paper by Yu et al.\(^5\) The editorial team states that unless the authors provide ‘indisputable, detailed and exhaustive evidence’\(^6\) that their institution (First Affiliated Hospital of Zhejiang University’s School of Medicine) did not use the organs of executed prisoners in their research the ‘authors will be subjected to a life-long embargo from submitting their work to Liver International.’\(^6\) The retraction is a further example of verified unethical (reporting) practice from China.

I am in agreement with Professor Munn that banning transplant patients from overseas travel to procure an organ exceeds the role of transplant physicians, however I reiterate my point that physicians should strongly dissuade their patients from traveling to China for the purpose of receiving an organ transplant.\(^2\)

This is justified because of ‘evidence that such black market organs do not perform as well in transplant recipients’,\(^1\) and because of the compelling likelihood that such organs are taken from women and men who were murdered for their organs.

Sustained and ongoing efforts to increase New Zealand’s organ donation rate is to be applauded. Our position internationally regarding deceased donation rates however is nothing to be proud of.\(^7\) Organ Donation NZ\(^8\) acknowledges that some New Zealanders waiting for an organ will die waiting and others will be limited in their quality of life for need of an organ. One way for New Zealanders to play their part in increasing the availability of organs for those individuals living with organ failure, is to seriously consider becoming an organ donor; either upon death, or as a living donor. Ensuring that one’s informed decision to donate is clearly articulated to others would go some way in mitigating the demand for overseas organs.
Competing interests:
Phillipa Malpas is a member of the group, the International Coalition to End Transplant Abuse in China (ETAC).

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Flucloxacillin-warfarin interaction: an under-appreciated phenomenon

Sub-therapeutic anticoagulation attributed to flucloxacillin-warfarin interaction has been described in individual case reports.

The authors of this report encountered one such case in their hospital-in-the-home service in Brisbane. Review of the records of this service revealed a total of four examples of patients who appeared to suffer from such a flucloxacillin-warfarin interaction. In all 4 cases there was a statistically significant increase in the warfarin dose in the final week of the flucloxacillin treatment – ranging between 57% and 130%.

Awareness of this interaction should prompt close monitoring of the INR (International Normalised Ratio) in such patients in order to reduce the risk of anticoagulation treatment failure.

Internal Medicine Journal 2018; 48:860–863

Benefits and harms of screening men for abdominal aortic aneurysm in Sweden

Large reductions in the incidence of abdominal aortic aneurysm (AAA) and AAA—related mortality mean that results from randomised trials of screening for the disorder might be out—dated. The aim of this study was to estimate the effect of AAA screening in Sweden on disease-specific mortality.

The researchers compared data relevant to the incidence of AAA and related mortality in a cohort of men aged 65 years who had been screened with an age—matched cohort who had not been screened. They found that mortality decreased at similar rates in screened and non—screened subjects. There was a non—significant reduction in AAA mortality associated with screening.

AAA screening in Sweden did not contribute substantially to the large observed reductions in AAA mortality. The reductions were mostly caused by other factors, probably reduced smoking. The researchers noted that the prevalence of smoking in Sweden decreased from 44% in 1970 to 15% in 2010. They conclude that the small benefit and substantially less favourable benefit—to—harm balance call the continued justification of the intervention into question.

Lancet 2018; 391:2441–47

A randomized trial of early endovenous ablation in venous ulceration

Venous disease is the most common cause of leg ulceration. Although compression therapy improves venous ulcer healing, it does not treat the underlying causes of venous hypertension. Treatment of superficial venous reflux has been shown to reduce the rate of ulcer recurrence, but the effect of early endovenous ablation of superficial venous reflux on ulcer healing remains unclear.

To elucidate, this randomised trial enrolled 450 patients from 20 centres in the UK with venous leg ulcers. Half were treated with compression therapy and venous ablation of superficial veins within 2 weeks after randomisation. The other half had compression alone and were considered for endovenous ablation when the ulcer was healed or at six months if the ulcer had not healed.

Apparently early endovenous ablation of superficial venous reflex resulted in faster healing of venous leg ulcers and more time free from ulcers than deferred endovenous ablation.


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A sailor came to the Auckland Hospital with a septic thumb. He was seen in the casualty department, when it was decided that the thumb should be opened under a general anaesthetic. The man was apparently in good health. The anaesthetic was proceeded with, and when the man was “under,” the house surgeon incised the abscess. As soon as he had done this he noticed that no bleeding took place from the incision; this was the first intimation he had that the man’s heart had stopped. It was then discovered that there was no radial pulse and the respirations were dying away. Artificial respiration was immediately started, and, as I happened to be in the hospital at the time, I was sent for. On my arrival in the casualty room the man was quite white and there were no heart sounds. Artificial respiration was going on but there was no attempt at voluntary respiration. The man seemed quite dead, so I quickly put iodine on the skin and made an incision in the upper right rectus region. Introducing my hand through this incision, I was able to grasp the heart firmly in my hand, for the diaphragm was so flaccid that this was quite easy. I then waited for a few seconds to see if there was any muscular movement in the heart, but could feel none, so I squeezed the heart between the hand and the ribs several times, whereupon it gave a distinct but feeble kick, followed by slow and feeble contractions, which soon became bounding and rapid. At this time the appearance of the man was quite alarming, for owing to the excessive pulsations in all the arteries of the body, he almost seemed to life off the couch with each beat. We were afraid that there must be clots in the smaller vessels which required this excessive driving force to push them along. However, as events showed no embolism or thrombosis took place, the wound was sewn up and the man put to bed.

I’m a dead man; he’s near my heart.” (Observer, 16 June 1906). Alexander Turnbull Library, Wellington, New Zealand. /records/6881364

Heart Massage

By Carrick Robertson, F.R.C.S.
On recovery he became maniacal and had to be put in a restraining—sheet. He remained in this excited state for twelve hours; after this he quietened down, but was quite childish for another day. In two days' time he was quite normal, but could not remember coming to the hospital or anything that had happened for two days afterwards.

I have had several cases of heart massage during the last year or two, but I have never seen so striking an example of its saving powers. The interest of this case lies particularly in the fact that at the lowest calculation this man must have been dead for three minutes, probably five. His mental symptoms I put down to an oedema of the brain supervening on the stasis of the circulation. I think it was only because he was a comparatively young man (34 years) that he did not burst a cerebral blood-vessel during the first five minutes after the heart started to beat again, for I feel sure that no arteries at all senile in type could have withstood such excessive heart action.

The first case of heart massage which I tried was upon a man on whom I was operating for appendicitis. His heart stopped after I had made the appendix incision, and as I could not reach the heart from this incision another was made below the costal margin as related in the above case. This man did well, but, of course, the result was not so striking, for a very little time elapsed between his heart stopping and the massage which restarted it. In a third case in which this manoeuvre was tried I am sorry to say it was unsuccessful.

An only child, nine years of age, was being operated on for enlarged tonsils.

The anaesthetist said she was ready, and I could see that the respirations were quiet and steady. I guillotined one tonsil and noticed there was no bleeding, and at once listened to the heart. It had stopped. I performed heart massage as before through the diaphragm, but could get no response whatever from the cardiac muscles. In this case, as in the first described, the heart had stopped some time before the respirations. A post-mortem examination was held on this child and a thymus four ounces in weight was found, together with pronounced glandular hyperplasia throughout the body: a well-marked case of status lymphaticus.

Although heart massage is fairly well known as a possible procedure, I have not heard any personal reports of such cases, so I venture to think the record of these cases may be of interest to the profession in New Zealand. It will be seen that heart massage adds another efficient method of dealing with cases of sudden collapse on the operating—table. With the experiences recorded above I am firmly convinced that when the surgeon is sure that the heart has stopped there should be no excuse for not applying this procedure; but I should like to emphasise the fact that this should only be done after failure to restore animation with the usual restoratives, and, judging from the first case, it would seem that there is no great hurry, for the heart will respond after a comparatively long latent period.

In each of these cases there was the one striking observation that no bleeding or oozing took place from the wound. Even with a slight flickering heart there will at least be some oozing.
NZMJDigest

published by the New Zealand Medical Association

Critical Friends

Why did I want to be a doctor?

You’ve got to be kidding – they want to know what I ate for breakfast!

NZMJDigest

http://www.nzma.org.nz/publications/nzmjdigest

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